
JOURNAL OF INSURANCE REGULATION

Cassandra Cole and Kathleen McCullough
Co-Editors

Vol. 35, No. 6

How Does Natural Hazard Insurance Literature Discuss the Risks of Climate Change?

Marvin Starominski-Uehara
E. Carina H. Keskitalo



The NAIC is the authoritative source for insurance industry information. Our expert solutions support the efforts of regulators, insurers and researchers by providing detailed and comprehensive insurance information. The NAIC offers a wide range of publications in the following categories:

Accounting & Reporting

Information about statutory accounting principles and the procedures necessary for filing financial annual statements and conducting risk-based capital calculations.

Consumer Information

Important answers to common questions about auto, home, health and life insurance — as well as buyer's guides on annuities, long-term care insurance and Medicare supplement plans.

Financial Regulation

Useful handbooks, compliance guides and reports on financial analysis, company licensing, state audit requirements and receiverships.

Legal

Comprehensive collection of NAIC model laws, regulations and guidelines; state laws on insurance topics; and other regulatory guidance on antifraud and consumer privacy.

Market Regulation

Regulatory and industry guidance on market-related issues, including antifraud, product filing requirements, producer licensing and market analysis.

NAIC Activities

NAIC member directories, in-depth reporting of state regulatory activities and official historical records of NAIC national meetings and other activities.

Special Studies

Studies, reports, handbooks and regulatory research conducted by NAIC members on a variety of insurance-related topics.

Statistical Reports

Valuable and in-demand insurance industry-wide statistical data for various lines of business, including auto, home, health and life insurance.

Supplementary Products

Guidance manuals, handbooks, surveys and research on a wide variety of issues.

Capital Markets & Investment Analysis

Information regarding portfolio values and procedures for complying with NAIC reporting requirements.

White Papers

Relevant studies, guidance and NAIC policy positions on a variety of insurance topics.

For more information about NAIC publications, view our online catalog at:

 <http://store.naic.org>

© 2016 National Association of Insurance Commissioners. All rights reserved.

Printed in the United States of America

No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any storage or retrieval system, without written permission from the NAIC.

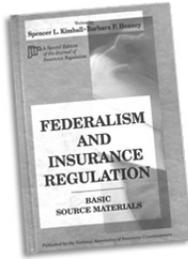
NAIC Executive Office
444 North Capitol Street, NW
Suite 700
Washington, DC 20001
202.471.3990

NAIC Central Office
1100 Walnut Street
Suite 1500
Kansas City, MO 64106
816.842.3600

NAIC Capital Markets
& Investment Analysis Office
One New York Plaza, Suite 4210
New York, NY 10004
212.398.9000

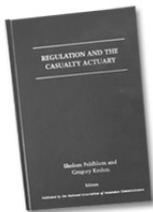
Companion Products

The following companion products provide additional information on the same or similar subject matter. Many customers who purchase the *Journal of Insurance Regulation* also purchase one or more of the following products:



Federalism and Insurance Regulation

This publication presents a factual historical account of the development of the framework for insurance regulation in the United States. It does so in part by using illustrative early statutes, presenting them chronologically, and in part by using cases that illustrate the interpretation of the crucial later statutes. Copyright 1995.



Regulation and the Casualty Actuary

This anthology reprints 20 important papers from past issues of the Journal of Insurance Regulation that are most relevant for practicing actuaries and state insurance regulators. It covers a wide range of issues, such as ratemaking, auto insurance pricing, residual markets, reserving and solvency monitoring. This invaluable reference explains these complex topics in straightforward, non-technical language. Copyright 1996.

How to Order

 816.783.8300

 prodserv@naic.org

 <http://store.naic.org>

Editorial Staff of the *Journal of Insurance Regulation*

Co-Editors

Cassandra Cole and Kathleen McCullough
Florida State University
Tallahassee, FL

Case Law Review Editor

Jennifer McAdam, J.D.
NAIC Legal Counsel II

Editorial Review Board

Cassandra Cole, Florida State University, Tallahassee, FL
Lee Covington, Insured Retirement Institute, Arlington, VA
Brenda Cude, University of Georgia, Athens, GA
Robert Detlefsen, National Association of Mutual Insurance Companies,
Indianapolis, IN
Bruce Ferguson, American Council of Life Insurers, Washington, DC
Stephen Fier, University of Mississippi, University, MS
Kevin Fitzgerald, Foley & Lardner, Milwaukee, WI
Robert Hoyt, University of Georgia, Athens, GA
Alessandro Iuppa, Zurich North America, Washington, DC
Robert Klein, Georgia State University, Atlanta, GA
J. Tyler Leverty, University of Iowa, Iowa City, IA
Andre Liebenberg, University of Mississippi, Oxford, MS
David Marlett, Appalachian State University, Boone, NC
Kathleen McCullough, Florida State University, Tallahassee, FL
Charles Nyce, Florida State University, Tallahassee, FL
Mike Pickens, The Goldwater Taplin Group, Little Rock, AR
David Sommer, St. Mary's University, San Antonio, TX
Sharon Tennyson, Cornell University, Ithaca, NY

Purpose

The *Journal of Insurance Regulation* is sponsored by the National Association of Insurance Commissioners. The objectives of the NAIC in sponsoring the *Journal of Insurance Regulation* are:

1. To provide a forum for opinion and discussion on major insurance regulatory issues;
2. To provide wide distribution of rigorous, high-quality research regarding insurance regulatory issues;
3. To make state insurance departments more aware of insurance regulatory research efforts;
4. To increase the rigor, quality and quantity of the research efforts on insurance regulatory issues; and
5. To be an important force for the overall improvement of insurance regulation.

To meet these objectives, the NAIC will provide an open forum for the discussion of a broad spectrum of ideas. However, the ideas expressed in the *Journal* are not endorsed by the NAIC, the *Journal's* editorial staff, or the *Journal's* board.

How Does Natural Hazard Insurance Literature Discuss the Risks of Climate Change?

Marvin Starominski-Uehara*
E. Carina H. Keskitalo**

Abstract

Natural hazard insurance has been increasingly considered in the literature of climate change. Based on a comprehensive literature review, this paper reviews how peer-reviewed literature on natural hazard insurance discusses the risks of climate change. The study highlights the increasing role of natural hazard insurance as a business opportunity contributing to adaptation and working in cooperation with governmental sectors. In response to these challenges, the insurance industry has started to develop adaptation strategies and measures to adjust data collection, catastrophe modelling and risk analysis despite the limitations of these strategies and difficulties arising from the requirement of considering a significant number of partners and systems.

* Research Assistant, Department of Geography and Economic History, Umeå University, 901 87 Umea, Sweden; m.uehara@uq.edu.au.

** Professor, Department of Geography and Economic History, Umeå University, 901 87 Umea, Sweden; Carina.Keskitalo@geography.umu.se.

1. Introduction and Aim: Climate Change Affecting Insurance

The Intergovernmental Panel for Climate Change (IPCC) confirmed that global warming increases the frequency of extreme weather events (IPCC, 2007). The result of this increased frequency is a heightened vulnerability of communities to weather events caused by a combination of natural and man-made factors (Blazey and Govind, 2007; Charpentier, 2008). This threatening combination is leading to a growing number of extreme weather events, whose impacts are becoming increasingly more costly (Charpentier, 2008; Mishra, 2010). The damage caused by Hurricane Katrina in 2005, for instance, was more than \$135 billion, and it greatly affected the insurance industry (Swiss Re, 2006). However, Blazey and Govind (2007) and Charpentier (2008) point out that increased losses from extreme weather events are not only due to climate changes, but also because of individuals' decisions that end up increasing their exposure to risks. Glade et al. (2008) add that an increase in exposure led to an increase of insured losses in the last decades. Most insurers, however, seem to be primarily adapting their business practices to the growing impacts of climate risks (Kunreuther and Michel-Kerjan, 2009), such as climate variability rather than implementing long-term adaptation and mitigation strategies based on potential losses to climate change and its related uncertainties.

Climate risks are thus becoming increasingly important to the insurance sector (Born and Viscusi, 2006; Charpentier, 2008). Changes in weather events may have been responsible for a growth in insured losses by about 2% a year since the 1970s (Muir-Wood et al., 2006; Ward et al., 2008). Climate change may have led to unprecedented losses in the 1980s and the 1990s (Muir-Wood et al., 2006). Swiss Re cautioned in November 1990 that insured losses from natural catastrophes were not a random occurrence (Dlugolecki and Keykhah, 2002). These occurrences are linear and bound to increase, and so is the exposure of populations at risk (Freedman, 1997). Thus, climate change is a risk management issue on a global scale, and the consequences of inaction, due to high costs, can result in potential larger losses for many countries (Charpentier, 2008; Robson, 2007).

2. Methodology

This study is a meta-synthesis of the literature reviewed, a technique used to integrate, evaluate and interpret the findings of multiple qualitative research studies (Cronin et al., 2008). The aim of meta-syntheses is to transform individual findings into new conceptualizations and interpretations (Polit and Beck, 2006). Comprehensiveness, through the inclusion of a large number of databases (Jesson

et al., 2011)¹, and relevance were the primary indicators considered in the review process (Newell and Burnard, 2006). Terms searched in databases were: “insurance,” “climate change” and “natural hazard.” This search was conducted on Oct. 21, 2013, and its categories of limitation were: 2000–2014, articles, English, peer reviewed and full text. The search yielded 195 papers from which the studies considered for this project were the ones making direct references and connections between the searched terms while answering the following question: “How does natural hazard insurance literature discuss climate change-related risks?” By “making direct references and connections,” this study took into account only those papers making explicit reference to the searched terms while discussing and answering the research question. As a result, the total number of relevant primary articles selected out of 195 papers resulting from the search terms was 33, with a lower number effectively cited in this review. From these primary references, a total of 420 secondary references were selected. Based on the selection criteria above, the number of secondary references was reduced to 54 articles, yielding a total of 87 articles for this review. In addition, studies on catastrophe risk and regulation that were not identified through the search mechanisms were later included in this review in order to extend the discussion on this area. In total, 10 additional references were included in this respect, yielding a total of 97 articles.

The great amount of information selected from these studies demanded the establishment of a set of criteria to identify which information would be the most relevant to this review. These criteria were: 1) a preference for statements rather than descriptions or examples; 2) inclusion of passages that highlighted comments and observations made by insurers; 3) a focus on climate change as a phenomenon instead of related hazards; 4) most updated information; and 5) discussions on the relationships between climate change and the insurance industry. While studies not falling into these categories were not immediately disregarded, they were given less focus as the scope of the review had to be narrowed down to accommodate general points, main arguments and debates in relation to the research question.

The categorization of the selected information was organized under the following sections. “Climate Change Affecting Insurance” provides an overview of the impacts of climate change on the insurance industry. “Insurers’ Views on Climate Change” describes the main viewpoints insurers share on the risks of climate change. “Challenges to Insurance Caused by Climate Change” covers the major problems faced by insurers as a result of climate change. “Insurance Addressing Climate Change” highlights insurers’ adaptation strategies and measures to reduce the risks of climate change. “The Role of Government:

1. ACM digital library, AIP Journals, American Chemical Society, Annual Review, Anthrosource, ASM, BioMed Central, BMJ, Brill, Cambridge Journals, De Gruyter, DOAJ, Duke University Press, Econpapers, Elsevier, Emerald Journals, Encyclopedia Britannica, Idunn, IEEE, Informa Healthcare, IOP, IOS Press, Journal of Bone and Joint Surgery, Jstor, Karger, Lippincott Total Access, Literature Resource Center, Mary Ann Liebert, Nature, New England Journal of Medicine, Ovid, Oxford Journals, Oxford Arts Online, Palgrave, Project Muse, Psycarticles, Pubmed, Royal Society of Chemistry, Sage Journals, Science Direct, Scopus, Springer, SwePub, Taylor and Francis, Web of Science 1989 and Wiley.

Regional and National Variation” describes the role of public policies and regulations in relation to insurance and climate change.

3. Results

3.1 Insurers' Views on Climate Change

The reviewed literature highlighted the growing concern among insurers about the impacts of climate change. The World Meteorological Organization (WMO) reported in July 2014 that weather, climate and water-related disasters are on the rise worldwide (WMO, 2014). From 1970 to 2012, \$2.4 trillion of economic losses were reported globally as a result of weather-related events and health epidemics (WMO, 2014). In two recent years, the worldwide economic losses from weather-related disasters were about \$130 billion in 2008 (\$44 billion insured) (Swiss Re, 2009) and \$190 billion (\$45 billion insured) in 2013 (AON, 2013). Mills informs that these losses have been rising more quickly than population or inflation (2005). Nonetheless, Neumayer and Barthel argue that “... there is no evidence so far that climate change has increased the normalized economic loss from natural disasters” (2011:23). Nonetheless, Neumayer and Barthel state that this lack of evidence does not omit policymakers from preventing “the further accumulation of wealth in disaster-prone areas” (2011:24) and designing policies that reduce greenhouse gas emissions. In 2009, analysts rated climate change as the greatest risk facing the insurance industry (Mills, 2009:324), and this growing risk raises serious questions about the future of insurance firms (Hecht, 2008). In Europe, climate change stands to increase losses from extreme events by 37% within a decade, while losses in a bad year could top \$400 billion (MacDonald-Smith, 2007).

Insurers believe that climate change can lead to the development of business opportunities (Mills, 2007; Botzen et al., 2009). Insurers can be a major partner in promoting climate change adaptation (Hecht, 2008; Mills, 2007) as they can “provide the means to restore things to their previous condition and to insulate vulnerable groups from external risks” (Blazey and Govind, 2007:19). Insurers can also provide signals of climate risks through pricing, terms and conditions while helping society spread financial risks (Charpentier and Maux, 2014; Ibragimov et al., 2009; Mills, 2009). Moreover, insurers can help mainstream climate change as long as policies remain affordable and accessible (Blazey and Govind, 2007). Blazey and Govind noted that climate change and insurance are dependent of each other: insurers can play a major role in adaptation, while adaptation ensures that “the insurance industry remains viable” (2007:29). As a result of this dependency, many insurers are adapting their business model to the realities of climate change (Charpentier, 2008; Mills, 2009). Insurers, however, “are still catching up ... to mainstream science and to their customers” (Mills, 2009:323). Insurance customers have changed the way they build, transport, design and produce (Mills, 2009:323). Insurers struggle to adapt as fast as their clients because of insufficient

data, the need of safeguarding customers, and regulations limiting coverage and the exit of markets (Born and Klimaszewski-Blettner, 2013; Grace and Klein, 2009; Klein, 1996; Mills, 2009).

As far as governance and public policies are concerned, it was noted that insurers require “an effective government strategy in order to remain solvent” (Blazey and Govind, 2007:17). This strategy is about the insurance industry actively engaging in policy making in order to help governments “deal with future financial consequences” resulting from climate change (Blazey and Govind, 2007:17). Governments, however, need to ensure that insurers have the necessary resources to provide climate change modelling services (Blazey and Govind, 2007; Ishihara, 2010). Gathering reliable information at the local level is one instance of the intersection between public policy and the insurance industry; another one is the capacity of the government and insurers to promote behavior modification (Blazey and Govind, 2007).

The issues of availability and affordability of insurance policies are also important intersections between the government and insurers (GAO, 2007; Klein, 1996). An often-raised question when it comes to climate change is who should pay for the elevated risks (Kunreuther et al., 2008). Insurers argue that they not only compensate damages, but also they contribute to the adaptation of societies to increasing risk and enhance economic resilience to disasters (Botzen and van den Bergh, 2008; Mills and Lecomte, 2006). However, the insurance sector faces problems with insuring low-probability, high consequence and correlated risks (Botzen and van den Bergh, 2009). As a result of these difficulties, insurers have tried to limit their exposure to losses by limiting availability, tightening terms and raising prices (Born and Viscusi, 2006; Mills et al., 2006).

When the private sector recedes, insurers expect that the government takes some responsibility for reducing climate risks and helps compensate damages (Mills, 2009). Blazey and Govind (2007) suggest that financial preparedness to climate change should become part of policies and strategies of all nations. These policies and strategies, however, must “be tailored to meet certain dangers and [are] conditioned by different budget levels and political concerns” (Blazey and Govind, 2007:18). However, this challenge of addressing climate change-related risks worldwide is hindered by the perspective that some insurers have that “the time pattern of losses due to socioeconomic developments is likely to cause fewer problems than the effects of climate change on disaster damage” (Botzen and van den Bergh, 2009:218). This happens because insurers argue that growing wealth, which increases the monetary value insured, results in increased premium revenues that balance expected insurance payouts and premium revenues (Botzen and van den Bergh, 2009; Charpentier, 2008).

3.2 Challenges to Insurance Caused by Climate Change

Increased climate uncertainties force insurers to come up with strategies to reduce their exposure to risks. Insurers reduce their exposure to risks by raising their rates, not accepting new risks, and reinsuring (Born and Viscusi, 2006;

Dlugolecki and Keykhah, 2002). Climate uncertainty also makes insurers face the possibility of having their ratings downgraded by rating agencies or collapse under the claims made by policyholders (Mills et al., 2005). Another risk is that a changing climate moves premiums “beyond less affordable to incalculable” (Phelan, 2011:227). In this process of increasing premium prices, insurers criticize regulatory policies on natural catastrophe because low-risk and high-risk individuals cannot be distinguished (Blazey and Govind, 2007; Picard, 2008). One effect of regulators constraining rate differentials between low- and high-risk insureds is market distortions. Another effect of this regulatory constrain is a situation where low-risk policyholders subsidize “those who are at higher risk and suffer risk on a more regular basis” (Blazey and Govind, 2007:33). In order to address this mismatch, premium rates should be calculated based on risks that most accurately reflect the exposure levels of those householders living in high-risk areas (Blazey and Govind, 2007:33). Conversely, policyholders considered as lower risk should be offered premiums at a reduced rate to avoid the risk of adverse selection (Freeman and Scott, 2005).

Uncertainty is not the only challenge faced by insurers while dealing with the risk of climate change. Density is another one because insurance for natural hazard is still rare in developed economies (Dlugolecki and Hoekstra, 2006), but this rarity is expected to fade away as the privatization of utilities and transport companies lead to more demand for insurance solutions since privatized entities “cannot carry uninsured risk exposures to natural disasters” (Dlugolecki and Hoekstra, 2006:651). As far as developing countries are concerned, most of the infrastructure is still government-owned, as well as the risks involved in these ownerships, forcing these governments to “resort to multilateral financial institutions and donors for disaster risk funding” (Dlugolecki and Hoekstra, 2006:651). Thus, urban infrastructure requires new investments in developed and developing nations.

Less developed countries also lack a preparatory phase, which consists of information-gathering and buildup towards a more formal property-owning system (Litan, 2000). As a result, developing nations face “major problems with covariate risks” (Dlugolecki and Keykhah, 2002:93). In Bangladesh, the 1998 flood affected little more than half of 2.3 million members of the Grameen Bank, resulting in difficulties in servicing loans (ISDR, 2002). Other issues faced by entities providing micro-credit are that premiums may be low and administration costs high (Dlugolecki and Keykhah, 2002). As a result, Hoogeveen (2000) argues that for a covariate risk such as catastrophe weather—where many losses can occur simultaneously—formal insurance is the most efficient approach as long as the pool of risks is broad, and there is sufficient capital. While Vatsa and Krimgold (2000) agree with this statement, they also point out the need for physical risk control. The main problem while addressing covariate risks, Dlugolecki and Keykhah observe, is that many of these risks are not financially addressed and when so, “the poor are excluded” (2002:93).

Socioeconomic issues, like disregarding the poor, have been considered “the main cause behind the rapid increase in damage” and exposure resulting from

climate change (Botzen and van den Bergh, 2009:220). In reviewing lessons from Hurricane Katrina in the U.S., Tierney states that “social class position is perhaps the most obvious contributor to disaster vulnerability and resilience” (2006:113). This is also particularly the case in developing countries, which also suffer from “poor control of land use and weak enforcement of building codes” (Dlugolecki and Hoekstra, 2006:650). Also, “trends such as growing populations in hazardous geographic zones and poor maintenance of infrastructure tend to be overlooked” (Blazey and Govind 2007:23).

Still in the context of urban infrastructure, insurance is considered a “low regret” activity. Enabling the environment for adaptation and implementing specific measures to manage flood risk includes: routine monitoring, flood forecasting, data exchange, institutional reform, bridging organizations, contingency planning for disasters, insurance and legal incentives to reduce vulnerability (Wilby and Keenan 2012:1). All such activities are seen as “low regret” in that they yield benefits regardless of the climate scenario (Wilby and Keenan 2012). Implementing these “low regret” activities, however, involves expenses on “safety factors for new buildings, upgrading resistance and resilience of existing infrastructure, modifying operating rules, development control, flood forecasting, temporary and permanent retreat from hazardous areas, periodic review, and adaptive management” (Wilby and Keenan, 2012:1).

Climate change-related challenges are heightened because risk management systems are still based on historical assessments. Underwriters have been using historic loss data as a guide to future losses (Crichton, 2002), but past experience may cease to provide a reliable guide to future experience as climate changes (Phelan, 2011). Catastrophe software, for instance, have struggled to “generate consistent future scenarios based on past experiences” (Charpentier, 2008:104). It is worth noting that climate change and climate variability are not strictly the same, but in practice it may be impossible to differentiate them (van Aalst and Burton, 2000). Therefore, whether it is climate change or climate variability, if insurers are to remain solvent or even to expand into underwriting risks in new territories, historic loss data in itself is no longer a reliable guide to the future (Crichton, 2002).

The IPCC Working Group confirmed that insurance companies agree that the challenge of climate change requires “forward looking” policies not only in terms of cover, but also to ensure that the insurance companies themselves remain viable (Climate Change, 2007). Progress in the field of climatology has helped the insurance industry “increase the predictability in assessing climate change-related risks” (Ishihara, 2010:99) and “catastrophe models may aid rate setting” (Botzen and van den Bergh, 2009:220). Insurers’ main criticisms over the work of the IPCC, despite the panel being the most trusted source of climate information among insurers (Dlugolecki and Keykhah, 2002), are that the IPCC often changes the forecasts of hazards linked to climate change (Henderson-Sellers et al., 1998) and lack details in its climate models both spatially and temporally (Keykhah, 2000). Insurers argue that the IPCC’s forecasts should be complemented by regional assessments (Botzen and van den Bergh 2009). Regional projections

inform adaptation and risk management strategies because they include the understanding of households' perceptions, which may deviate from expert assessments (Botzen and van den Bergh, 2009; Ishihara, 2010).

"Forward looking" policies, however, have implications on pricing. Insurance pricing is a serious matter and one that insurers largely ignore (Booth, 2004). Booth (2004) argues that prices are lagging the real risk and that we cannot see these real risks because disasters do not happen every year. However, Booth (2004) notes that the real risk is going up by between 2% and 4% a year. Because insurers are using historical statistics, prices for weather risks are lagging by between 15% and 30% all the time (Booth, 2004). Also, Booth (2004) warns that additionally, it seems that most classes of insurance are affected by climate change: property and business interruption lines are the most at risk, and there are less obvious exposures that have implications for commercial lines coverages (Booth, 2004). Employers' liability programs could also be hit as temperatures rise and working conditions become unsafe (Booth, 2004). A UNEP Finance Initiative (UNEPFI) study lists perceived threats across sectors including: property/casualty (P/C) insurance; life and health insurance; banking and project finance; and asset management (Booth, 2004).

"The ability to appreciate risk is the first step when considering whether the insurance industry can withstand a natural catastrophe onslaught" (Blazey and Govind 2007:23). Risk appreciation also depends on consumers' willingness to pay (WTP). WTP is expected to increase if climate change increases the frequency or severity of natural hazards (Botzen and van den Bergh, 2009). However, premium changes may have little impact on insurance penetration if changes in WTP are in line with expected losses from climate change (Botzen and van den Bergh, 2009). In other words, customers are expected to continue taking out and accepting paying more for insurance as they become aware of the risks involved with climate change-related hazards (Botzen and van den Bergh, 2009).

Another challenge for insurers is market penetration. Mills (2009) affirms that efforts in this regard have improved, but the amount of information in this regard is still insufficient. Even though the full scale of market penetration is not known, Mills (2009) argues that the current market penetration of natural hazard insurance is "a tiny fraction of global policies." Thus, Mills concludes that the overall insurance market is still "considerably undeveloped" (2009:337). Also, insurers' traditional modelling techniques are still ill-suited for understanding the implications of climate change (Charpentier, 2008) and detailed loss data are "incomplete and under-utilized in understanding the trends" (Mills, 2009:338). This is the reason why the insurance industry needs to work with "local weather information in the underwriting process" (Ishihara 2010:98). Data quality defines underwriting performance (Ishihara, 2010).

Public insurance is also presented as a challenge. Crichton (2002) argues that government compensation schemes can be a severe burden on the taxpayer and generally do not provide similar levels of protection to private insurance. Crichton (2002) believes that public money should be spent on alleviation projects to prevent or reduce flood impacts. Even insurance technologies such as the

Caribbean Catastrophic Risk Insurance Facility (CCRIF) are not fully addressing the risks of climate change as “there is an unacknowledged politics at play” (Grove, 2010:538). In addition, Mills et al. (2005) and Klein (1996) posit that the government’s main role in the insurance and climate change debate is maintaining availability and affordability of insurance. King (2005) states that failure by governments to act in this area results in a failure or refusal to offer adequate coverage to populations at risk. Some authors defend that some mechanisms that could be used to achieve a broad participation in public insurance are discounted or subsidized premiums, making additional funds available during high loss years (Born and Klimaszewski-Blettner, 2013; Medders et al., 2011; USGAO, 2007).

3.3 Insurance Addressing Climate Change

In response to these challenges, the insurance industry has started to apply its expertise in data collection, catastrophe modelling and risk analysis “to better track trends and define the problems posed by climate change and point towards solutions for both the industry and society” (Mills, 2009:338). Kunreuther, for instance, advocates a “comprehensive disaster insurance program whereby all natural hazards are required to be part of a standard homeowner policy” (2006b:176). A number of property/casualty (P/C) insurance companies also have been underwriting environmental technologies, such as carbon capture and sequestration facilities or wind-power generators, while personal lines insurers are seeing an increasingly desire to rebuild a home or office using green materials after an insured loss (Ishihara 2010). Insurance adaptation mechanisms offer the prospect of “a positive payout if adverse circumstances occur” (Robson, 2007:23).

Most adaptation policies are addressed at the national level (Warner et al., 2007). Effective adaptation, however, occurs at the local level, which requires the reinforcement of community policy and action targeted at disaster risk reduction (Helmer and Hilhorst, 2006; Picard, 2008). These local measures are essential because “climate change impacts are already manifest” (Phelan, 2011:229). Thus local “adaptation must be proactive rather than reactive” so that the benefits of insurance can be realized (Blazey and Govind, 2007:29). The promotion of local proactive adaptation happens by attaching conditions to policies that ensure “the survival and viability” of insurers (Blazey and Govind, 2007:29). This is consistent with the purpose of trying “to minimise risk ... on a long term basis” (Blazey and Govind, 2007:29) in communities at risk. Local adaptation is also a race against time as the measures required to adapt to climate change depend on the rate of changes: “If climate change occurs at a more rapid rate, investments in infrastructure will need to occur rapidly” (Blazey and Govind, 2007:30).

Mills (2009) states that insurers have been proactive in designing climate change adaptation strategies. These strategies promote loss prevention, align terms and conditions with risk-reducing behavior, finance customer improvement, and build awareness and participation in policy making (Mills, 2009). As for reducing greenhouse gas emissions, Blazey and Govind (2007) defend that insurers should couple insurance to strategies that help reduce the risk of power outages and

business interruption. Moreover, deductibles should be higher “to policies where homes or businesses are located close to coastlines or other vulnerable areas” (Blazey and Govind, 2007:32). These conventional forms of insurance are recognized as insurers’ attempts to rationalize their role in relation to climate change (Blazey and Govind 2007). However, a difficulty that insurers face while creating new products and reviewing their policies is that regulators have resisted premium adjustments (Born and Klimaszewski-Blettner, 2013; Grace and Klein, 2009), arguing that rates should be based only on historical losses and not reflect predictions (Kunreuther et al., 2008).

Insurers also argue that collecting premium from many individuals helps pay for damages that are very large for individual households and companies (Botzen and van der Bergh, 2009). Insurers do so “to reduce individual loss exposures and ... spread risks” (Botzen and van den Bergh, 2009:219). Primary insurers also spread risks by buying reinsurance coverage that spreads risk on large geographical markets or hedge risk on capital markets using weather derivatives, such as catastrophe bonds (Charpentier, 2008; Michel-Kerjan and Morlaye, 2008). This risk-spreading function of insurance improves financial security of insurers and policyholders (Botzen and van den Bergh, 2009a). In the case of Hurricane Katrina, more than 50% of the financial damage was ceded to reinsurance companies (Carpenter, 2006). Catastrophe insurance, for its part, has gained attention as an adaptation strategy in small island developing states (SIDS) and other regions exposed to the threat of hurricanes (Grove, 2010). Insurance enables SIDS “to transfer disaster risk to global financial markets, reducing states’ financial vulnerability and allowing an influx of capital after a disaster” (Grove, 2010:538). Catastrophe insurance and reinsurance are, however, expensive, and climate change exacerbates these costs—“potentially to uncontrollable levels” (Blazey and Govind, 2007:38).

Insurers tap into risk segregation to reduce moral hazard (Blazey and Govind, 2007). However, the insurance industry’s ability to segregate risk is reduced (Freeman and Scott, 2005; Medders et al., 2011) because “climate change intersects across a wide variety of different insurance lines, and extreme weather events present a number of contemporaneous or co-variant risks” (Blazey and Govind, 2007:33). Catastrophes generally mean that segregation of risk is difficult because large numbers of people are simultaneously exposed to the same peril (Freeman and Scott, 2005). Insuring agriculture illustrates moral hazard since it has many exposures to climate change (Dlugolecki and Hoekstra, 2006). Climate change alters agricultural risks through a slow-change process, with positive and negative effects for agricultural productivity, and through an increasing number of extreme weather events (Dlugolecki and Hoekstra, 2006).

Governments have supported agricultural insurance systems because of the high risk of moral hazard (“when farmers exploit their insurance cover rather than making an effort to reduce their losses”) and an adverse selection (“when only farmers with substandard risks take out insurance”) (Dlugolecki and Hoekstra, 2006:650). A case study by Giné et al. (2008) showed that less than 5% of the eligible farmers in a drought-prone region of India bought rainfall index-insurance.

Also, weather-index insurance failed to attract the target group of farmers as it was purchased mainly by those farmers who needed it the least (Akter, 2012). Charpentier and Maux, however, argue that adverse selection theory “may not be suited to the analysis of natural-catastrophe insurance” because of information asymmetry; that is, “insurers are better informed about catastrophe risks than are individuals” (2014:3). As far as moral hazard is concerned, government programs may cause significant moral-hazard problems because public programs discourage individuals and local governments to take protective measures and encourage construction in hazard-prone areas (Charpentier and Maux, 2014; Medders et al., 2011).

Another problem is that loss potential from catastrophes “often exceeds the capacity that the private insurance sector is willing to offer” (Dlugolecki and Hoekstra, 2006:650). Moreover, state-subsidized insurance schemes serve as “financial safety nets for farmers but make it less likely that farmers will insure non-catastrophic losses privately” (Dlugolecki and Hoekstra, 2006:650). Another issue with regard to public insurance programs is that farmers are not only influenced by premium prices, but also by broad economic changes in conjunction with climate change (Belliveau et al., 2006). To address these challenges, Smit and Skinner (2002) developed an adaptation framework that includes technological developments, government programs and insurance, farm production practices, and farm financial management (Bonsal et al., 2011). Wheaton and MacIver (1999) also developed a framework to improve the understanding of the adaptation cycle by asking questions about who is adapting, to what, why, how, with what effectiveness and with what residual effects. As for forest insurance, Blennow and Sallnäs (2002) found out that a small percentage of non-industrial private forest owners take action to remedy the effects of climate, but many of them did not know whether they take risk-reducing measures in relation to which specific climate change-related hazard.

Insurance limits damage by acting as a price signal for risk and encouraging the undertaking mitigation measures (Botzen and van den Bergh, 2008; Kunreuther, 1996; Medders et al., 2011). A necessary condition to limit damages is that insurance premiums reflect the risk faced by the insured property (Kunreuther et al., 2008). Premiums can stimulate development in less risky areas and restrain development in hazard-prone areas (Born and Klimaszewski-Blettner, 2013; Botzen and van den Bergh, 2009). Moreover, insurance can provide incentives to homeowners “to invest in measures that mitigate damage” (Botzen and van den Bergh 2009:220). This is relevant because mitigation measures are useful to manage risks despite individuals rarely undertaking them (Kunreuther, 2006a). Studies found out that homeowners do not undertake mitigation measures through insurance because: 1) they cannot see the tradeoff between spending money now and the future benefits; 2) they have little knowledge about financial adaptation; 3) they believe that government relief efforts provide a financial safety net; and 4) they have no resources to buy insurance premiums (Kleindorfer and Kunreuther, 2000; Medders et al., 2011). Private and public sectors financing

disaster risk, therefore, feature advantages and limitations (Dlugolecki and Hoekstra, 2006).

In addition to helping diversify risks, the private sector tends to be more effective and innovative than the public sector because of the private sector emphasis on increasing its profits through the controlling of administrative costs and fraud (Dlugolecki and Hoekstra, 2006). However, there has been little evidence that new risk management tools such as weather derivatives, catastrophe bonds and micro-insurance “will become a significant part of the standard repertoire of underwriting products” (Dlugolecki and Keykhah, 2002:95). Insurers are actually struggling to increase the popularity of catastrophe bonds beyond reinsurers’ circles (Salmon and West, 2007; Blazey and Govind, 2007). As far as micro-insurance is concerned, Mills (2009) states that this type of insurance is reaching a greater number of policyholders than most climate-related products in the traditional market and that micro-insurance products respond to vulnerabilities such as food and water shortages in rural areas of South America, Africa and Asia.

Insurance can modify behavior to reduce risk exposure (Freeman and Kunreuther, 2002). Insurance terms and policies designed to “instill behaviors that reduce greenhouse gas emissions as well as appropriate efforts to prepare for the impacts are beginning to emerge” (Mills, 2009:339). Pay-as-you-drive, for instance, has been offered with discounts in recognition of “the link between accident risk, energy use and distance driven,” and “potential liability of corporate directors and officers for their actions regarding climate change risks” is now reflected in insurance policies (Mills, 2009:339). As a result of these policies, customers with a tendency to reduce vulnerabilities are increasingly seen as “good risks” and “are being rewarded with ... lower premiums” (Mills, 2009:339). The promotion of behavior change puts insurance “in the vanguard of the environmental movement” (Mills, 2009:344). Challenges and opportunities in this area include “bringing promising products and services to scale, continuing to identify and fill coverage gaps, and becoming more sophisticated in identifying and confirming the performance benefits of green improvements” (Mills, 2009:355). However, it has “not yet been demonstrated how some insurance lines might respond to climate change” and, if insurers do not meet environmental expectations and are not subject to more scrutiny, they can be “pointed out as an industry only interest in ‘greenwashing’” (Mills, 2009:355).

Pricing climate change-related risks more highly can be seen as an “adaptive insurance response to an increase in the probability of extreme events” (Phelan, 2011). The problem is that “private insurance against natural catastrophes can be prohibitively costly” (Medders et al., 2011:191), and it raises significant social equity issues with regard to economic access to insurance (Phelan, 2011; Picard, 2008). As a response to this equity issue, in the U.S., the Florida Commission on Hurricane Loss Projection Methodology was created in 1995 to evaluate computer models that ensure reliable projections of hurricane losses so that rates for residential property insurance are neither excessive nor inadequate (FCHLPM, 2009). This type of initiative reveals necessary because inaction by the

government or communities will have a negative impact on the availability and affordability of insurance (Blazey and Govind, 2007).

Insurers, however, still claim that premium income will lag behind payouts of claims unless premiums are adjusted (Grace and Klein, 2009; Mills et al., 2002). Born et al. explain that premium income lags behind payout of claims because “residual markets should focus on addressing the availability of coverage and less on the affordability of coverage” (2011:295). The best strategy for insurers would be to incorporate expected changes in probabilities of weather extremes in assessing exposure to, and pricing and management of, risk (Botzen et al., 2009). Grace and Klein (2009) noted that the supply of insurance policies after Hurricane Andrew in 1992 decreased because Florida regulators resisted rate increases. The supply of insurance policies only started to increase in 2004 when insurers viewed their rates “as being close to adequate except in the high-risk areas” (Grace and Klein, 2009:17).

At the regional level, some catastrophe reinsurance companies established themselves on Bermuda, an Atlantic island that has developed a financial service infrastructure after Hurricane Andrew (1992) “precipitated the collapse of a number of insurance and reinsurance companies ... [and because of] its attractive tax status” (Dlugolecki and Keykhah, 2002:92). These companies, funded mostly by American and British capital, formed an international reinsurance hub committed to catastrophe reinsurance (Dlugolecki and Keykhah, 2002). In addition to operating independently, several of them decided to form the Risk Prediction Initiative (RPI)—an industry-academic research consortium—with the Bermuda Biological Station for Research (BBSR) as the scientific partner (Dlugolecki and Keykhah, 2002). The RPI framed its approach as “the open alternative to catastrophe models” and does not engage in climate science research per se or use general circulation models as its focus has been on “the development of historical records of tropical windstorm landfall in the U.S. Gulf Coast, the modeling of tropical windstorm formation and propagation in the Atlantic Ocean, and the proposal of seasonal forecasts of tropical windstorm activity” (Malmquist, 1997 and 1998).

Insurers have also been collaborating with non-insurance groups (Mills, 2009). Research centers are working with reinsurers “to implement satellite-based remote sensing in support of micro-insurance for small farmers in Africa and on a joint project ... to refine the understanding of the economics of climate change” (Mills, 2009:335). Other partnerships have been initiated with regional development banks and financial corporations (Mills, 2009). P/C insurance companies are the ones driving “the majority of the activity with life-health companies lagging far behind” (Mills, 2009:336). In addition, well-designed financial compensation arrangements based on strategic networks can speed up recovery processes and contribute to overall economic resilience (Botzen and van den Bergh, 2009). A combination of this financial expertise with investments in damage mitigation measures by households (e.g., retrofitting and structural designs and materials) and prevention undertaken by the public sector (e.g., infrastructure and long-term mitigation loan programs) is likely to result in

well-diversified risk management strategies that enhance economic resilience to natural hazards (Born et al., 2011; Botzen and van den Bergh, 2009; Charpentier and Maux, 2014).

To enhance economic resilience, Ibragimov et al. (2009) suggest a centralized agency at the national level to coordinate risk distribution and to ensure that risk sharing takes place. This coordination role is especially important because “catastrophe insurance markets have failed worldwide,” and “government interventions are generally considered to be quite inefficient” (Ibragimov et al., 2009:960). The national model that Ibragimov et al. suggest sets conditions for a “functioning reinsurance industry” by aiming a “global diversification outcome” through a “coordinated reinsurance/diversification equilibrium” (2009:961).

Finally, insurance strategies addressing climate change and driving product innovation has also been collaborating with mitigation efforts (Ishihara, 2010). The expectation is that the insurance industry will “meet the growing need to manage risks” through adaptation even though some insurance products function as “mitigation tools by facilitating the production and distribution of green technologies or low emission appliances” (Ishihara, 2010:96). Mitigation, or the reduction of greenhouse gas emissions, should be undertaken given the potential for significant costs arising from climate change (Robson, 2007). Booth (2004) argues that industrial corporations will eventually have to deal with regulatory constraints on the amount of greenhouse gases they can emit by investing in new technology and trading in emissions permits. Booth (2004) notes that that this is an area where the insurance industry can play an important role and benefit by offering risk management services and more traditional insurance products. Climate change mitigation, however, is characterized by complexity and interdependencies as it requires behavioral change (Phelan, 2011:229). The responsiveness of the insurance industry in this area is tested in two key areas: “protections provided to policyholders and indemnifying clients who face litigation in connection with GHG [greenhouse gas] policies” (Blazey and Govind, 2007:35). In relation to indemnifying liability of GHG producing companies, the main source of litigation will be “negligence and litigation can also be utilized by policyholders where there is a lack of loss prevention efforts”; as a result, insurance companies need regulations that “force companies to internalize the costs of carbon” (Blazey and Govind, 2007:35). These regulations will act as “financial incentives to companies to reduce pollution and ... the exposure of insurance companies to liability” (Blazey and Govind, 2007:35). However, there remains “the problem of causation and attribution of fault and responsibility... [as] it is not ... clear who is responsible for greenhouse gas emissions in terms of time, place, and composition of gases” (Blazey and Govind, 2007:35).

3.4 The Role of Government: Regional and National Variation

The design of public policies limiting exposure to and reducing the impacts of natural disasters is necessary (Born and Klimaszewski-Blettner, 2013; Botzen and van den Bergh, 2009). Compensation to risk at large in a society is regularly a

result of state-private interplay, where in some countries public insurance is more prominent and in others private is more prominent. The state, however, regularly provides the “insurance of last resort”—i.e. is the party that is required to provide fundamental services and compensation in the case of large events or very large losses (Botzen and van den Bergh et al., 2009).

In relation to climate change, policies need to provide “a number of incentives in order to be effective” (Blazey and Govind, 2007:21) and to ensure that the insurance industry “can adequately fulfill its function without collapsing under the weight of demand” (Blazey and Govind, 2007:41). These regulatory incentives are usually about keeping rates adequate; companies solvent; and state insurance pools having the capacity to pay losses in the event of large risks (Blazey and Govind, 2007; Born and Klimaszewski-Blettner, 2013). Insurers, for their part, need to demonstrate that “there will be an offsetting reduction in losses” in relation to this policy-making process (Mills, 2009a:349). Governments may also be supportive of policies that incentivize a proactive insurance role against climate change-related risks. Blazey and Govind (2007) argue that the insurance industry can manage risk on a long-term basis given its expertise in translating information into risk evaluation. Blazey and Govind add that having insurers dealing with the risk of climate change rather than government disaster relief programs is preferred because it increases “business confidence in relation to given risks whilst government continues with post event relief payments,” encourages adaptation, and avoids that governments costs “for post disaster repair ... spiral to the point where budgetary resources are outstripped by the needs for assistance” (2007:20). Medders et al., however, highlight the importance of government intervention strategies to reduce hazard risks and support the creation of a “hybrid system,” in partnership with the private market, to mitigate natural catastrophes more effectively (2011:192).

Insurance solutions may thus often be described as “the fruit of partnership between the public sector and private companies, under which the insurance industry typically offers the expertise needed to cope with the risk, while the public sector offers financial capacity to support the program” (Ishihara, 2010:99). A result of this partnership is the establishment of private-public partnerships (PPPs) to prevent insurance companies from “being dragged into insolvency in the event of a climate disaster” (Blazey and Govind, 2007:16). PPPs constitute a relief effort when post disaster payouts are no longer viable (Blazey and Govind, 2007), helping governments cover extreme losses resulting from the extreme tail of the loss distribution of natural disasters (Botzen and van den Bergh, 2008; Kunreuther, 2006b; Michel-Kerjan and de Marcellis-Warin, 2006). However, in designing PPPs, governments should keep the characteristics of the insurance industry in managing disaster risks (Born and Klimaszewski-Blettner, 2013; Botzen and Van Den Bergh, 2009) while making available the protection of affordable and accessible policies (Blazey and Govind, 2007). In establishing PPPs, regulators can harness the power of institutional investors through a framework that determines the provision of basic data and ensures that the basic information is

available so that they can rely on competitive forces to exploit it for the common good (Dlugolecki and Keykhah, 2002).

In developing countries, PPPs seem to be the appropriate model for insuring climate risk because “public resources are limited” (Dlugolecki and Hoekstra, 2006:655). Governments need to link financial incentives with environmental planning so that the effect of disaster insurance becomes “a powerful leveraging tool” (Blazey and Govind, 2007:21). Disclosure of greenhouse gas emissions and climate change-related risks is another major regulatory requirement (Blazey and Govind, 2007:41) because of the potential magnitude of climate change impacts on insurers’ solvency, as well as availability and affordability across all major categories of insurance (Mills, 2009a:326). The information usually required to be disclosed relates to a company’s discounted premiums and “evidence detailing an offsetting reduction in losses” (Blazey and Govind, 2007:41). Such disclosure would allow regulators to follow up with questions as they emerge and “investors and consumers to incorporate additional information into their investment and purchasing decisions” (Mills, 2009a:345). Disclosure would also help regulators to monitor insurers’ “financial conditions and the progress they are making towards managing climate change risks” (Mills, 2009a:346).

Governments also can “devolve some responsibility to individuals or communities,” but this can only occur when “the information regarding the risk is very clear and the adaptive operations are relatively simple” (Blazey and Govind, 2007:30). The most problematic barrier to this “dispersal of responsibility” is whether individuals can be relied upon to take consistent and coherent action to “adequately share the risk of a common problem” (Blazey and Govind, 2007:30). Also, communities display limited understanding of how financial services could contribute to risk reduction, and few tools are available for them to address such actions (Warner et al., 2007). Moral hazard and adverse selection are issues that illustrate “the individual failure to bear the responsibility for risk” (Blazey and Govind, 2007:30). In the U.S., a report found that residents in hurricane-prone areas were reluctant to invest in protection measures because they did not see the benefit in paying for risk prevention (Kleindorfer and Kunreuther, 2000) despite information or education campaigns to motivate people to take responsible measures to reduce risk (Blazey and Govind, 2007).

The designation of risk zones by governments also helps insurers. Risk zones are important for the development and implementation of drought and hurricane insurance policies, and long-term land use planning for adaptation to climate change (Smith and Lenhart, 1996; Adger et al., 2005; Botzen et al., 2009). Climate change-related regulations are, therefore, related to: 1) the reduction of greenhouse gases; 2) policies that move people out of disaster prone locations; and 3) minimizing potential future damage (Blazey and Govind, 2007).

International frameworks also guide discussions on climate change and insurance. The United Nations Environment Programme (UNEP) Insurance Industry Initiative came into being in 1995. Its activities on climate change are channeled through the Climate Change Working Group of the UNEP Finance Initiatives, which allows “banks and other institutions to collaborate” (Dlugolecki

and Keykhah, 2002:86). The strategy outlined by the UNEP is the establishment of a relationship between insurance “facilitating sustainable business practices” (Blazey and Govind, 2007:29). In addition, the United Nations Framework Convention on Climate Change (UNFCCC) released its “Bali Action Plan” in 2007, recognizing the importance of insurance mechanisms for climate risk management (Ishihara, 2010). The UNFCCC’s statement helped drive an industry-wide debate on the role insurance is expected to play (Ishihara, 2010). The World Bank has also sponsored considerable research into the question of how the risk of climate change can be managed. One issue that the World Bank is especially concerned about is the vulnerability of the Caribbean region to natural catastrophes with the possibility of deterioration due to climate change (CGCED, 2002). As far as developing nations are concerned, the Conference of the Parties in Marrakech 2001 decided to proceed with the issue of vulnerability in developing nations. Workshops were proposed on “insurance and risk assessment in the context of weather extremes, and on what specific insurance-related actions could be taken to address the concerns of developing countries” (Dlugolecki and Keykhah, 2002:91).

The literature also evidences significant variation in the work of insurance between different world regions. Western European insurers have the deepest history with climate change insurance initiatives, and “some of the more comprehensive strategies can be found there” (Mills, 2009:336). However, “considerable creativity and innovation has emerged from the United States” (Mills 2009:336). In Asia, “insurers have been first movers in many areas,” and in Australia, “insurers are quite active on a variety of fronts” (Mills, 2009:337).

The UK insurance industry, for instance, has been “much more proactive on climate change than other nations” (Dlugolecki and Keykhah, 2002:86). British insurers often had “international interests through subsidiaries and global reinsurance,” and British insurance coverage usually “includes flood and storm as well as subsidence and uplift of the ground” (Dlugolecki and Keykhah, 2002:87). “Communication with the scientific community on climate change has been strong since 1988” (Dlugolecki and Keykhah, 2002:87). The first time insurance was considered in a national climate change review was in the UK (CCIRG, 1991) and in 1994, an insurance institute commissioned a report on climate change from its fellowship members (CII, 1994) and repeated it in 2001 (CII, 2001). The governments in England and Wales, however, have failed to address the issues of hazards, vulnerability and exposure from an insurance standpoint (Crichton, 2002a). The impacts of flooding have grown as defenses have been allowed to deteriorate (Crichton, 2002a). Vulnerability has increased because new lightweight building techniques have been adopted without any corresponding strengthening of building codes (Crichton, 2002a). Exposure has increased as well because the government has permitted developments in flood hazard areas, even when their own environmental agencies advised against it (Crichton, 2002a). As a result of these failures, insurers have been lobbying government to seek changes in policy (Crichton, 2002a).

At the regional level, the European Union (EU) Commission states that climate change demands insurance solutions, the integration of these solutions into a financial framework, and a review of existing public and private disaster funds (Commission of the EU, 2007). As a result of this political priority, the reform of natural hazard insurance has become a cornerstone of the EU's strategy for climate change adaptation (Schwarze et al., 2011). The debate over this strategy has been on whether certain lines of insurance covering natural hazards should be left to private markets or assumed by government, and whether it is preferable to have one entity or multiple entities insure natural hazards. The EU had previously changed its indemnity insurance landscape because of pressure from forces within the Union in favor of increased competition; however, a public monopoly insurance program for natural hazards can prove to be more efficient as insurance systems in Europe "have developed over long periods of time ... and are adapted to the natural and socio-historical conditions of the regions they cover" (Schwarze et al., 2011:28). Also, insurances are deeply rooted in the different cultures of the societies in combating natural hazards, the collective ego and a specific framework of political institutions (Medders et al., 2011; Schwarze et al., 2011).

In the U.S., the insurance industry is heavily regulated at state level (Dlugolecki and Keykhah, 2002; Ibragimov et al., 2009). As a result, there is "not a single domestic market to serve as a base for overseas expansion, which may also lead to an inward-looking nature of the U.S. insurance community" (Dlugolecki and Keykhah, 2002:88). Also, there are "very few U.S. insurers" considered international, which isolate them from concerns over global issues (Dlugolecki and Keykhah, 2002:88). Therefore, there are "relatively few catastrophe insurance firms [operating] in each state for each catastrophe line" (Ibragimov et al., 2009:961) and the traditional insurance strategies of dealing with disasters in the U.S. have been through raising premiums, relying on investment returns or withdrawing from certain insurance markets (Keykhah 2002). The problem of these strategies is that insurers in the U.S. focus only on consequences—not causes—of disaster losses (Keykhah, 2002) and insurance executives are "tied down to their own firm" (Ibragimov et al., 2009:961). In Europe, in contrast, insurers' strategies have embraced both the causes and effects of hazards' related losses (Mills et al., 2001). The most important difference, however, "between the European and the American insurance communities is their time frames and priorities" (Dlugolecki and Keykhah, 2002:88). American insurers are concerned with short-term impacts (Packard and Reinhardt, 2000) whereas European reinsurers "are not bound by quarterly indices" and so can envision a longer time frame "in which issues such as viability, sustainability, and partnerships can evolve" (Dlugolecki and Keykhah, 2002:88).

Mills (2009) presents a different perspective on the status of the insurance and climate change debate in the U.S. The topic of climate change in the U.S. went from "one that was rarely ... addressed in the trade press ... to a regular news item" (Mills, 2009:330). In more recent years, insurance regulators, under the National Association of Insurance Commissioners (NAIC) Property and Casualty Insurance (C) Committee's Climate Change and Global Warming (C) Working

Group, have met to discuss climate change and, in 2008, issued “a paper whose subject was among the top agenda items at the 2007 meeting of the International Association of Insurance Supervisors (IAIS)” (Mills, 2009:330). This paper eventually led to the creation of “Insurer Climate Risk Disclosure Survey” (Ishihara, 2010:97). Insurers and reinsurers in the U.S., therefore, “are increasingly seeing their industry as part of the solution through the creation of innovative products and services to promote emerging technologies and practices” (Mills, 2009:330). Their main concern is that climate change can affect “insurer solvency, as well as availability and affordability across all major categories of insurance” (Ishihara 2010:97).

Finally, some scholars criticize the use of insurance as an environmental security mechanism led by European and U.S. insurers. Insurance is believed to be a governmental mechanism that regulates, produces life, and operates through commodifying and managing contingency (Dillon, 2007). Also, the emergence of insurance as a security mechanism reflects “rearticulations of environmental security discourses” through security rationalities (Grove, 2010:538). Rather than offering security through geopolitical strategies that identify and exclude sources of danger, insurance maximizes the potentials of emergent life (Dillon, 2008). There are two assumptions behind insurance discourses on dangerous climate changes (Grove, 2010). First, “risk management and insurance sustain the forms of social and political order that Western-led ‘development’ has produced” through the institutional discourses of the World Bank and United Nations (UN) (Grove, 2010:538). Second, this Western type of development expects to transform an unruly world of difference into techno-managerial spaces of control and domination (Ferguson, 1990).

4. Conclusion

This review demonstrated that insurers are increasingly concerned about climate risks, whether these risks arise from climate change or climate variability. Increased frequency and severity of damaging weather events resulted in growing insured losses. In the case of property/C insurance, for instance, increased exposure and losses to climate risks require immediate actions on a global scale.

Insurers view climate risks as business opportunities. Insurers argue that their policies can help individuals and groups reduce the levels of exposure, risks and costs to the effects of damaging weather hazards. Insurance firms, however, require the support of public authorities to make their policies available and affordable for those people living in hazard-prone areas.

Insurers face more challenges as a result of climate risks. Natural hazard insurance is still rare, particularly in developing and poor countries. Socioeconomic issues affect the degree of exposure of householders to weather hazards. As far as risk management practices are concerned, modelling techniques are still based on historical data rather than on future risks. And government

intervention, such as public insurance, may lead to increased exposure levels and place a burden on taxpayers. Information on market penetration of natural hazard insurance is still limited.

Climate uncertainties pose significant challenges to insurers. If insurers' income is lowered beyond payouts, the industry could stand the risk to collapse after a catastrophic event. Rating agencies can also downgrade ratings of insurers because of growing risks. Under a significant risk increase, premium prices may grow exponentially until they become prohibitive. Regulators may also prevent insurers from increasing the prices of their policies. Natural hazard insurers thus need to deal with the issues of moral hazard and adverse selection at the individual level.

So far, insurers have been addressing climate risks in a variety of ways. Insurers have been underwriting environmental technologies that reduce the emission of GHG. Insurers also have requested public authorities the design of regulations that ensure the viability and survival of the sector in face of growing risks. Up-to-date scientific information has also been requested to improve insurers' rate setting. Reinsurance and the financial market are mechanisms that insurers can use to spread risks. Insurers have also been rewarding decisions and behavior that reduce risk exposure and promote mitigation. Insurers have withdrawn from markets that feature high risks and advocated flexibility to increase policy prices, in spite of equity discussions that premium adjustments unfold.

Finally, insurers rely on the government as an insurer last resort, and to keep insurance viable. Public policies can reduce the exposure and reduce the impacts of natural hazards, and help maintain risk levels insurable to amongst other avoid risks of collapse. Public-private partnerships, for instance, protect the government and business interests by preventing both from becoming insolvent or being the only part responsible for mitigating and adapting to climate risks, in addition to dealing with the costs of recovery after a disaster. The degree of these partnerships and the structure of the insurance market varies in each country and region, as does the perception and critique over insurance practices addressing climate change-related risks.

References

- Adger, W., N.W. Arnell, and E.L. Tompkins, 2005. "Successful Adaptation to Climate Change Across Scales," *Global Environmental Change*, 15:77–86.
- Akter, S., 2012. "The Role of Microinsurance as a Safety Net Against Environmental Risks in Bangladesh," *The Journal of Environment & Development*, 21(2): 263–280.
- AON, 2013. "Annual Global Climate and Catastrophe Report: Impact Forecasting – 2013," accessed Dec. 19, 2014, at http://thoughtleadership.aonbenfield.com/Documents/20140113_ab_if_annual_climate_catastrophe_report.pdf.
- Belliveau, S., B. Smit, B. Bradshaw, 2006. "Multiple Exposures and Dynamic Vulnerability: Evidence from the Grape Industry in the Okanagan Valley, Canada," *Global Environmental Change*, 16(4): 364–378.
- Blazey, P., and P. Govind, 2007. "Financial Adaptation Challenges for the Insurance Industry Due to Climate Change," *Macquarie Journal of Business Law*, 4:15–48.
- Blennow, K., and O. Sallnäs, 2002. "Risk Perception Among Non-Industrial Private Forest Owners," *Scandinavian Journal of Forest Research*, 17(5): 472–479.
- Bonsal, B., E. Wheaton, A. Chipanshi, C. Lin, D. Sauchyn, and L. Wen, 2011. "Drought Research in Canada: A Review," *Atmosphere-Ocean*, 49(4): 303–319.
- Booth, G., 2004. "A Climate of Fear," *Reactions*, 24(7).
- Born, P., R. Dumm, M. Grace, L. Medders, and C. Nyce, 2011. "Mitigation, Money and Residual Markets: Findings from a Symposium on Catastrophic Risk Management," *Journal of Insurance Regulation*, 30(1): 287–296.
- Born, P., and B. Klimaszewski-Blettner, 2013. "Should I Stay or Should I Go? The Impact of Natural Disasters and Regulation on U.S. Property Insurers' Supply Decisions," *Journal of Risk and Insurance*, 80(1): 1–36.
- Born, P., and W. Viscusi, 2006. "The Catastrophic Effects of Natural Disasters on Insurance Markets," *Journal of Risk and Uncertainty*, 33(1/2): 55–72.
- Botzen, W., J. Aerts, J., and J. van den Bergh, 2009. "Willingness of Homeowners to Mitigate Climate Risk Through Insurance," *Ecological Economics*, 68: 2265–2277.
- Botzen, W., and J. van den Bergh, 2008. "Insurance Against Climate Change and Flooding in the Netherlands: Present, Future and Comparison with Other Countries," *Risk Analysis*, 28(2): 413–426.
- Botzen, W., and J. van den Bergh, 2009. "Managing Natural Disaster Risks in a Changing Climate," *Environmental Hazards*, 8(3): 209–225.
- Botzen, W.; and J. van den Bergh, 2009a. "Bounded Rationality, Climate Risks and Insurance: Is There a Market for Natural Disasters?" *Land Economics*, 85(2): 266–279.

- Carpenter, G., 2006. "The World Catastrophe Reinsurance Market: Steep Peaks Overshadow Plateaus," accessed July 26, 2007, at <http://gcportal.guycarp.com/portal/extranet/popup/pdf/GCPub/World%20Catastrophe%20Report%202006.pdf?vid=4>.
- Carpenter, G., 2006a. *Instrat Briefing: Tropical Cyclone Review 2006* (February 2007) 21. Figures were originally produced by Munich Re, Dec. 28, 2006, press release.
- Caribbean Group for Co-operation in Economic Development (CGCED), 2002. *Natural Hazard Risk Management in the Caribbean: Revisiting the Challenge*, unpublished discussion document; CGCED, World Bank.
- Charpentier, A., 2008. "Insurability of Climate Risks," *The Geneva Papers*, 33: 91–109.
- Charpentier, A., and B. Le Maux, 2014. "Natural Catastrophe Insurance: How Should the Government Intervene?" *Journal of Public Economics*, 115: 1–17.
- CII, 1994. *The Impact of Changing Weather Patterns on Property Insurance*, ed. A. Dlugolecki, a research report by the Society of Fellows of the CII, London: CII.
- CII, 2001. *Climate Change and Insurance*, ed. A. Dlugolecki, a research report by the Society of Fellows of the CII, London: CII.
- Climate Change Impacts Review Group (CCIRG), 1991. *The Potential Effects of Climate Change in the United Kingdom*, first Report by the CCIRG on behalf of the Department of the Environment, London: HMSO.
- Commission of the EU, 2007. *Green Paper: Adapting to Climate Change in Europe – Options for EU Action*. SEC(2007) 849} COM(2007) 354 final, Brussels: June 29, 2007.
- Crichton, D., 2002. "Residential Flood Insurance: Lessons from Europe," in D.I. Smith and J. Handmer (eds.), *Residential Flood Insurance: The Implications for Floodplain Management Policy*, Canberra: Water Research Foundation of Australia: 41–58.
- Crichton, D., 2002a. "UK and Global Insurance Responses to Flood Hazard," *Water International*, 27(1): 119–131.
- Cronin, P.; F. Ryan, and M. Coughlan, 2008. "Undertaking a Literature Review: A Step-by-Step Approach," *British Journal of Nursing*, 17(1): 38–43.
- Dillon, M., 2007. "Governing Through Contingency: The Security of Biopolitical Governance," *Political Geography*, 26:45.
- Dillon, M., 2008. "Underwriting Security," *Security Dialogue*, 39(3): 309–332.
- Dlugolecki, A., 2009. "The Climate Change Challenge," *Assessment and Prevention*, 45(SC1): 1–12.
- Dlugolecki, A., and E. Hoekstra, 2006. "The Role of the Private Market in Catastrophe Insurance," *Climate Policy*, 6(6): 648–657.
- Dlugolecki, A., and M. Keykhah, 2002. "Climate Change and the Insurance Sector: Its Role in Adaptation and Mitigation," *Greener Management International*, 16(39): 83.
- Ferguson, J., 1990. *The Anti-Politics Machine: Development, Depoliticization, and Bureaucratic Power in Lesotho*, Minneapolis: University of Minnesota Press.

- Freedman, S., 1997. "Global Climate Change and Its Policy Implications for the U.S. Insurance Sector," master's thesis, *Center for Energy and Environmental Policy*, University of Delaware.
- Freeman, P., and H. Kunreuther, 2002. "Environmental Risk Management for Developing Countries," *The Geneva Papers on Risk and Insurance*, 27(2): 196–214.
- Freeman, P., and K. Scott, 2005. Commissioned by the OECD, "Chapter 12 – Comparative Analysis of Large Scale Catastrophe Compensation Schemes," *Catastrophic Risks and Insurance*, p. 192.
- GAO, 2007. *Climate Change: Financial Risks to Federal and Private Insurers in Coming Decades are Potentially Significant*, U.S. Government, Washington, DC.
- Giné, X. et al., 2008. "Patterns of Rainfall Insurance Participations in Rural India," *The World Bank Economic Review*, 22(3): 539–566.
- Glade, T. et al., 2008. "Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards," 2(4): 179–180.
- Grace, M., and R. Klein, 2009. "The Perfect Storm: Hurricanes, Insurance and Regulation," *Risk Management and Insurance Review*, 12(1): 81–124.
- Grove, K., 2010. "Insuring Our Common Future? Dangerous Climate Change and the Biopolitics of Environmental Security," *Geopolitics*, 15(3): 536–563.
- Hecht, S., 2008. "Climate Change and the Transformation of Risk: Insurance Matters," *UCLA Law Review*, 55(6): 1559–1620.
- Helmer, M.; D. Hilhorst, 2006. "Natural Disasters and Climate Change," *Disasters*, 30(1): 1–4.
- Henderson-Sellers, A., H. Zhang, G. Berz, K. Emanuel, W. Gray, C. Landsea, G. Holland, J. Lighthill, S. Shieh, S., P. Webster, and K. McGuffie, K., 1998. "Tropical Cyclones and Global Climate Change: A Post-IPCC Assessment," *Bulletin of the American Meteorological Society*, 79.1, January 1998.
- Keykhah, M., 2000. "Global Hazards and Catastrophic Risk: Assessments, Practitioners and Decision Making in Reinsurance," in J. Jaeger and A. Farrell (eds.), *Design of Environmental Assessment*, Global Environmental Assessment Project, Belfer Center for Science and International Affairs, Harvard University, forthcoming.
- Hoogeveen, J., 2000. "Risk and Insurance by the Poor in Developing Nations," in A. Kreimer and M. Arnold (eds.), *Managing Disaster Risk in Emerging Economies*, Disaster Risk Management Series, No. 2, Washington, DC: The World Bank, June 2000: 103–28.
- Ibragimov, R.; D. Jaffee, D., and J. Walden, 2009. "Nondiversification Traps in Catastrophe Insurance Markets," *The Review of Financial Studies*, 22(3): 959–993.
- IPCC, 2007. "Climate Change 2007: Impacts, Adaptation and Vulnerability," Working Group II, Contribution to the Intergovernmental Panel of Climate Change Fourth Assessment Report, www.ipcc.ch/SPM13apr07.pdf, Aug. 28, 2007.

- ISDR, 2002. *Living with Risk: A Global Review of Disaster Reduction Initiatives*. Preliminary version prepared as an interagency effort coordinated by the ISDR Secretariat, Geneva, Switzerland.
- Ishihara, K., 2010. "Contributing to the Global Debate on Climate Change – A View from Asia: A Retrospective Report on the 37th General Assembly in Zurich," *The Geneva Papers on Risk and Insurance Issues and Practice*, December 2010, Vol.35 (S1), p. S92 (8), *Journal of Comparative Social Welfare*, 2010, 26(2): 239–260.
- Jesson, J.K., L. Matheson, and F.M. Lacey, 2011. *Doing Your Literature Review: Traditional and Systematic Techniques*, Los Angeles: SAGE Publications.
- King, R. 2005. Congress Research Service, *Hurricane Katrina: Insurance Losses and National Capacities for Financing Disaster Risk*, accessed at <http://fpc.state.gov/documents/organization/53683.pdf>.
- Klein, R., 1996. "Regulation and Catastrophe Insurance," in Kunreuther, H.; Roth, R. (eds.), *Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States*, Washington, DC: Joseph Henry Press.
- Kleindorfer, P., and H. Kunreuther, 2000, "Managing Catastrophe Risk," *Regulation*, 23:26.
- Kunreuther, H., 1996. "Mitigating Disaster Losses Through Insurance," *Journal of Risk and Uncertainty*, 12(2–3): 171–187.
- Kunreuther, H., 2006a. "Disaster Mitigation and Insurance: Learning from Katrina," *Annals of the American Academy of Political and Social Science*, 604(1): 208–227.
- Kunreuther, H., 2006b. "Has the Time Come for Comprehensive Natural Disaster Insurance?" in R. J. Daniels, D.F. Kettl, and H.C. Kunreuther (eds.), *On Risk and Disaster: Lessons from Hurricane Katrina*, University of Pennsylvania Press, pp. 175–202.
- Kunreuther, H.; E. Michel-Kerjan, N. Doherty, M. Grace, R. Klein, and M. Pauly, 2008. *Managing Large-Scale Risks in a New Era of Catastrophes: Insuring, Mitigating and Financing Recovery from Natural Disasters in the United States*, Wharton Risk Management and Decision Processes Center, Georgia State University and Insurance Information Institute: Philadelphia, PA.
- Kunreuther, H., and E. Michel-Kerjan, 2009. *At War with the Weather – Managing Large-Scale Risks in a New Era of Catastrophes*. U.S.: MIT Press.
- Litan, R., 2000. "Catastrophe Insurance and Mitigating Disaster Losses: A Possible Happy Marriage?" in A. Kreimer and M. Arnold (eds.), *Managing Disaster Risk in Emerging Economies*, The World Bank: Washington, DC.
- MacDonald-Smith, A., 2007. *Climate Change to Boost Insured Losses*, Allianz Says, Bloomberg.
- Malmquist, D., 1997. *Tropical Cyclones and Climate Variability: A Research Agenda for the Next Century*, Risk Prediction Initiative: Los Angeles.
- Malmquist, D., 1998. "Forecasting the Big One," *Reactions*, July 1998.
- Medders, L., K. McCullough, and J. Verena, 2011. "Tale of Two Regions: Natural Catastrophe Insurance and Regulation in the United States and the European Union," *Journal of Insurance Regulation*, 30(1): 171–196.

- Michel-Kerjan, E., and F. Morlaye, 2008. "Extreme Events, Global Warming, and Insurance-Linked Securities: How to Trigger the 'Tipping Point,'" *Geneva Papers on Risk and Insurance – Issues and Practice*, 33(1): 153–176.
- Mills, E., 2005. "Viewpoint: Insurance in a Climate of Change," *Science*, accessed at www.sciencemag.org/cgi/content/full/309/5737/1040.
- Mills, E., 2005. "Insurance in a Climate of Change," *Science*, 309(5737): 1040–1044.
- Mills, E., 2009a. "A Global Review of Insurance Industry Responses to Climate Change," *Geneva Papers on Risk and Insurance: Issues and Practice*, 34(3): 323–359.
- Mills, E., E. Lecomte, and A. Peara, 2001. *U.S. Insurance Industry Perspectives on Global Climate Change*, Lawrence Berkeley National Laboratory MS 90–4000, U.S. Department of Energy, University of California: Berkeley, CA.
- Mills, E., E. Lecomte, and A. Peara, 2002. "Insurers in the Greenhouse," *Journal of Insurance Regulation*, 21(1): 43–78.
- Mills, E., R. Roth, and E. Lecomte, E., 2005. Commissioned by CERES, "Availability and Affordability of Insurance Under Climate Change – A Growing Challenge for the U.S."
- Mills, E., R. Roth, and E. Lecomte, 2006. "Availability and Affordability of Insurance Under Climate Change: A Growing Challenge for the U.S.," *Journal of Insurance Regulation*, 25(2): 109–149.
- Mills, E., and E. Lecomte, 2006. "From Risk to Opportunity: How Insurers Can Proactively and Profitably Manage Climate Change," *Ceres Report*, Ceres: Boston, MA.
- Mishra, A., V. Singh, V., and S. Jain, 2010. "Impact of Global Warming and Climate Change on Social Development," *Journal of Comparative Social Welfare*, 26(2–3): 239–260.
- Muir-Wood, R.; S. Miller, and A. Boissonade, A., 2006. "The Search for Trends in a Global Catalogue of Normalized Weather-Related Catastrophe Losses," *Workshop on Climate Change and Disaster Losses*, Hohenkammer.
- Neumayer, E., and F. Barthel, 2011. "Normalizing Economic Loss from Natural Disasters: A Global Analysis," *Global Environmental Change*, 21(1): 13–24.
- Newell, R., and P. Burnard. P., 2006. *Research for Evidence-Based Practice*, Blackwell Publishing: Oxford.
- Packard, K., and F. Reinhardt, 2000. "What Every Executive Needs to Know About Global Warming," *Harvard Business Review*, July/August: 128–35.
- Phelan, L., 2011. "Managing Climate Risk: Extreme Weather Events and the Future of Insurance in a Climate-Changed World," *Australasian Journal of Environmental Management*, 18(4): 223–232.
- Picard, P., 2008. "Natural Disaster Insurance and the Equity-Efficiency Trade-Off," *Journal of Risk and Insurance*, 75(1): 17–38.
- Polit, D., and C. Beck, 2006. *Essentials of Nursing Research: Methods, Appraisal and Utilization*, 6th edn, Lippincott Williams and Wilkins: Philadelphia.

- Robson, A., 2007. The Prime Ministerial Task Group's Report on Emissions Trading, "A Solution in Search of a Problem," *A Journal of Policy Analysis and Reform*, 14(3): 19–25.
- Schwarze, R., M. Schwindt, H. Weck-Hannemann, P. Raschky, F. Zahn, and G. Wagner, 2011. "Natural Hazard Insurance in Europe: Tailored Responses to Climate Change are Needed," *Environmental Policy and Governance*, 21(1): 14–30.
- Smit, B., and M. Skinner, 2002. "Adaptation Options in Canadian Agriculture to Climate Change," *Mitigation and Adaptation Strategies for Global Change*, 7:85–114.
- Smith, J., and S. Lenhart, 1996. "Climate Change Adaptation Policy Options," *Climate Research*, 6: 193–201, Social Resilience, Earthscan: London, UK.
- Swiss Re, 2006. "Natural Catastrophes and Man-Made Disasters 2005: High Earthquake Casualties, New Dimension in Windstorm Losses," *Sigma* No. 2/2006.
- Swiss Re, 2009. "Natural Catastrophes and Man-made Disasters in 2008," *Sigma*.
- Tierney, K., 2006. "Social Inequality, Hazards, and Disasters," in R.J. Daniels, D.F. Kettl and H. Kunreuther (eds.), *On Risk and Disaster: Lessons from Hurricane Katrina*, University of Pennsylvania Press: Philadelphia, PA, pp. 109–128.
- USGAO, 2007. *Climate Change: Financial Risks to Federal and Private Insurers in Coming Decades Are Potentially Significant*.
- van Aalst, M., and I. Burton, 2000. "Climate Change from a Development Perspective," in A. Kreimer and M. Arnold (eds.), *Managing Disaster Risk in Emerging Economies*, The World Bank: Washington, DC: 91–98.
- Vatsa, K., and F. Krimgold, 2000. "Financing Disaster Mitigation for the Poor," in A. Kreimer and M. Arnold (eds.), *Managing Disaster Risk in Emerging Economies*, (The World Bank: Washington, DC: 129–53.
- Ward, R., C. Herweijer, N. Patmore, and R. Muir-Wood, 2008. "The Role of Insurers in Promoting Adaptation to the Impacts of Climate Change," *The Geneva Papers on Risk and Insurance: Issues and Practice*, 33: 133–139.
- Warner, K., L. Bouwer, and W. Ammann, 2007. "Financial Services and Disaster Risk Finance: Examples from the Community Level," *Environmental Hazards*, 7(1): 32–39.
- Wheaton, E., and D. MacIver, 1999. "A Framework and Key Questions for Adapting to Climate Variability and Change," *Mitigation and Adaption Strategies for Global Change*, 4: 215–225.
- Wilby, R., and R. Keenan, R., 2012. "Adapting to Flood Risk Under Climate Change," *Progress in Physical Geography*, 36(3): 348–378.
- World Meteorological Organization, 2014. "Press Release No. 98," accessed at www.wmo.int/pages/mediacentre/press_releases/pr_998_en.html.
- Zia, A., and M. Glantz, 2012. "Risk Zones: Comparative Lesson Drawing and Policy Learning from Flood Insurance Programs," *Journal of Comparative Policy Analysis: Research and Practice*, 14(2): 143–159.

Journal of Insurance Regulation

Guidelines for Authors

Submissions should relate to the regulation of insurance. They may include empirical work, theory, and institutional or policy analysis. We seek papers that advance research or analytical techniques, particularly papers that make new research more understandable to regulators.

Submissions must be original work and not being considered for publication elsewhere; papers from presentations should note the meeting. Discussion, opinions, and controversial matters are welcome, provided the paper clearly documents the sources of information and distinguishes opinions or judgment from empirical or factual information. The paper should recognize contrary views, rebuttals, and opposing positions.

References to published literature should be inserted into the text using the “author, date” format. Examples are: (1) “Manders et al. (1994) have shown. . .” and (2) “Interstate compacts have been researched extensively (Manders et al., 1994).” Cited literature should be shown in a “References” section, containing an alphabetical list of authors as shown below.

Cummins, J. David and Richard A. Derrig, eds., 1989. *Financial Models of Insurance Solvency*, Norwell, Mass.: Kluwer Academic Publishers.

Manders, John M., Therese M. Vaughan and Robert H. Myers, Jr., 1994. “Insurance Regulation in the Public Interest: Where Do We Go from Here?” *Journal of Insurance Regulation*, 12: 285.

National Association of Insurance Commissioners, 1992. *An Update of the NAIC Solvency Agenda*, Jan. 7, Kansas City, Mo.: NAIC.

“Spreading Disaster Risk,” 1994. *Business Insurance*, Feb. 28, p. 1.

Footnotes should be used to supply useful background or technical information that might distract or disinterest the general readership of insurance professionals. Footnotes should not simply cite published literature — use instead the “author, date” format above.

Tables and charts should be used only if needed to *directly support* the thesis of the paper. They should have descriptive titles and helpful explanatory notes included at the foot of the exhibit.

Papers, including exhibits and appendices, should be limited to 45 double-spaced pages. Manuscripts are sent to reviewers anonymously; author(s) and affiliation(s) should appear only on a separate title page. The first page should include an abstract of no more than 200 words. Manuscripts should be sent by email in a Microsoft Word file to:

Cassandra Cole and Kathleen McCullough
jireditor@gmail.com

The first named author will receive acknowledgement of receipt and the editor's decision on whether the document will be accepted for further review. If declined for review, the manuscript will be destroyed. For reviewed manuscripts, the process will generally be completed and the first named author notified in eight to 10 weeks of receipt.

Published papers will become the copyrighted property of the *Journal of Insurance Regulation*. It is the author's responsibility to secure permission to reprint copyrighted material contained in the manuscript and make the proper acknowledgement.

NAIC publications are subject to copyright protection. If you would like to reprint an NAIC publication, please submit a request for permission via the NAIC Web site at www.naic.org. (Click on the "Copyright & Reprint Info" link at the bottom of the home page.) The NAIC will review your request.