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ARTICLE

Insurance as a Mitigation Mechanism: Managing International Greenhouse Gas Emissions through Nationwide Mandatory Climate Change Catastrophe Insurance

ANASTASIA TELESETSKY*

"The insurance industry must now seize the opportunity to make a difference not just to the future of our own industry, but to the future of society."

—Lloyds of London¹

"It is in insurers' direct interest that government is encouraged to manage the mitigation of climate-related risks and adapt to changing climate."

—Pricewaterhouse Cooper²

INTRODUCTION

Living at sea level, the Dutch are constructing a climate defense system, which is the envy of countries such as Bangladesh that cannot afford the public infrastructure to shore up its coastline. With current estimates of adaptation ranging from \$ 49 billion to \$171 billion per year,³ those States which fail to climate-proof their cities, may face considerable costs for future disaster relief and recovery if we fail to adequately mitigate the

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1. 360 Risk Project, Lloyds of London Climate Change, Adapt or Bust 21 (2006).

2. Shamiram Nissan & Jon Williams, Pricewaterhouse Coopers, Insurance Digest, Insurance and Climate Change Challenge 4 (2009), <http://www.pwc.com/gx/en/insurance/insurance-digest-2.html>.

3. Department of Economic and Affairs, United Nations, World Economic Social Survey 2009: Promoting Development, Saving the Planet 155-56 (2009) (amounts are in U.S. currency).

quantity of greenhouse gases being emitted. While Africa and Asia will bear the major brunt of future climate change given the lack of basic disaster prevention in these regions,⁴ climate change disasters are by no means confined to these two continents. As suggested by the deadly heat waves in Europe and the recent bushfires in Australia, climate induced disasters strike indiscriminately. Relative affluence is no guarantee of safety. At present, current estimates of the increase in humanitarian costs associated with climate change disaster vary widely from 32% increase in current costs based on more frequent disaster events to 1600% based on climate related events that are both more frequent and intense.⁵

What if 104 degree Fahrenheit heatwaves like the one in Europe that claimed 70,000 lives were to become regular events?⁶ There is some evidence that weather related disasters are on the rise. According to the United States National Climatic Data Center, this past decade has been the warmest decade in history with temperatures almost one degree Fahrenheit above previous averages.⁷ According to the report, there have been numerous weather disaster events that some contend are correlated with anthropogenic influences on climate change including the deadliest tornado in Oklahoma history, the largest wildfire in Los Angeles history, heaviest snowfall in China in fifty-five years, and the deadliest typhoon in Taiwan for five decades.⁸

4. Small Island Developing States in the Pacific and other Lesser Developed Countries are also especially vulnerable. Guyana may lose up to 19% of its GDP by 2030 if the floods predicted to accompany climate change materialize. *See* ECONOMICS OF CLIMATE ADAPTATION WORKING GROUP, SHAPING CLIMATE RESILIENT DEVELOPMENT: A FRAMEWORK FOR DECISION-MAKING 39 (2009).

5. MACKINNON WEBSTER ET AL., FEINSTEIN INTERNATIONAL CENTER, THE HUMANITARIAN COSTS OF CLIMATE CHANGE 4 (2008).

6. Press Release, European Union, Climate Change: Europe Must Take Adaptation Measures to Lessen Impacts of Current and Future Warming (June 29, 2007).

7. Randolph E. Schmid, *2000s Warmest Decade on Record, Government Reports*, PRESS DEMOCRAT, Jan. 19, 2010, available at <http://www.pressdemocrat.com/article/20100119/ARTICLES/100119434>; see Press Release, World Meteorological Organization, 2000-2009, The Warmest Decade (Dec. 8, 2009), [hereinafter WMO Press Release], available at http://www.wmo.int/pages/media_centre/press_releases/pr_869_en.html.

8. WMO Press Release, *supra* note 7.

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As our global population increases with greater concentrations of people in cities especially cities in coastal locations, extreme weather events become both deadlier and more expensive. Billion dollar disasters no longer surprise the insurance industries. In 2009, a combination of flooding, thunderstorms, wildfires, and tornadoes resulted in \$9.3 billion dollars of damage.⁹ In 2008 with its longer hurricane season, damages from severe weather events amounted to \$56.5 billion.¹⁰ In countries such as the United States (U.S.), private insurance covers a major portion of casualty and property damages. But not all damages will be fully covered. Public infrastructure, government buildings, and public amenities are not insured or the insurance coverage may be insufficient to cover catastrophic losses.¹¹

This paper proposes mandatory climate change catastrophe insurance as a risk-sharing mechanism to distribute future climate change disaster relief costs between major greenhouse gas emitting industries and the government. This article argues that mandatory catastrophe risk insurance for major greenhouse gas emitters will deliver necessary financial coverage for future climate disasters as well as compel timely climate change mitigation on the part of major emitters. The first part of this paper offers mandatory climate change catastrophe insurance as an additional market tool to the existing proposals for emission trading schemes and carbon taxes. This part begins with a summary of the costs of responding to a climate change disaster followed by a description of government involvement in delivering national disaster relief for natural disasters such as earthquakes and flooding. The paper concludes that even if governments ultimately become the insurer of last resort in catastrophic climate change events, that industries should be held accountable for having contributed to the disaster through “business as usual”

9. National Climactic Data Center, National Oceanic and Atmospheric Administration, Billion Dollar U.S. Weather Disasters, <http://www.ncdc.noaa.gov/oa/reports/billionz.html> (last visited Aug. 18, 2010).

10. *Id.*

11. FEMA: The Disaster Process and Disaster Aid Programs, <http://www.fema.gov/hazard/dproc.shtm> (last visited Aug. 18, 2010); *see also* Stephan Hochrainer and Reinhard Mechler, *Assessing Financial and Economic Vulnerability to Natural Hazards in ASSESSING VULNERABILITY TO GLOBAL ENVIRONMENTAL CHANGE* 185 (Anthony Patt et al. eds., 2009).

practices. After reviewing government's existing disaster relief programs, the paper surveys the insurance industry's climate change mitigation efforts. Since there are no ongoing insurance efforts to connect current corporate actions with future climate change impacts, this paper proposes that governments adopt regulations mandating catastrophe risk insurance for major greenhouse gas emitters. The insurance would serve the goals of both corrective and distributive justice.

The second part of this article suggests that, in the context of climate change, mandatory insurance fulfills the equitable goals of the polluter pays principle by legally allocating responsibility for climate change to industries. In the context of future climate change disaster, the polluter pays principle is primarily an equitable principle for restitution and corrective justice rather than an economic efficiency tool.

**PART ONE:
MANDATORY CLIMATE CHANGE CATASTROPHE
INSURANCE**

If communities remain vulnerable to extreme weather events triggered by climate change, the social and economic costs of climate disaster will be significant. In a March 2009 meeting on extreme weather events, experts affiliated with the Intergovernmental Panel on Climate Change (IPCC) observed that the "frequency, intensity, and length" of certain types of events has increased.¹² The IPCC experts proposed insurance as a possible approach for addressing disaster management and transferring risk rationally.¹³

This paper argues that new insurance products need to be offered that have the potential not just to compensate for climate change losses through effective risk management strategies but also to provide a needed kick-start for mitigation of emissions. The next section of this paper describes one possible insurance product that could provide payments to national, state, and municipal governments to cover rescue costs, delivery of

12. Vicente Barros et al., Scoping Paper- IPCC Report: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation 2 (Apr. 2009).

13. *Id.* at 4.

essentials to disaster victims, losses of public property, and other specified damages to communities injured by climate catastrophes.

A. Costs of Climate Disasters

There are many types of costs associated with disaster and not all costs are easily monetized. Because the focus of this article is on insurance and insurance requires monetization of losses in order to calculate risks, this section will focus exclusively on summarizing economic cost studies associated with future climate disasters.

The projected costs for climate change catastrophe damages range widely depending on the assumptions made by various studies. Economists consider various factors to be catastrophic losses for the purpose of calculating climate change damages. Some of the factors for which catastrophic costs have been calculated include wildfire damages, damages to crops, damages to marine resources, salinization of water systems, power outages, and human health risks including injuries caused by floods.

The years 2008 and 2009 were studded with weather anomalies triggering humanitarian crises resulting in emergency relief to more than 211 million people,¹⁴ which for comparison is about two-thirds of the U.S. population. In Asia, heavy monsoon rains displaced half a million people in India, Nepal and Pakistan.¹⁵ Flooding and cyclones impacted 1.2 million people in Angola, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Swaziland, Zambia, and Zimbabwe.¹⁶ While it was flooding in Southern Africa, Syria was experiencing droughts affecting 1 million people.¹⁷ The United Nations concluded that, “the increased severity and frequency of hazard events-other than

14. The Secretary-General, Report of the Secretary-General on the Strengthening of the Coordination of Emergency Humanitarian Assistance of the United Nations, 2, delivered to the Economic and Social Council and the General Assembly, U.N. Doc. E/2009/87, A/64/84 (May 28, 2009) [hereinafter U.N. Economic and Social Council Report].

15. *Id.* at 3.

16. *Id.*

17. *Id.*

earthquakes and volcanoes- are more than 90% likely to be a result of climate change.”¹⁸

In terms of severe weather events, U.S. economist Nordhaus predicts that at least .08% of the U.S. gross domestic product (GDP) (\$10 billion) would be needed to deal with increases in hurricane intensity.¹⁹ British economist Nicholas Stern predicts that losses from extreme weather could reach 0.5–1% of world GDP by 2050.²⁰ In particular, disaster planners worry about the survival of public infrastructure during weather disasters. Using 55 years of Munich Re insurance loss data, members of the IPCC calculate that the average loss to infrastructure from catastrophic climate change would be between \$21.1 billion and \$87.7 billion per year.²¹ If states are unable to adapt to climate change impacts or mitigate these disasters, damages from severe climate change induced weather events are estimated to be increasing at an annual rate of 2-6%, amounting to potential global losses of \$850 billion to \$1.3 trillion.²² While there is no consensus among economists on the actual costs associated with future climate change catastrophes, the costs will not be negligible.

The historic budgets of national government disaster relief agencies have not taken into account the predicted increase in intensity and frequency of severe weather events. For example, in 2000, the U.S. Federal Emergency Management Agency (FEMA) listed a \$320 million annual appropriation to their disaster fund plus an additional \$24 billion of emergency appropriations distributed over the course of 10 years.²³ Over the

18. *Id.* at 2.

19. WILLIAM D. NORDHAUS, *THE ECONOMICS OF HURRICANES IN THE UNITED STATES* 19 (Aug. 31, 2009), *available at* http://nordhaus.econ.yale.edu/documents/hurr_083109.pdf.

20. NICHOLAS STERN, *THE ECONOMICS OF CLIMATE CHANGE* 149 (2007).

21. UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, *INVESTMENT AND FINANCIAL FLOWS TO ADDRESS CLIMATE CHANGE*, 121, para. 463 (2007), *available at* http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf.

22. *Id.* at 124, para. 477.

23. Letter from Stanley J. Czerwinski, Assoc. Dir., Housing and Cmty. Dev. Issues, Res. Cmty, and Econ. Dev. Div., U.S. Gen. Accounting Office to Hon. Christopher S. Bond, Chairman, & Hon. Barbara A. Mikulski, Ranking Minority Member, Subcomm. on Va., HUD, and Indep. Agencies Comm. on Appropriations, U.S. Senate (Aug. 29, 2000) *in* U. S. GEN. ACCOUNTING OFFICE,

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course of fiscal years 2004 through 2008, FEMA spent approximately \$16.3 billion on goods and services.²⁴ If multiple events such as the 2008 Hurricane Ike were to happen in succession,²⁵ FEMA will face budget shortfalls if Congress does not increase FEMA's budget or allocate additional emergency appropriations.

Governments are allocating funds to assist with adaptation, such as the \$2.9 billion Dutch budget to rezone flood areas and reposition dikes²⁶ and the proposed \$42 billion set aside by the United Kingdom government to raise the Thames flood barriers.²⁷ These funds are earmarked for infrastructure projects to adapt to gradual climate change impacts, such as sea level rise and not to respond to costs associated with extreme weather events. As the next section explains, governments are traditionally the primary source of funding for disaster relief and many governments may not be well equipped to handle the financial burden of multiple climate-induced disasters.

B. Government's Traditional Role in Disaster Relief

Historically, national and subnational governments provide financial relief and compensation when a natural disaster occurs that damages property and requires human rescue. The central role of government in disaster relief is in response to private insurers refusing to cover catastrophic "act of God" damages that

DISASTER RELIEF FUND: FEMA'S ESTIMATES OF FUNDING REQUIREMENTS CAN BE IMPROVED, GAO/RCED-00-182 at 1 (2000).

24. OFFICE OF INSPECTOR GEN., U.S. DEPT OF HOMELAND SECURITY, IMPROVEMENTS NEEDED IN FEMA'S DISASTER CONTRACT MANAGEMENT, OIG-10-53, at 2 (2010).

25. Hurricane Ike is one of the most costly recent disasters on record with private losses of \$17.6 billion and \$2.4 billion in claims under the National Flood Insurance Program, *see* HOWARD KUNREUTHER & ERWANN MICHEL-KERJAN, ENCOURAGING ADAPTATION TO CLIMATE CHANGE: LONG-TERM FLOOD INSURANCE 2 (2009), *available at* <http://opim.wharton.upenn.edu/risk/library/RFF-IB-09-13.pdf>.

26. David Satterthwaite et al., *Adapting to Climate Change in Urban Areas*, *International Institute for Environment and Development* 89 (Human Settlements Discussion Paper Series, Theme: Climate Change & Cities No.1 2007), *available at* <http://www.iied.org/pubs/pdfs/10549IIED.pdf>.

27. MARCO GRASSO, JUSTICE IN FUNDING ADAPTATION UNDER THE INTERNATIONAL CLIMATE CHANGE REGIME 74 (2010).

are not specifically contemplated during the underwriting of a given policy.

Since only about 20% of global disaster losses are privately insured,²⁸ citizens generally depend on their governments as the ultimate reinsurer for property losses and the provider of emergency financial relief. Most governments in industrialized countries are involved in some sort of risk management strategy as either primary insurers or reinsurers of extraordinary risks. Depending on the country, coverage may be voluntary or compulsory. Some of the compensation arrangements are ad hoc, while others operate through state or quasi-state institutions. In some States, the party who ultimately pays for the national disaster compensation schemes will be either citizens who own property insurance (e.g. France), or the tax-paying population at large (e.g. U.S.).

In the U.S., disaster relief is delivered primarily by the Department of Homeland Security's Federal Emergency Management Agency (FEMA).²⁹ As a federal government agency, FEMA's budget is derived from national taxes. Other States have implemented different disaster relief management approaches. In 1982, the French government created a nationwide disaster compensation scheme.³⁰ It covers earthquakes, floods, landslides, hailstorms, avalanches, tsunamis, and droughts. All property damage policies sold by private insurers include compulsory natural disaster coverage with rates set by the government. The coverage is triggered when 1) a natural disaster is officially declared by the government; 2) the damaged property was protected under the policy; and 3) the claimant proves that the property was damaged by the natural disaster. After an insured meets a mandatory deductible that is calculated by the government, the insurer pays for material losses as well as business interruptions. In order to guarantee the solvency of this

28. Reinhard Mechler, *Financing Disaster Risks in Developing and Emerging Economy Countries*, in FLORE-ANNE MESSY, *POLICY ISSUES IN INSURANCE CATASTROPHIC RISKS AND INSURANCE*, No. 8 at 105, 116 (2005).

29. See The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. No. 100-707, 102 Stat. 4689 (codified as amended at 42 U.S.C. § 5121 (1988)).

30. See Law No. 82-600 of July 13, 1982, *Journal Officiel de la Republique Francaise* [J.O.] [Official Gazette of France], Jan. 4, 1992, p. 187.

system, the government offers natural disaster reinsurance to the property insurers with unlimited coverage.³¹

In Spain, the Consorcio de Compensacion de Seguros is a society-wide compensation scheme for extraordinary risks and was created in response to the man-made losses during the Spanish Civil War.³² The organization's work is grounded on the principles of solidarity among the insured, compensation for risks and hazards across different regions, cooperation between the private market, and the public government, and reliance on public funds as a last resort.³³ It is run as a statewide business attached to the Ministry of Economy and Finance but has assets and liabilities that are separate from the state. It pays claims when an extraordinary risk is not specifically covered by another insurance policy or the risk is covered but the company cannot meet its financial obligations. The types of risk that are covered include floods (except for the flooding of artificial canals), volcanic eruption, sea surges, earthquakes, storms including windstorms with winds greater than 135 km/h, terrorism, and civil unrest.³⁴ To create a sufficient capital reserve, the Consorcio collects compulsory sums that are levied on all accident and property insurance policies. The Consorcio puts these partially tax-deductible sums in a stabilization reserve. Historically, the Consorcio has also temporarily covered risks where there is no market activity to protect parties, such as the risk of terrorism and war after the September 11, 2001, attacks. Unlike the French model described above, compensation from the Consorcio does not depend on an official declaration of a disaster by the state. The General Manager of the Consorcio is aware that climate change will present a challenge to the Consorcio and has observed that even though the insurance industry is not the exclusive solution to compensation for climatic events, "it will

31. *See generally* CCR, <http://www.ccr.fr/> (last visited Aug. 18, 2010). (Caisse Centrale de Réassurance-website for State-owned reinsurance company that provides reinsurance coverage for French natural disasters).

32. *See generally* Ignacio Machetti, *The Spanish Experience in the Management of Extraordinary Risks, Including Terrorism*, in FLORE-ANNE MESSY, *POLICY ISSUES IN INSURANCE CATASTROPHIC RISKS AND INSURANCE*, NO. 8 at 337 (2005).

33. *Id.* at 341.

34. *Id.* at 342.

have to offer insurance alternatives according to each climatic reality.”³⁵

New Zealand introduced the Earthquake Commission Natural Disaster Fund in 1993 to cover natural disaster losses for residential properties.³⁶ The coverage is compulsory whenever fire insurance is purchased.³⁷ The premium for natural disaster coverage is collected by private insurers and then sent to the Earthquake Commission, a state entity, which administers the natural disaster insurance, including processing the claims and organizing reinsurance.³⁸ As with the French compensation scheme, the government is the ultimate reinsurer.

In the Netherlands, some government compensation may be provided under the Calamities and Compensation Act.³⁹ The available compensation is limited to those situations in which a flood results in a disruption of public safety and requires a coordination of civil services. Damage caused by storm surges is not covered, because it is considered too difficult to calculate the costs of such events.⁴⁰

Some countries such as Australia use funding mechanisms created from tax revenue. Through its Natural Disaster Relief and Recovery Arrangements fund, the federal government provides post-catastrophe funding to both States and Territories to cover specific expenses. The fund is intended to supplement private insurance.⁴¹

In Turkey, a national disaster insurance scheme provides relief to Turkish households located within municipalities in the

35. *Id.* at 347.

36. Earthquake Commission Act 1993, Public Act 84, Section 13 (N.Z.), available at <http://www.legislation.govt.nz/act/public/1993/0084/latest/DLM305968.html>; see generally EQC, Earthquake Commission, EQC Insurance, <http://www.eqc.govt.nz/insurance.aspx> (last visited Aug. 18, 2010).

37. Earthquake Commission Act 1993, Public Act 84, Section 18 (N.Z.).

38. *Id.* at Section 5.

39. Alberto Monti, *Policy Approaches to the Financial Management of Large-Scale Disasters*, in POLICY ISSUES IN INSURANCE FINANCIAL MANAGEMENT OF LARGE-SCALE CATASTROPHES, No. 12 at 82 (2008).

40. W. J. W. Botzen & J. C. J. M. van den Bergh, *Insurance Against Climate Change and Flooding in the Netherlands: Present, Future, and Comparison with Other Countries*, 28 RISK ANALYSIS 413, 416 (2008).

41. See NEIL WEEKS, FINANCIAL MANAGEMENT OF CATASTROPHES IN AUSTRALIA (n.d.), available at <http://www.oecd.org/dataoecd/51/33/38120102.pdf>.

event of an earthquake.⁴² Depending on where a home is located, how the home is constructed, and what risk-reduction measures households have taken, the insurer calculates a premium. Every household is required to pay an insurance premium to a privately administered, public fund. The World Bank provides another layer of reinsurance in the form of low-interest loans to cover losses that occur before there is sufficient capital in the insurance fund to cover them, or where losses are unusually high.⁴³

In Japan, a similar earthquake reinsurance program exists with the Japanese government, rather than the World Bank serving as the insurer of last resort. With the creation of the Japan Earthquake Reinsurance Company,⁴⁴ the public and private sector share the responsibility of compensating for losses. When a homeowner purchases insurance for earthquakes, volcanic eruptions, and tsunamis, the private insurance company carries liability up to 75 billion yen for each earthquake. Anything above this sum, up to approximately 1 trillion yen (\$11 million), is carried 50% by the insurance company and 50% by the government. Anything above this sum, up to maximum payment limit per event of 4.5 trillion yen (\$50 million), is 95% carried by the government, and 5% by the insurance industry. This model provides a critical role for the private sector in loss-management and prevention up to a certain point, after which the government becomes the primary risk manager for large losses.

What do all these government sponsored or government run risk management schemes suggest in the context of climate change? These schemes all provide primarily public models and mechanisms for compensating for climate change damages. They point to a society wide inclination to allow the government or a quasi-governmental agency to be the primary risk manager for catastrophic disaster relief. The proliferation of such schemes

42. Monti, *supra* note 39 at 95-99. (summarizing Turkey's Insurance Decree Law).

43. D. Kuzek, K. Campbell & M. Khater, *The Use of Probabilistic Risk Models for Managing Earthquake Insurance Risks: Example for Turkey*, in CATASTROPHE RISK AND REINSURANCE: A COUNTRY RISK MANAGEMENT PERSPECTIVE, World Bank 41-64 (E. Gurenko ed. 2004).

44. *See generally* Non-Life Insurance Rating Organization of Japan & K. Kawachimaru, *Disaster Risk Management in Japan*, in FLORE-ANNE MESSY, POLICY ISSUES IN INSURANCE: CATASTROPHIC RISKS AND INSURANCE, No. 8 at 337 (2005).

means that the insurance industry is reluctant to underwrite extraordinary catastrophic risks.

Unlike some of the catastrophes contemplated in the design of these government disaster relief schemes, climate change catastrophes, as the General Manager of the Consorcio de Compensacion de Seguros noted, produce qualitatively different sorts of risk than earthquakes. Before scientists understood that ongoing human activities had direct impacts on climate change risks, there were few or no agents to hold directly responsible for a given natural disaster. In some cases, builders of shoddy construction or municipalities who permitted building in floodplains might be held indirectly responsible for the ultimate damages suffered. With the anthropogenic connection between extreme weather events and greenhouse gas emissions, however, there is now at least a partial chain of responsibility. While it may be efficient for industry to allow government to shoulder the expenses of disaster relief, it is no longer equitable for government to be the primary financier of disaster relief. If the government remains the loss manager of first resort for a climate change related disaster, the government absolves the private sector of its responsibility for contributing to the larger pollution problem and provides no incentive to change any “business as usual” practices.⁴⁵

What is needed is some regulatory tool to distribute financial losses in the event of a climate change catastrophe, between the government who currently shoulders the full burden of catastrophe relief and industries who will have contributed to the conditions triggering a disaster without paying for the consequences of those actions. As explained below, private mandatory catastrophe risk insurance distributes financial losses in a catastrophe while satisfying goals of corrective justice encapsulated in the polluter pays principle.

45. This argument does not suggest that governments with their large fossil fuel driven bureaucracies and individual citizens with their carbon-intensive lifestyles are not somehow also responsible for contributing to ongoing climate change, but entrenched partisan politics in countries such as the U.S. and a lack of individual continuity regarding environmental values restrain the government and individuals from either setting stringent emissions targets or changing consumption patterns in a timely, meaningful fashion to avert further increases in greenhouse gas concentrations.

C. Insurance Industry Response to Climate Change

The insurance and investment industries have been actively seeking to engage policymakers on climate change adaptation and mitigation issues.⁴⁶ In 2008, the insurance industry recognized climate change as the number one threat to property and casualty insurance markets.⁴⁷ The insurance industry recognizes that averting long-term catastrophic climate change impacts is necessary for the growth, profitability and viability of its industry. After the Copenhagen talks, global reinsurer Munich Re was quick to comment that an international agreement reducing greenhouse gases is crucial in light of the \$21 billion loss in 2009 and the \$50 billion loss in 2008 for the insurance industry from impacts caused by natural disasters.⁴⁸ Of the \$80 billion paid by the U.S. insurance industry in 2005, \$62 billion of that was paid for weather-related losses in contrast to \$40 billion dollars of losses in the 1990s and \$4 billion dollars of losses in the 1950s.⁴⁹ Insurers speculate that large future catastrophes are likely to be more frequent and/or more damaging as a result of climate change since the number of severe weather-related catastrophes has already cost the insurance industry \$1.6 trillion dollars since 1980 in claim payments.⁵⁰

Up to now, most of the effort of the insurance industry has either been in adapting insurance policies to leave them less exposed to predicted extreme weather events or in providing products that encourage investors in carbon mitigation services through financial loss insurance. Concerned about their

46. See, e.g., Global Reporting Initiative, <http://www.globalreporting.org> (last visited Aug. 18, 2010); Investor Network on Climate Risk, <http://www.incr.com> (last visited Aug. 18, 2010); Munich Re Climate Change and Insurance, http://www.munichre.com/en/ts/climate_change_and_insurance/default.aspx (last visited Aug. 18, 2010).

47. See generally Ernst & Young, *Climate Change No. 1 in Top 10 Risks Facing the Insurance Industry*, *INSURANCE JOURNAL*, Mar. 12, 2008, <http://www.insurancejournal.com/news/national/2008/03/12/88138.htm>.

48. Ulrike Dauer, *Munich Re: Climate Change Losses Set to Rise; Deal Needed*, *WALL ST. J.*, Dec. 29, 2009, <http://online.wsj.com/article/SB10001424052748703510304574625931956804434.html>.

49. Paul Gutermann, et al., *Storm Clouds Ahead: Climate Change and the Insurance Industry*, in *CLIMATE CHANGE: LITIGATION, REGULATION, AND RISK* (Phyllis Skupien & Jodine Mayberry eds., 2008).

50. Gerrit Wiesmann, *Munich Re Urges Climate Action*, *FIN. TIMES*, Dec. 30, 2009, <http://www.ft.com/cms/s/0/98a3ac0a-f4e2-11de-9cba-00144feab49a.html>.

overexposure in certain geographical markets to impending severe weather events, insurers are refusing to renew property and casualty policies. Insurers in areas perceived to have high risks from severe weather events such as Cape Cod, Massachusetts are withdrawing from certain markets because of growing concerns about undercapitalization for large-scale weather related events.⁵¹ Responding to the losses associated with Hurricane Katrina, three of the largest insurers Allstate, State Farm, and Liberty Mutual substantially reduced future exposure to Katrina-like events by turning down all new homeowner insurance requests in New Jersey, Connecticut, Rhode Island, Maryland, Massachusetts and the eight downstate counties of New York.⁵²

Insurers are also offering products associated with the emerging carbon markets. For example AIG is currently offering Carbon Credit Delivery Insurance to cover costs associated with investing in a Clean Development Mechanism Project or a Joint Implementation Project that does not deliver carbon credits because of technical problems or political risk problems.⁵³ AIG also intends to offer Renewable Energy Certificate Insurance and Forest Carbon Sequestration Insurance.⁵⁴ Most of these insurance products simply protect external mitigation efforts through programs such as the Reducing Emissions from Deforestation and Degradation and the Clean Development Mechanism. These products do not directly stimulate emission mitigation through changes in existing business practices. The following section explores an insurance product designed to stimulate systemic change, share financial responsibility for future climate change disasters between industries and governments, and hold industries accountable for greenhouse gas emitting business practices.

51. Karen Breslau, *The Insurance Climate Change: Coastal Homeowners In The East Are Losing Their Policies Or Watching Premiums Skyrocket. Carriers Say That Global Warming Is To Blame*, NEWSWEEK, Jan. 29, 2007.

52. Paul Vitello, *Home Insurers Canceling in East*, N.Y. TIMES, Oct. 16, 2007.

53. AIG American International Group, Inc. Initiatives, <http://phx.corporate-ir.net/phoenix.zhtml?c=76115&p=irolgovresponsinitatives> (last visited Aug. 18, 2010).

54. *Id.*

D. Mandatory Private Climate Change Catastrophe Insurance as a Climate Change Mitigation Strategy

1. Introduction

Why is mandatory private insurance part of the solution to stimulating mitigation efforts? First, as professional risk managers, the insurance industry is one of the few business sectors that can catalyze rapid change from other private business sectors. In fact, some insurance analysts envision a particularly active role for the industry in addressing the long-term challenges of climate change as suggested by the following comments in a well-respected insurance industry journal.

[The insurance industry] needs to prepare itself for the adverse effects that climate change may entail on its business and on its customers . . . [and] find solutions to reduce the economic risks linked to climatic evolutions and possibly to help society to cope with the root that causes global warming by promoting new technologies that should enhance mitigation of greenhouse gas emissions.⁵⁵

Second, the private insurance industry has the market clout to demand changes since it is the world's largest industry in terms of yearly revenues. If the industry were a country, it would be the world's third largest country with annual revenues of \$3.2 trillion a year.⁵⁶ Almost 8% of the global GDP comes from insurance premiums.⁵⁷

Insurance works as a climate change mitigation strategy because insurance companies have the potential to catalyze fundamental behavioral change among insurees; insurance companies interested in their bottom line will not insure bad risks and where they insure highly risky activities they will demand high premiums to cover their risks. Even though climate

55. Sophie Chemarina & Pierre Picarda, *Editorial Insurance and Adaptation to Climate Change*, THE GENEVA PAPERS ON RISK AND INSURANCE ISSUES AND PRACTICE 33, 66–70 (2008).

56. Evan Mills, *Insurance in a Climate of Change*, 309 SCIENCE 1040 (2005).

57. Evan Mills, *Insurance as an Adaptation Strategy for Extreme Weather Events in Developing Countries and Economies in Transition*, 12 (Lawrence Berkeley Nat'l Lab. Report No. 52220, 2004), available at <http://escholarship.org/uc/item/5609x12n>.

change research is vexed with unknowns, insurance companies can make some assumptions about future extreme weather events and construct insurance contracts that equitably pool and share risks.

Insurance will also work as a mitigation strategy because it defines in advance the limits of a given risk and then “finds ways to insure what has previously been regarded as uninsurable.”⁵⁸ A few decades ago, no one would have expected the insurance industry to be able to manage risks such as nuclear energy production and terrorist events through insurance products. Yet, the insurance industry has developed products to spread the risk associated with these open-ended events by defining insurance parameters. In the case of climate change, insurers can work in tandem with scientists and climate modelers to identify technical and economic parameters to define the risks of climate change based on agreed upon measurable triggers.⁵⁹ To the extent that it can set some mutually agreed upon parameters, the industry can disaggregate the completely speculative risk of climate change into more discrete risks such as a sharp increase in temperature, an increase in sea level rise, a decrease in water supply, an increase in intensity of storm systems, or an increase in number of wildfires.

Once risks have been identified and quantified and an adequate number of possible parties needing insurance have been identified to satisfy insurance’s “law of large numbers,”⁶⁰ insurers need to set fair premiums based on the specific risk potential of

58. RICHARD ERICSON & AARON DOYLE, *UNCERTAIN BUSINESS: RISK, INSURANCE, AND THE LIMITS OF KNOWLEDGE* 18 (2004).

59. P.A. Scott, et al., *Human Contribution to the European Heat Wave of 2003*, 432 *NATURE*, 610–14 (2004).

60. This is a probability theorem that explains why insurance policies need to be system-wide or at least adopted across various risk groups in order for profits from a given insurance product to be stable. If only a few insurance policies were issued for a random risk such as an urban flood, then the insurance agency would have too broad of a deviation of risk to ensure sufficient capital from premiums to cover losses in the case of a flood resulting from a single clogged storm sewer. The more policies that are issued, the more stable long-term results become. Not every insurance policy will be for the neighborhood next to the clogged storm sewer. If all of the insurance policies are for the same affected neighborhood, then the law of large numbers no longer works because the risks are no longer independent of each other.

each party seeking insurance.⁶¹ In the context of climate change, this means understanding the probability of a given event in relation to the probability of an insuree's activities causing a loss.

Proposing that the insurance industry actively manage climate change risks by requiring insurees to behave in a less risky fashion is not a radical proposal for the industry. As one author suggests, the quiet power of insurers over their insured parties is equivalent to a "material constitution . . . that operates through routine, mundane transactions that nevertheless define the contours of individual and social responsibility."⁶² In the past, to reduce exposure to losses, the insurance industry has frequently mandated system-wide implementation of technologies that mitigate losses. For example, fire insurers have required that their insured parties install fire alarms not just to protect the insured property but also to protect other buildings in the community whose owners might be able to file a third-party claim against the insurer. Even where a given technology is not required, insurance companies offer incentives for adopting certain technology. For example, preferential auto insurance rates are given to vehicle owners who drive cars with anti-lock braking systems and other safety features.

While major industry players have conceded that their greenhouse gas emissions must be managed, these players want to be able to set their own schedule for reductions. If the insurance industry were to become substantially involved in underwriting the climate change catastrophe risks posed by certain major emitters, then emitters would find themselves having to answer to the risk tolerances of insurers rather than simply the annual profit demands of their boardroom. The climate risks associated with certain industry behaviors would be scrutinized and evaluated not only through the public lens of environmental agencies and environmental activism groups, but more importantly, through the risk tolerance of private insurers.

As long as insurers seek to responsibly manage their risk portfolios, any requirement for mandatory insurance from major

61. Howard C. Kunreuther, & Paul K. Freeman, *Insurability, Environmental Risks, and the Law*, in *THE LAW AND ECONOMICS OF THE ENVIRONMENT* 302, 305 (Anthony Heyes, ed. 2001).

62. T. Baker, *On the Genealogy of Moral Hazard*, 75 *TEX. L. REV.* 237, 291 (1996).

greenhouse gas emitters should gradually reduce national climate change emissions as insurers demand certain mitigation efforts on the part of their insurees. If fully implemented, a mandatory insurance scheme should lead to some combination of direct mitigation by large greenhouse gas emitters or indirect emission mitigation as the goods or services of large greenhouse gas emitters become more expensive and consumers purchase less, conserve more, or seek less-polluting alternatives.

2. Earthquake Insurance as a Model for Developing Climate Change Insurance Products

While scientists are well informed about what happens during and after an earthquake, the tools to forecast earthquakes remain underdeveloped. While there are substantial challenges with obtaining information about when an earthquake will happen, there are ample models about what losses are likely in the event of a certain magnitude earthquake. So while insurers do not know when to expect a given magnitude earthquake, they can make predictions about how much damage a given magnitude earthquake would cost. While wary of insuring for earthquakes because of the uncertainties of timing, private insurers have offered and continue to offer certain levels of earthquake insurance. A review of earthquake insurance products may provide some insights about the role of insurance in climate change.

Like climate change, the modeling of earthquakes is based on “dubious assumptions and subjective criteria related to what might happen over the next several hundred years.”⁶³ What data does exist on historic earthquakes is limited. Yet private insurers have not completely shied away from offering insurance products to cover against long-term geological risks. They have instead simply relied on more creative and imaginative analytical techniques, collected more evidence including independent geological surveys, and then issued policies on the basis of certain educated assumptions about geological risk.

Insurance companies view earthquakes from the point of view of not “if” but “when.” With the emphasis placed on “when,”

63. ERICSON & DOYLE, *supra* note 58, at 34.

the companies consider their contribution to be one of amassing capital that will be made available to protect the monetary value of assets “when” there is a disaster. Where earthquake insurance is offered as part of property and casualty insurance packages, some nationwide insurers provide affordable premiums by packaging the earthquake coverage as a non-negotiable part of the policy regardless of the actual risk of earthquakes.⁶⁴ This means that property owners in areas where there is no danger of earthquake subsidize future payouts for earthquake losses.

In order to create somewhat affordable premiums with a broad enough market for risk pooling, the insurers currently rely on contributions from both the government and insured parties. Governments can provide some security and incentive for insurers who offer earthquake insurance by either reinsuring certain high-level risk or by offering capital reserve-building tax benefits to insurers including relief from paying income tax on earthquake insurance premium income.⁶⁵

Like other kinds of insurance for “uninsurable” risks, earthquake insurance has its own challenges. One of the greatest challenges is to convince parties to purchase insurance since earthquakes are improbable risks. The second challenge is to ensure that insurers are actually setting premiums aside from its general pool into an earthquake reserve pool.⁶⁶ The general perception in the industry is that earthquakes are distant dangers that do not require short-term financial planning. The final challenge is making sure that the reinsurance on earthquake risks does not result in a “house of cards” effect if one reinsurer was to collapse because it has assumed too much risk from irresponsible underwriters.⁶⁷

The challenges faced by earthquake insurers are informative for would-be insurers of climate change. Both events involve a high magnitude of damages with poor levels of predictability. While no one knows when or how likely it is that key ice shelves will melt or Category IV storms will hit the coasts, existing earthquake insurance schemes suggest that a viable climate

64. *Id.* at 191.

65. *Id.* at 208.

66. *Id.* at 199.

67. *Id.* at 200.

change insurance scheme may require some form of government reinsurance or guarantee, may need to be both mandatory and risk-differentiating to ensure adequate capitalization, and may require from its insured parties changes in business practices to reduce risks. Earthquake insurance is mandatory in New Zealand, Taiwan, Turkey, and Iceland.

3. Mandatory vs. Voluntary Insurance

One of the keys allowing for proper capitalization for earthquake insurance is mandatory participation in an insurance scheme. For a climate change catastrophe insurance product to serve a meaningful mitigation role, it will need to be mandated for major greenhouse gas emitters. There are various economic, political, and scientific approaches to defining a “major” greenhouse gas emitter. For the purposes of this proposal for insurance, a major greenhouse gas emitter will be any industrial plant that emits 25,000 tons of greenhouse gases a year as well as any industry whose business activities cumulatively contribute 25,000 tons of greenhouse gases a year. This number was chosen based on the U.S. Environmental Protection Agency’s proposal to require polluters releasing 25,000 tons of greenhouse gases a year to implement best available technology whenever an existing facility is changed or a new facility is built.⁶⁸

The most important reason for mandating catastrophe risk insurance is to compel industry actors to take action under the supervision of the profit motivated insurance industry. Industries have understandably taken few steps to mitigate their emissions since there remains uncertainty about what sort of carbon market will emerge or what regulatory expectations companies must meet. In some respects, the current regulatory paralysis may be encouraging companies to continue “business as usual” practices in hopes of future benefits under an unknown trading scheme. Even though some companies have participated in carbon footprinting through projects such as the Carbon Disclosure Project,⁶⁹ coal powered electricity plants continue to go

68. Dina Cappiello, *EPA to Crack Down on Greenhouse Gas Emitters*, S.F. CHRON., Oct. 1, 2009.

69. Carbon Disclosure Project, <http://www.cdproject.net> (last visited Aug. 18, 2010).

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on-line in countries such as the U.S. with 77 plants under construction, permitted, or being developed as of January 2010.⁷⁰ Without a regulatory incentive such as mandatory insurance to change current behavior, history suggests that industries are unlikely to adopt greener production. Even though climate change concerns have been debated since the 1990s, it has taken almost two decades to get research and development financing into areas such as cleaner emissions in greenhouse gas intensive sectors such as the heavy trucking industry⁷¹ whose overall greenhouse gas emissions have grown 76% since 1990.⁷²

There are numerous other practical reasons for mandating insurance. First, mandating the insurance should provide some safeguard against insurer insolvency in the face of a catastrophic disaster. If the product was completely voluntary, the burden would be on the insurance industry to market the product by persuading companies that the cost-benefit analysis weigh in favor of paying an insurance premium now rather than facing the costs of future unknown liability.

Given the current line of cases seeking liability against greenhouse gas producers, the industry may be willing to gamble that plaintiffs will not be able to definitively prove causation thereby reducing industries exposure to payments for climate change damages. In the earliest climate change liability cases, plaintiffs argued that unabated emission of greenhouse gases by corporations were the equivalent of public nuisances. Trial courts rejected this line of reasoning because the plaintiffs were seeking resolution of a “political question” by the courts.⁷³ In a later case *Native Village of Kivalina v. Exxon Mobil Corporation*, plaintiffs sued for the costs of relocating their village due to historically

70. Erik Shuster, *Tracking New Coal-Fired Power Plants*, NATIONAL ENERGY TECHNOLOGY LABORATORY, Jan 8, 2010, <http://www.netl.doe.gov/coal/refshelf/nep.pdf>.

71. Peterbilt News & Events, Jan. 12, 2010 U.S. Department of Energy Awards \$39 million in Support of the Supertruck Program, <http://www.peterbilt.com/newsdetails.aspx?id=275> (last visited Aug. 18, 2010).

72. U.S. DOT, *Transportation & Climate Change Clearinghouse, Transportation GHG Emissions and Trends: U.S. Greenhouse Gas Emissions from Transportation and Mobile Sources, by Vehicle Type*, <http://climate.dot.gov/ghg-inventories-forecasts/national/us-inventory-structure.html> (last visited Aug. 18, 2010).

73. *People v. General Motors Corp.*, No. C06-05755 MJJ, 2007 WL 2726871, at *16 (N.D. Cal., Sept. 17, 2007).

unprecedented storm surges created by the early melting of Arctic ice sheets. Plaintiffs argued that in addition to creating a public nuisance certain oil companies should be held responsible for conspiring to cover up the impacts of their activities on climate and be required to compensate plaintiffs on a market-share basis.⁷⁴ Relying on the factors from the seminal political question case *Baker v. Carr*,⁷⁵ the judge dismissed the plaintiff's case in *Kivalina* by finding that the pleadings raised a non-justiciable political question. Even though the Second Circuit recently decided in *Connecticut v. American Electric Power Co.*,⁷⁶ that the political question doctrine did not bar nuisance claims against major greenhouse gas emitters, the California District Court refused to follow suit and commented that, "[t]his court is not so sanguine. While such principles may provide sufficient guidance in some novel cases, this is not one of them."⁷⁷

With the future of civil liability so uncertain, industry has no incentive to change "business as usual" and certainly no incentive to purchase voluntary climate change insurance. The only possible incentive to purchase voluntary insurance would be if the government guaranteed some cap on industries' exposure to future liability suits. The failure of civil liability suits to create any traction to promote greenhouse gas mitigation efforts suggests a second reason for mandating climate change catastrophe insurance. No voluntary insurance scheme would cover in any meaningful fashion the government costs associated with responding to an extreme weather climate disaster. If there are only a few companies participating voluntarily in the scheme, the insurance will be unable to spread the risk across the population of insured parties and without the law of large numbers operating, any insurance claims would result at best in only token payouts.

A final reason for mandating insurance is to establish for the business community that climate change is a manmade disaster

74. Complaint at 2, *Native Vill. Of Kivalina v. ExxonMobil Corp.*, 663 F.Supp2d 863 (N.D. Cal Feb. 26, 2008) (No. 08-01138); *Native Vill. Of Kivalina v. ExxonMobil Corp.*, 663 F.Supp2d 863 (N.D. Cal 2009) (granting the motion to dismiss the complaint).

75. *Baker v. Carr*, 369 U.S. 186 (1962).

76. *Connecticut v. Am. Elec. Power Co.*, 582 F.3d 309 (2d Cir. 2009).

77. *Kivalina*, 663 F.Supp2d at 875.

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and that the long-term solutions to avert climate change are human solutions. Legal precedent suggests that even though the state has traditionally shouldered the costs associated with “act of God” natural disasters, the community expects private insurers to pay for damages associated with manmade disasters.⁷⁸ Even with the general scientific and policymaking consensus that climate change has been caused by anthropogenic sources, corporations continue to introduce technologies that fly in the face of climate change being any sort of short-term corporate policy concern.⁷⁹ When premiums are accurately set, mandatory insurance is an effective tool for limiting the externalization of the social and environmental costs of business practices.

Legislating for mandatory insurance products will be controversial. It may even be more controversial among insurance companies than among insurees. Efforts in February 2009 to require insurers to offer a climate change product such as pay-as-you-drive insurance in order to incentivize driving less were met with resistance from the insurance industry. David Snyder, a vice president with the American Insurance Association, claims that when the legislature creates mandatory policies it puts insurers in a “regulatory straitjacket.”⁸⁰

Yet without mandating a nationwide policy, there will be neither industry wide changes leading to meaningful reductions in emissions nor adequate capitalization for any insurance product protecting against catastrophic climate change damages. Insurance customers seeking coverage under a voluntary product

78. *See, e.g.*, Admiralty and Maritime Law Guide, International Convention on Civil Liability for Oil Pollution Damage (Nov. 29, 1969) 9 I.L.M. 45 (1970); Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and to the 1992 Convention on the Transboundary Effects of Industrial Accidents, *available at* http://www.unece.org/env/civil-liability/documents/protocol_e.pdf.

79. Mike Robinson, Vice President, Environment, Energy, and Safety Policy, GM (Oct. 29, 2009) (stating in a corporate responsibility blog: “we will take issues like climate change head on”); *but see* Cadillac.com, <http://www.cadillac.com/dts/features-specs/> (last visited Aug. 21, 2010) (noting that GM continues to offer in 2010 its new “full-size” 4000 pound Cadillac DTS which gets 15 mpg in the city).

80. Evan Lehmann, *Regulators Vote to Make Industry Act on Climate Change*, CLIMATEWIRE, Feb. 25, 2009, <http://www.eenews.net/climatewire/2009/02/25/archive/6?terms=insurance>.

who refuse to make the changes requested by an insurance company as part of an insurers' risk assessment would have the option to simply not insure. Some players in the insurance industry seem to favor regulation. In testimony before the Select Committee on Energy Independence and Global Warming, Frank Nutter of the American Reinsurance Association commented that the insurance industry is not responsible for "bearing the cost of climate change without a concomitant commitment on the part of society to pursue a mitigation strategy—addressing the causes and consequences of climate change."⁸¹

Government regulations provide the nationwide commitment that some players in the insurance markets seem to be waiting for before acting. A regulatory scheme that requires mandatory private catastrophe risk insurance makes sense for the federal and state governments as they seek to adequately capitalize disaster relief compensation programs and post-disaster infrastructure revitalization programs. Mandatory insurance provides governments with a proven market mechanism that can indirectly manage existing and future risks in a dynamically changing environmental and business climate.

4. Logistics of Implementing Private Climate Change Catastrophe Risk Insurance

The impetus for proposing mandatory climate change catastrophe insurance to cover the costs generally associated with government run catastrophic relief is to provide an indirect incentive for major greenhouse gas emitting corporations to make systemic greenhouse gas reducing changes in their operations. If enough major emitters make systemic changes then there should be some measurable mitigation effect. In contrast to individuals who are constrained in large part by what the market makes available to them, corporate entities have the capacity on a large and influential scale to reinvent their products and services to

81. FRANKLIN NUTTER, REINSURANCE ASSOCIATION OF AMERICA, ECONOMIC IMPACTS OF GLOBAL WARMING: PART I-INSURANCE 7 (2007), *available at* <http://www.globalwarming.house.gov/tools/assets/files/0087.pdf>.

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meet not only their economic bottom line but also a broader environmental bottom line.⁸²

Bearing in mind that insurance companies deplore “regulatory straitjackets”, this section explores how private insurance might operate if governments issued a broad regulation requiring all major greenhouse gas emitters⁸³ under their jurisdiction to carry insurance to cover climate change catastrophe damages. In selecting which set of major greenhouse gas emitters to regulate, the focus should be on which emitters are most likely to continue to have a sizable cumulative impact on atmospheric concentrations of greenhouse gases. The amount of required insurance coverage by an industry would be based on estimated costs of future climate change disaster relief multiplied by what percentage each emitter contributes to the national greenhouse gas inventory.

There are no existing products on the market that would protect the public’s interest in disaster relief or infrastructure. The insurance products on the market that are not targeted specifically at climate change risks may not cover climate change disaster. Insurers may refuse to pay claims where a policy contains pollution exclusion and where greenhouse gases are accepted as pollution.⁸⁴ Many insurance policies deny coverage

82. United Nations, Global Compact, The Global Compact and the United Nations Environment Programme, http://www.unglobalcompact.org/ParticipantsAndStakeholders/un_agencies/un_environment_programme.html (last visited Aug. 21, 2010) (describing UNEP’s “triple bottom line” work with private sector to improve environmental sustainability).

83. These numbers are based on EPA’s proposal to regulate retrofits and new plants from industries emitting 25,000 tons of greenhouse gas or more. According to EPA plants emitting 25,000 tons of greenhouse gas or more account for 70% of the carbon dioxide in the United States. See John Broder, *EPA Moves to Curtail Greenhouse Gas Emissions*, Sept. 30, 2009, N.Y. TIMES, <http://www.nytimes.com/2009/10/01/science/earth/01epa.html>. In order to be more inclusive, the term “major greenhouse gas emitters” for mandatory insurance coverage might be defined by regulators to include plants emitting at least 25,000 tons of greenhouse gas or all industries who contribute through their activities or products 25,000 tons of greenhouse gas.

84. Press Release, U.S. EPA, Office of Air and Radiation, Greenhouse Gases Threaten Public Health and the Environment/Science overwhelmingly shows greenhouse gas concentrations at unprecedented levels due to human activity (Dec. 7, 2009), available at <http://yosemite.epa.gov/opa/admpress.nsf/7ebdf4d0b217978b852573590040443a/08d11a451131bca585257685005bf252!OpenDocument> (announcing that the current concentrations of greenhouse gas in the atmosphere represent a pollution problem).

where a given occurrence leading to loss is found by the court to have been intended by the corporation. Arguably, industries such as energy companies who continue to release greenhouse gases into the atmosphere in spite of evidence that they are contributing to the emerging impacts of climate change, intend to cause long-term losses.

i. Who would be required to carry coverage and how much coverage?

While no single corporate entity may have a sizable greenhouse gas footprint in proportion to the atmospheric greenhouse gas concentrations, certain industry sectors are having disproportionate cumulative impacts including the producers of electricity, iron and steel, aluminum, oil, cement, lime, and pulp and paper.⁸⁵ A State could decide who is a major emitter for purposes of its insurance regulations either based on tons of carbon or carbon equivalent emitted annually (raw quantification approach) or on the percentage of carbon emitted annually in comparison to other industries (proportionality approach). A number of tools exist which would provide methods for setting a baseline for identifying who qualifies as a “major” emitter within a given greenhouse gas intensive sector. For example, the Carbon Monitoring for Action group provides databases of the carbon dioxide emitted by various power companies which might be used to set a numerical baseline to quantify which corporate entities in the electricity sector would be required to carry insurance coverage as “major greenhouse gas emitters”.⁸⁶

How much insurance each party is required to carry would be the subject of negotiation between the insurance industry and government regulators. The private insurance industry cannot viably provide climate change catastrophe insurance without capping liability for a given event. What caps would be set would depend on what the insurers and the government agree represent

85. Jake Schmidt, Nate Helme, Jin Lee, & Mark Houdashelt, *Sector Based Approach to the Post-2012 Climate Change Policy Architecture*, 8 CLIMATE POLICY 494, 498 (2008).

86. CARMA, Carbon Monitoring for Action, <http://carma.org/> (last visited Aug. 21, 2010).

a fair economic analysis of low-probability, high-damage climate catastrophes.

ii. How would premiums be calculated?

Insurers could calculate initial general premium sums based on the corporate sector's overall contribution to national emissions and expected financial losses resulting from predicted climate change catastrophe such as an anomalous heat wave, storm surge, ice storm or a series of class three plus hurricanes. Individual premiums would be based on a risk-specific factor for each insured party. The individual risk-specific factor might be calculated based on a raw quantification approach (e.g. for insurance premium purposes, if carbon is valued at X per unit, an entity would pay a risk-specific premium for volume emitted multiplied by X), a proportionality approach (e.g. emitting 3% of the corporate sector's carbon contribution would result in a premium covering 3% of the expected damages assigned to the corporate sector), or some combination of the two. Using any of these approaches to calculate premiums should provide incentives to emission producing companies to focus either individually on cutting emissions or collectively within a sector to reducing a given sector's emission contribution. Currently, the consumption of electricity is responsible for 39.5% of the anthropogenic carbon dioxide emissions with over 80% of these emissions coming from coal-fired power plants.⁸⁷ Any reduction in the corporate sector percentage could, if a proportionality approach is used, translate into reduced premiums for each company in the sector.

In order to rely on historical patterns of usage and realizing that it takes time for corporations to make behavioral changes, initial premiums could be based on the operation and production activities of an industrial entity over a 5 to 10 year period prior to the implementation of the insurance. To set a baseline for an insured parties share in the carbon economy, insurance agencies might undertake audits of direct emissions or some combination of direct and indirect emissions for each party. In subsequent years, insured parties would be required to submit updated third-party greenhouse gas reports calculated based on parameters

87. *U.S. Power Plant Carbon Emissions Zoom in 2007*, ENVTL. NEWS SERVICE, Mar. 18, 2008, <http://www.ens-newswire.com/ens/mar2008/2008-03-18-04.asp>.

established by the initial insurance audits. Subsequent premiums would depend on whether a company had increased or decreased its carbon share in comparison to both its initial baseline and to other national emission sectors. Calculating the premium accurately and fairly is crucial in order to provide tangible incentives for individual companies to cut their emissions while also continuing to hold large-scale polluters responsible for the harms caused by their ongoing activities.

Even leaving aside the uncertainties of climate science, insurers, industry, and government environmental regulators are likely to dispute what is appropriately within the gamut of an audit designed to set a baseline and how to measure industry performance against the baseline. For a company such as retail leviathan Wal-Mart, should they be held responsible only for the emissions associated with operating their chain of stores in the U.S. e.g. shipping in Wal-mart owned trucks and operating storefronts? Or should they also be held accountable for the emissions of their suppliers in China who are providing goods specifically to the U.S. market or the transport emissions by third-party transpacific shippers who are contracted by Wal-mart to move goods to the U.S. market? The legislature would need to make final decisions regarding which types of emissions would be covered by baseline audits. From a mitigation perspective, both direct and indirect emissions associated with a product or service should be included so as to provide a realistic footprint of a given entities greenhouse gas intensive activities.

From the perspective of simply reducing emissions, overlap between carbon share audits might spur multiple actors into action to mitigate the impact of their goods or services. Since mandatory insurance would depend on national legislation and States may be able to effectively regulate activities of a multinational in another State, it would be prudent from the perspective of the State and the private insurers participating in the mandatory insurance scheme to be as inclusive as possible in defining the parameters of direct emissions. This would ensure that companies' insurance premiums and amount of coverage reflect the reality of a carbon intensive global supply chain. In the case of a multinational such as Wal-Mart, if the emissions audit is restricted to its activities in the U.S., it may have a relatively modest greenhouse gas footprint in comparison to other

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similarly sized industrial actors. But, when the focus is broadened to include all of its manufacturing and shipping activities across the world, the footprint becomes noticeably larger. From a pure carbon mitigation perspective and the concept that a polluter must pay for the consequences of its business decisions, it makes sense to include the manufacturing and shipping activities as part of Wal-Mart's corporate footprint because the strategy of using certain overseas suppliers and third-party shippers contributes to Wal-Mart's overall profit base in the U.S..

iii. Who could bring claims?

The only claimants under the proposed insurance would be the state, federal, and municipal government agencies who are responders in the case of a catastrophe, climate change induced or otherwise. These government agencies are in the best position to understand how much a given catastrophe costs a community and would have the resources to pursue and document the losses needed to file a third-party claim. The catastrophe risk insurers would make single payments to the government agencies that would either be reimbursals for first response emergency work that the government agencies had done in response to a catastrophe such as hazard mitigation and debris removal or for post-disaster rehabilitation payments to restore and adapt damaged public infrastructure such as road systems, public buildings, bridges, public utilities, and parks. In the case of post-disaster rehabilitation payments, the insurance company would send someone to document the extent of the losses and whether a structure could be repaired or would need to be rebuilt.

iv. What claims may be brought?

The proposed insurance would cover claims for prospective disaster relief expenses. Claims could not be made for damages alleged to be from before the policy was issued. This approach simplifies one of the recurring debates about extending climate change responsibility retroactively to cover the actions of historic emitters and avoids employing insurance as a form of reparation. Daniel Farber observes that while a reparation model of compensation has a certain moral appeal, such a model relies on

connecting a specific damage to a specific wrongdoer and then somehow assigning responsibility through an indeterminate intergenerational approach.⁸⁸ While the reparation approach satisfies the equity concerns of making the polluter pay, it raises technical problems with attributing historical pollution since many previous polluters have ceased to exist and the pre-1990 amount of emissions has been dwarfed by current emissions.⁸⁹ A reparation approach also raises issues of whether we can hold parties accountable when there was conflicting knowledge and awareness of the long-term consequences of greenhouse gas emitting activities.

v. Relationship to other insurance products

The mandatory insurance proposed by this paper would not replace existing products but would provide another layer of insurance for existing disaster relief insurance products. Currently, there is an emerging market for state and municipal property insurance products to protect states who have experienced disaster losses and who might need to rely in the future on public assistance for disaster rehabilitation. In order to receive public assistance from FEMA, entities that have already received historic payments for disaster losses must prove insurance coverage “for the type of hazard that caused the damage” in order to remain eligible for public funds.⁹⁰

vi. On what basis will claims be paid?

This paper proposes the use of an index-based approach for triggering payments of insurance claims. This approach avoids problems of causation that are inherent in pursuing other liability theories such as nuisance. In the context of climate change liability, much has been written on the difficulty of

88. Daniel Farber, *Basic Compensation for Victims of Climate Change*, 155 U. PA. L. REV. 1605, 1634 (2007).

89. Myles Allen, *Liability for Climate Change*, 421 NATURE 892 (2003) (scientists suggest that two-thirds of the greenhouse gases in the atmosphere by the 2020s will have been emitted post-1990).

90. FEMA, Insurance Considerations for Applicants: Disaster Assistance Fact Sheet No. 9580.3 (May 29, 2008), available at http://www.fema.gov/government/grant/pa/9580_3.shtm.

causation and attribution.⁹¹ How can one reasonably trace a particular weather event to a particular set of greenhouse gases emitted by an identifiable defendant? Physicist Myles Allen proposes one potential methodology for attributing damage to anthropogenically caused climate change. He argues that even though we cannot know with certainty how greenhouse gas emissions alter the risks associated with events such as flooding, it may be able to work out a “mean likelihood-weighted liability” through averaging over all the possibilities.⁹² If Allen is correct about this, we can then calculate what percentage of a given event is attributable to climate change factors. If it is possible to assign a climate change attribution rate to any given event, then all that is needed to assign costs for damages in a nationally equitably way is the collective carbon share of all insured parties and the national carbon share for each insured party at the time of an event covered by the insurance policy.

But Allen’s probability and percentage approach could prove very complicated and would leave ample space for interminable legal and scientific wrangling about whether an event was actually caused by anthropogenic climate change. Instead, insurers could decide in concert with independent climate experts, who are not employed by the government, what measurable environmental triggers should result in the government’s ability to file a claim. For example, heat waves of a certain temperature and duration in a particular location that result in damages and a government disaster response might trigger a claim. Or windstorms of a certain velocity that result in damages and a government disaster response might trigger a claim. This approach would enhance the objectivity of the claim process and would lend a degree of predictability to both paying damages and recovering damages under the insurance policy.

The use of triggers for insurance products is already common for certain types of index insurance such as weather based crop insurance schemes. These products look at one or more

91. Howard C. Kunreuther & Erwann O. Michel-Kerjan, *Climate Change, Insurability Of Large- Scale Disasters, And The Emerging Liability Challenge*, 155 U. PA. L. REV. 1795 (2007); Roda Verheyen, *CLIMATE CHANGE DAMAGE AND INTERNATIONAL LAW* (2005); David A. Grossman, *Warming up to a not so radical idea: Tort-based climate change litigation*, 28 COLUM. J. ENVTL. L. 1 (2003).

92. Allen, *supra* note 89, at 891.

measurable parameters such as temperature or precipitation which is considered responsible for most crop losses. In the case of these products, insurers give payouts even where there is no damage claimed. Development organizations such as the World Bank are currently popularizing index-based insurance to help small-scale farmers in Malawi, India, and Thailand cope with droughts and floods attributable to severe weather.⁹³ Some of the strengths of trigger-based insurance products over other insurance products are the transparency of the trigger-based system, the objectivity and relative speed of the claims process, and the ability of insurers to more accurately calculate their losses when a trigger event occurs.

Even though claims payments on the part of the insurer for an index insurance product would simply be an objective exercise, setting what parameters would trigger the insurance would be a highly subjective exercise given what is known and not known about attribution and climate change. Creating reasonable climate change attribution triggers requires a careful refinement of climate models coupled with eventual judgment calls by scientists and policymakers. Once a trigger is set, the trigger-based insurance approach will avoid a constant battle of experts over each claim. If the standards to set triggers are easily verifiable, whether a given trigger has been activated should be easily ascertainable for government claimants. Without requiring any formal finding by an expert or a judiciary, the events that trigger insurance claims would be considered, for purposes of insurance payouts, climate change attributable events.

Setting appropriate triggers is likely to be primarily a scientific endeavor coupled with an economic judgment call. Arguably the insurance industry could set triggers that are unreasonably high such as 10-day heat waves of 100 plus in Anchorage, Alaska. While setting the triggers at this level would result in low premiums, which may be favored by the insured companies, it would provide no financial incentive for undertaking any short or long-term emission mitigation or other loss prevention measures. At the other extreme, setting the

93. Xavier Gine, *The World Bank, The Promise of Index Insurance*, THE WORLD BANK (Mar. 2009), <http://go.worldbank.org/FN5UCVPJG0>.

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triggers too low would potentially result in multiple payments by insurers, exorbitantly high premiums, and a higher likelihood of insolvency on the part of both insurers and insured companies. Some balance would be necessary if insurance is to serve any role in reducing emissions and ensuring that the polluter pays some of the expenses associated with government disaster response through their required insurance payments.

One possible, albeit controversial, trigger for climate change index insurance could be parts per million of carbon or carbon equivalents in the atmosphere. How much carbon is too much is heavily disputed. Some groups argue that we have passed the last “safe” level of 350 ppm. Others suggest that the point of no return is 450 ppm.⁹⁴ Perhaps regulators in cooperation with insurance companies could set a trigger somewhere in between and use this number as a basis for calculating insurance risk and appropriate premiums.

vii. Collecting on claims

How would the government be able to collect disaster payments to reimburse for government expenses? For illustration purposes, take the following hypothetical case. A heat wave hits New York with temperatures in excess of 115 degrees Fahrenheit over the course of five days. It results in the city of New York declaring a disaster and delivering \$10,000,000 dollars of services. According to the insurance policy, heat waves of greater than 105 degrees in the New York metropolitan area that last for more than two days and that result in government responses would trigger claims. Once the government demonstrates that the trigger elements in the policy have occurred, the insurer would pay the claim for losses and damages attributed to the trigger elements, such as costs of acquiring water from another water district or the costs of bringing in additional emergency medical services.

Since not all of the emissions responsible for the temperature spike would be the responsibility of major greenhouse gas emitters who are under the jurisdiction of the insurance scheme,

94. Green, A Blog About Energy & the Environment, N. Y. TIMES, The Climate Change Numbers Game, <http://greeninc.blogs.nytimes.com/2009/06/04/carbon-concentrations-already-too-much/> (June 4, 2009, 11:32 EST).

the insured parties would only be responsible for some proportion of the losses. In the heatwave hypothetical, if 80% of the New York heat wave triggering emissions were assigned to the major greenhouse gas emitters, all insurees would be collectively responsible for \$8,000,000.

Because each insuree would only be held accountable for a proportional amount of the damages associated with a particular event, the proportion of damages collected would depend on the emissions record of each insured party. If power company A has made a concerted effort to reduce its emissions by using alternative less polluting fuels and power company B has continued to use coal-generation power plant technology, the contribution from power company B to climate disaster damages would be substantially more than power company A. As premiums climb for late-adopters of climate friendly practices, the insurance market will need to demand either a schedule of emission reductions or larger premiums to cover insurers' risks. As premiums grow larger and more costs are passed on to consumers, large recalcitrant greenhouse gas emitters may become less competitive as consumers seek alternative products and services.

viii. Reinsurance

The viability of a mandatory catastrophe risk insurance product depends in part on the availability of reinsurance markets to insure the risk portfolios of insurance companies. Like other insurance products, this proposed product would need to have some upper limit on payouts to protect private insurance and reinsurance companies from bankruptcy. Once the policy limit for a particular event is exceeded, the government would, as in the case of Japanese earthquake insurance, be the ultimate social reinsurer by paying for the bulk of certain extraordinary claims.

5. Climate change equity and the advantages and disadvantages of using mandatory insurance as a mitigation strategy

The intent behind the proposed third-party climate change catastrophe insurance product is two fold: recoup some amount of

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government costs for disaster relief in the case of a low probability high damage disaster, and provide financial incentives for industries to change current business practices so as to reduce the future probabilities of climate related disasters.

The success of this type of insurance scheme to promote climate change mitigation depends on insurers accurately setting base premiums that would cover their projected losses in the event of a climate change catastrophe. If the insurance premiums become simply another minor business expense, it will have little influence on promoting behaviors that will result in measurable emission reductions and may expose insurers to insolvency in the case of a claim that cannot be paid out of the collected premiums.

In addition to addressing the distributive justice issue of who should pay for long-term damage, the catastrophe risk insurance policies have the potential to also be used to address larger equity issues between currently industrialized states and states that have neither benefited from nor contributed to the carbon economy. Depending on how it structures its regulations, a government may be able to seek reimbursals from industries for government payments into global insurance pools for states with low adaptive capacity, such as the Pacific Island states or Bangladesh, or to global climate funds such as the \$3.5 billion of funds pledged at the 2009 Copenhagen conference to prevent tropical forest destruction and degradation.⁹⁵ This would not only result in an implementation of the polluter pays principle discussed below but would also satisfy the goals of distributive justice by transferring wealth to those communities where the global carbon economy has unfairly exposed individuals to human-created conditions of vulnerability.

The advantage of creating a new insurance product is that it provides a fast-track approach for greenhouse gas mitigation with key roles for non-political, business-oriented agents to ensure compliance with insurer-insuree negotiated mitigation targets. In fact, before such a mandatory insurance system would go into effect, insurance companies, seeking to manage their potential

95. Juliet Ellperin, *Hope and Funding for Saving Forests Around the World*, WASH. POST, Dec. 20, 2009, <http://www.washingtonpost.com/wp-dyn/content/article/2009/12/19/AR2009121902262.html?hpid=topnews#>.

losses, might demand easy-to-implement risk loss measures from their insured parties (e.g. energy efficiency measures or investments in emission reducing production practices). In order to reduce initial premiums, companies may voluntarily undertake emission reduction measures before requesting a coverage policy.

This mandatory insurance proposal avoids the problems faced in the aftermath of the Exxon Valdez disaster. The U.S. endeavored to make Exxon internalize the costs of its dangerous activities by requiring Exxon to pay for the cleanup and restoration of the environment. The result was a “dilatory and inadequate response.”⁹⁶ Here the Valdez problem is avoided because the large carbon emitters internalize the future costs of delivering emergency services before a potential disaster through the payment of annual premiums.

Because certain corporate entities are being targeted for participation in the program, certain equal protection issues emerge. Any mandatory insurance system has to have parameters whereby some companies are held financially accountable while others are spared. In an ideal world of textbook equity, all corporate entities regardless of quantity of emissions, would be required to undertake climate-proofing of their activities and to indemnify the government in the event of a climate change induced catastrophe. This approach is, however, not feasible since the transaction costs associated with establishing a nationwide comprehensive program would be far greater than the benefits accrued from requiring a single restaurant owner to reduce deliveries or a small business consultant to eliminate all travel.

In weighing the advantages and disadvantages of the proposed insurance system, two sets of questions emerge. The first set of questions address industry-to-industry relations. Will implementation of this insurance policy cause one set of industries to ultimately bear the responsibility for climate change that should be more broadly shared by other industries? For example, should the electricity industry have to bear the largest burden because its direct products and service are greenhouse gas intensive while other companies such as car manufacturers are

96. PATRICIA BIRNIE & ALAN BOYLE, *INTERNATIONAL LAW AND THE ENVIRONMENT* 93 (2002).

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only being held accountable for their direct production emissions and not for the indirect emissions resulting from consumers? Should car companies be held accountable for some additional share of emissions because they have demonstrated the capacity to produce low-emission vehicles and yet continue to manufacture fossil fuel driven vehicles to meet what they perceive as consumer demand?

The second set of questions addresses the relationship between industry and consumers. Where a business is faced with new regulations and expenses, it frequently passes some portion of the costs onto consumers. In the context of climate change damages, it is arguably fair that automobile drivers, energy users, airline passengers, and other consumers of greenhouse gas-intensive products and services pay for the privileges of participating in the carbon economy. After all, as discussed above, the polluter should pay for harm caused by their choice of activities. But is it fair to allow corporations to pass on all of their costs to consumers when consumers have little to no influence over the design of the cars available on the market? How can our legal system truly hold a corporate actor responsible as a polluter without triggering a ripple effect of responsibility that ultimately ends up in consumers funding a company's expenses through the future price of goods and services?

These are the dilemmas that will surface when trying to define specific rules for an insurance approach that combines carbon mitigation with long-term accountability. The focus on the relationship between climate change and insurance should be on these sorts of questions rather than the currently debated question of whether climate change as a phenomenon is insurable. Requiring mandatory catastrophe risk insurance for high emitters is not a silver bullet solution. Yet requiring companies to take a hard look at their emissions in the context of risk management for disaster relief may serve as an important step in the stimulation of rapid mitigation efforts on the part of major emitters.

**PART TWO:
MANDATORY INSURANCE AS AN IMPLEMENTATION OF
THE CORRECTIVE AND DISTRIBUTIVE JUSTICE
ASPECTS OF THE POLLUTER PAYS PRINCIPLE**

This second part of the paper argues that the mandatory insurance scheme described above promotes a viable approach to implementing the Polluter Pays Principle as an equity concept that satisfies the goals of both corrective justice and distributive justice. Insurance explicitly allocates responsibility.

The polluter pays principle (PPP) seems rudimentary in concept. Parties are held accountable to compensate injured parties for the costs of the damage that they have caused or are likely to cause given the hazardous nature of a particular activity. In practice, PPP remains under-implemented especially for problems with a global reach. One reason for the inequitable implementation of the principle is the split nature of the concept. In legal debates, PPP is cited as both a general principle of equity as well as a principle of economic efficiency.⁹⁷ This dual nature of PPP has in practice led to it being considered primarily as an efficiency principle and only secondarily as an aspirational legal principle.

Because its first articulation as a principle was at the Organization of Economic Cooperation and Development (OECD) as a methodology for internalizing costs of pollution abatement, PPP is considered primarily an economic concept for efficiently sharing damages.⁹⁸ It described PPP as “the principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment.”⁹⁹ The goal for the principle was “to ensure that the environment is in an acceptable state.”¹⁰⁰

97. See generally NICOLAS SADELEER, ENVIRONMENTAL PRINCIPLES: FROM POLITICAL SLOGANS TO LEGAL RULES 23-32 (2000).

98. ORGANISATION OF ECONOMIC COOPERATION AND DEVELOPMENT, No. C(72) 128, ENVIRONMENT AND ECONOMICS: GUIDING PRINCIPLES CONCERNING INTERNATIONAL ECONOMIC ASPECTS OF ENVIRONMENTAL POLICIES annex para. (A)(a)(4) (1972).

99. *Id.*

100. *Id.*

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The OECD eventually adopted a broader interpretation of PPP as a liability concept and not simply as a cost allocation principle.¹⁰¹ The idea of PPP was interpreted by the secretariat of the International Law Commission as an extension of civil liability concepts.¹⁰² In recent OECD documents, staff indicate that “environmental liability is an important instrument of implementation of the Polluter Pays Principle” and that PPP should have “deterrent effects.”¹⁰³

In analyzing the dual economic and liability paradigms of the concept, Hans Christian Bugge describes PPP as an environmental economics principle which promotes the “efficiency principle of internalization of environmental costs” as well as a legal principle which promotes “liability and compensation for environmental damage.”¹⁰⁴ While fusing law with economics has emerged as an influential theoretical approach, treating PPP as both an economic and a legal principle has failed to effectively promote justice or create justice-generating norms. In fact the fused approach of PPP as a law and economic principle has led in part to PPP being the source of “doubts and criticism in economic theory as well as in politics.”¹⁰⁵

Instead of attempting to negotiate a dual economic and legal approach to PPP, PPP as applied to global problems should focus on the principles of equity and fairness rather than as a means of

101. Sanford Gaines, *The Polluters Pays Principle from Economic Equity to Environmental Ethos*, 26 TEX. INT'L L. J. 463 (1991).

102. Int'l Law Commission, Survey on liability regimes relevant to the topic International liability for injurious consequences arising out of acts not prohibited by international law: study prepared by the Secretariat, 84, U.N. Doc. A/CN.4/471 (1995).

103. Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe, Caucasus, and Central Asia, OECD ENV/EPOC/EAP/REPIN 1 (2009); *cf.* Environmental Liability to Natural Resources in OECD Countries: The Concept and Key Approaches, ENV/EPOC/EAP/REPIN 3, 13 (2009); *cf.* Jean-Philippe Barde, *Economic Instruments in Environmental Policy: Lessons from the OECD Experience and their Relevance to Developing Economies* OCDE/GE/(93)(193) 31 (Working Paper No. 92, 1994), (stating unequivocally that the PPP is not a liability principle concerned with who is responsible for pollution but only determining at what level environmental costs should be internalized.).

104. Hans Christian Bugge, *The Polluter Pays Principle: Dilemmas of Justice in National and International Contexts*, in ENVIRONMENTAL LAW AND JUSTICE IN CONTEXT 411 (Jonas Ebbesson & Phoebe Okowa eds., 2009).

105. *Id.* at 412.

efficiently distributing loss. Given industry's increasing knowledge of the social costs of industrial pollution coupled with industry's refusal to take responsibility in areas such as hazardous waste disposal (the shipping of hazardous waste such as electronic waste from North American dumps to overseas dumps in developing countries) and large natural resource extraction, the legal aspects of PPP should be deemed to trump any application of the economic components of the principle. Fairness and equity may not always result in efficient results.

In its purest legal form, PPP is a doctrine that when applied in a global context could exemplify the goals of corrective justice.¹⁰⁶ It rectifies wrongs and endeavors to make parties whole even when it requires substantial and inefficient economic sacrifices from a polluter. Applying it in its purest form, PPP provides relief for not only economic damages but also social costs and environmental costs. It can correct systemic discrimination by holding parties accountable for both the intended and unintended consequences of their actions.

In spite of the evolution of PPP into a liability concept, PPP has only been rarely applied as a remedy for distributive or corrective justice.¹⁰⁷ While the principle is widely recognized, PPP has not played a particularly robust role in legal theory given its treatment in negotiations as a relatively amorphous principle. After its debut at the OECD as a named principle, PPP has appeared in numerous international documents starting with the 1986 Single European Act, designed to unify and liberalize

106. *Id.* at 420 (describing how holding a person responsible for pollution damages regardless of fault under a PPP analysis would support "a clear principle corrective justice.").

107. *See Vellore Citizens Welfare Forum v. Union of India* (1996) Supp 5 SCR 241. In this case, an environmental citizen group sued the government to demand regulation of tanneries in Tamil Nadu who were discharging large quantities of untreated effluent into agricultural fields and public waterways resulting in 35,000 hectares of land damage and water contamination. The Court ordered the government to establish an environmental authority to deal with Tamil Nadu's polluting industries, to identify local victims of pollution, and to seek compensation which would reverse environmental damage. Polluters who refused to pay whole compensation would be shut down and compensation for victims would be recovered from the sale of polluters' assets. In shutting down non-responsive polluters, the Supreme Court of India made a decisive move to pursue the equities of remedying pollution damages over the efficiencies of economic development and cost allocation.

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European markets.¹⁰⁸ The EU nations committed themselves so that “action by the Community relating to the environment shall be based on principles that preventive action should be taken, that environmental damage should as a priority be rectified at the source, and that the polluter should pay.”¹⁰⁹ No definition was offered for what constitutes “action by the Community relating to the environment” or how to ensure that the polluter pays for environmental damage.

PPP was also included in the 1992 Rio Declaration on Environment and Development but in an equally vague fashion. The Rio representatives conceived of PPP as an emerging principle of international law and described it in the tepid language of Principle 16 where governments agreed to “endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.”¹¹⁰ The choice emasculates PPP as a legal principle providing only that “in principle” parties should “endeavor” to take certain actions.

Yet in spite of the lack of specificity of what an international application of PPP requires from the polluter and from an oversight agency, there is a prevailing theme in most of the treaties and other international environmental documents where PPP appears, that the application of this principle is grounded in equity, fairness, and accountability rather than merely in economic efficiency.¹¹¹

108. 1986 Single European Act, art.130r(2), (Feb. 17, 1986), Official Journal of the European Communities, No. L. 169/11.

109. *Id.*

110. U.N. Dep’t of Econ & Soc Affairs [DESA], Report of the United Nations Conference on Environment and Development, Annex 1, Rio Declaration on Environment and Development, August 12, 1992, A/CONF.151/26 (Vol. I) (Aug. 12, 1992).

111. *See, e.g.*, Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of The Northeast Pacific, Feb. 18 2002; Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and to the 1992 Convention on the Transboundary Effects of Industrial Accidents, May 21, 2003; Convention on civil liability for damage resulting from activities dangerous to the environment,

In order to address the social challenges inherent in climate change, insurance makes sense as a fair accountability mechanism because it contributes to an ex ante solution. Insurance has an important role in managing risk up front rather than analyzing risky behavior after the fact as in an ordinary liability context. This ex ante versus ex post approach to risk management has the potential to secure some changes in mitigating emissions in the short-term rather than waiting for long-term consequences of climate change and then apportioning of liability. In addition, insurance has the possibility of contributing to new risk management practices that may eventually decelerate the pace of climate change. Insurers can create the conditions for needed emission reductions by assigning high premiums to major emitters. High premiums may stimulate innovation or new policies in corporate energy use, methane capture, or low carbon delivery of goods and services.

Purists may argue that insurance that has policy caps can never satisfy PPP because polluters under any given claim would only cover a portion of incurred damages. If the government incurs costs, the polluter will not have paid. But nothing in the principle indicates that the polluter pays all. As far as the goals of distributive justice are concerned, mandatory insurance ensures that key polluters contribute fairly to public disaster services thereby redistributing the current financial burden on the government. As far as the goals of corrective justice are concerned, insurance ensures that polluters are held at least partially accountable for the environmental consequences of their business decisions.

CONCLUSION

Presently, the insurance industry is watching the ongoing climate change negotiations carefully in order to understand how it might impact existing property and casualty policies. This proposal comes at an important time in the U.S. given the ongoing congressional discussions regarding whether federal reinsurance should be made available to cover state catastrophe funds. Florida Democrat Ron Klein argues that 100% taxpayer

June 21, 1993; Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Mar. 17, 1992.

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funded reinsurance is necessary to ensure that states can respond to new climate change pressures.¹¹²

The proposal in this paper for mandatory third-party catastrophe risk insurance would more equitably distribute the costs of climate change between the government as the “ultimate reinsurer” and major greenhouse gas emitters who have benefited from maintaining the status quo greenhouse gas intensive economy. Unlike the current bills proposed in Congress to federally backstop state catastrophe funds, this paper’s proposal for mandatory insurance ensures a major role for the private insurance industry¹¹³ as not just a risk manager but more importantly as an unparalleled source of private governance with a financial incentive to ensure timely mitigation of existing climate catastrophe risks. The proposed insurance would benefit from early adoption by nations to bolster efforts of disaster relief agencies to prepare for the improbable but not impossible events predicted by scientists.¹¹⁴

Much has been written and said about corporate social responsibility in the past decades. Mandatory corporate insurance provides industries with the opportunity to demonstrate their social responsibility. The product requires insurance industries to follow Lloyds of London’s directive to its insurers to go out and “engage with the wider world through

112. Dipka Bhambhani, *Federal Insurance Considered for Climate Change Disasters*, CLEAN SKIES, Mar. 11, 2010, <http://www.cleanskies.com/articles/lawmakers-consider-federal-disaster-insurance-amid-threat-climate-change-disasters>.

113. American Insurance Association is currently opposing the Homeowners Defense Act designed to provide federal reinsurance for state catastrophe funds. As their spokesperson observed, “[a]lthough well-intended, H.R. 2555 will not generate new private sector insurance, reinsurance or capital market capacity. Instead, it is more likely to encourage the development of state programs that will displace the private market and require a federal government bailout in the event of a catastrophe.” *House Panel Face Environmental, Insurer Groups over Catastrophe Bill*, INS. J., Mar. 10, 2010, <http://www.insurancejournal.com/news/national/2010/03/10/108014.htm>.

114. Matthew Moore, *Copenhagen Climate Summit: Global Warming Disaster Predictions*, TELEGRAPH, Dec. 9, 2009, <http://www.telegraph.co.uk/earth/copenhagen-climate-changeconfe/6726226/Copenhagen-climate-change-summit-the-key-countries-and-what-they-want-us.html> (predicting that an increase of 2 degrees Celsius cause acidification that will devastate shellfish stocks, 20 to 30% food and water shortages in Asia, 20 to 30% loss of biodiversity, and more damaging extreme weather events).

meaningful, tangible partnerships to mitigate risk.¹¹⁵ The product requires major greenhouse gas emitters to accept accountability and ensure that greenhouse gas mitigation is a core function of their activities. Leaving aside all of the details of how best to implement the product, the concept behind insuring the public at large against catastrophic climate events is simple: those who profit the most from the greenhouse gas intensive markets will pay until they innovate.

115. Lloyds of London, *supra* note 1, at 13.