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## **Tsunamis and Earthquakes: Is Federal Disaster Insurance in Our Future?**

**April 6, 2005**

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# Tsunamis and Earthquakes: Is Federal Disaster Insurance in Our Future?

## Summary

On December 26, 2004, an earthquake measuring 9.0 on the Richter Scale struck six miles below the surface of the Indian Ocean on the northern tip of the Indonesian island of Sumatra. The 2004 earthquake spawned a massive tsunami (and extensive flooding) that smashed the coastlines of 12 countries in South Asia and East Africa, resulting in over 175,000 fatalities, an additional 106,000 missing, and significant economic and non-economic damages. Insured losses are relatively low compared to the economic and non-economic costs. Few structures or facilities in the region were insured.

Although tsunamis pose some risk to coastal communities around the world, they occur infrequently in the United States. The communities at risk are along the U.S. West Coast, Alaska, and the Pacific Region (Hawaii, American Samoa, Guam, the Republic of Palau, the Federated States of Micronesia, and the Republic of Marshall Islands). In contrast, most Americans live in areas considered “seismically active” — although the degree of earthquake risk varies greatly — and the areas with the potential for the most seismic activities are the Pacific coast, the Mississippi valley around New Madrid in Missouri, Alaska, Utah, South Carolina, and the New England region centered around Boston.

Some insurance experts have suggested that a catastrophic earthquake could be a financial calamity for the U.S. property and casualty insurers. The Northridge Earthquake in California in 1994 was the last major earthquake in the United States, producing \$15.3 billion in insured losses. The California Earthquake Authority (CEA) was created as a short-term solution to market dislocation, but today only 13% of California property owners have earthquake coverage, and the CEA is untested.

In the aftermath of the 2004 Indonesian tsunami and America’s continued vulnerability to seismic hazards, Members of the 109<sup>th</sup> Congress might focus attention on the vulnerability of the U.S. coastlines to offshore earthquakes and tsunamis, and the potential effects of a major earthquake on both the homeowners’ insurance market and the overall U.S. economy. Congress has debated the vulnerability of America’s coastline to earthquake and tsunami hazard risks, leading to legislative action following the April 1992 California earthquake/tsunami and the 1964 earthquake/tsunami at Alaska’s Prince William Sound. Although a federal flood insurance program was eventually enacted in 1968 in response to the 1964 earthquake, it took Congress another decade to address the nation’s exposure to earthquake hazards with the enactment of the Earthquake Hazard Reduction Act of 1977. Congress did not create an explicit federal earthquake insurance program. The 1992 earthquake and tsunami led to the creation of the National Tsunami Hazard Mitigation Program. Some insurance and disaster policy experts suggest the time has come to implement a federal insurance or reinsurance program for earthquakes and other seismic risks. Conversely, other experts question the need for such a program.

This report will be updated as events warrant.

## Contents

Introduction .....	1
Earthquakes, Tsunamis, and Early Warning Systems .....	4
National Tsunami Hazard Mitigation Program .....	7
NOAA's Tsunami Ready Program .....	8
The Administration's Plan for Improving Tsunami Detection and Warning Systems .....	8
Insured Losses from the 2004 Indonesian Tsunami .....	8
Insurance and Catastrophe Risk Management .....	11
Catastrophe and Non-Catastrophe Insurance Risks .....	11
The Role of Reinsurance .....	13
California Earthquake Authority .....	14
Overview of Attempts to Create a Federal Disaster Insurance Program .....	15
Policy Issues .....	18
Concluding Observations .....	19

## List of Tables

Table 1. Ten Largest-Magnitude Earthquakes of the Past Century .....	9
Table 2. Most Damaging Tsunamis Worldwide, by Mortality .....	10

# Tsunamis and Earthquakes: Is Federal Disaster Insurance in Our Future?

## Introduction

On December 26, 2004, a magnitude 9.0 earthquake struck 6 miles below the surface of the Indian Ocean on the northern tip of the Indonesian island of Sumatra.<sup>1</sup> The earthquake triggered a massive tsunami, or seismic sea waves, which caused the deaths of over 175,000 people and an additional 106,000 missing, and the destruction of homes, infrastructure and livelihoods of millions more inhabitants in 12 South Asian and East African countries.<sup>2</sup> The Indonesian earthquake/tsunami is one of the worst natural disasters in human history not only because of the number of casualties, but also because of the combination of the unprecedented geographical scope of the devastation and degree of economic loss.

The magnitude of the 2004 Indonesian tsunami in terms of deaths and economic damages has prompted government officials from around the world to call for greater international cooperation on emergency disaster relief planning and assistance, and the establishment of a tsunami early-warning system in the Indian Ocean similar to that already functioning in the Pacific Ocean. Even a relatively inexpensive tsunami detection and warning system in the Indian Ocean that warned people of an imminent tsunami hazard and the arrival time at selected coastal communities in South Asian and East African countries would have almost certainly saved tens of thousands of lives.

The United States has some exposure to earthquake and tsunami hazard risks. In testimony before the House Science Committee on January 26, 2005, the director of the U.S. Geological Survey told Congress that there is a 10%-14% probability that the U.S. (Oregon) coast will be hit within the next 50 years by a tsunami comparable

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<sup>1</sup> On March 28, 2005, a magnitude 8.5 earthquake struck near the same place as the December 26, 2004 event. It is along the North-South fault (also known as the Sunda Trench), where the Indian plate dives below the Burma plate. The 2004 earthquake pushed a section of the Burma plate ocean floor (6 to 9 miles wide and 745 miles long) 100 feet straight up. This sudden shift triggered the displacement of ocean water that caused the seismic sea waves. The 2005 aftershock caused hundreds of deaths, but it did not generate a tsunami large enough to be damaging.

<sup>2</sup> These countries are: Bangladesh, India, Indonesia, Kenya, Malaysia, Myanmar, Maldives, Seychelles, Somalia, Sri Lanka, Tanzania, and Thailand.

in size to the South Asian earthquake and tsunami.<sup>3</sup> Charles S. Groat's testimony reinforced the perception that although the United States is not as vulnerable to tsunamis as other regions of the world, West Coast states face some tsunami hazard risk. In addition, the National Oceanic Atmospheric Administration's (NOAA) national historical tsunami database for the 105-year period from 1900 to 2004 indicates that 9% of all tsunamis were generated off Alaska and the west coast of Canada and the United States and 3% were generated near Hawaii.<sup>4</sup>

In the aftermath of the 2004 Indonesian tsunami, certain questions of public policy have been raised. Examples include the potential effects of a catastrophic earthquake on the solvency of insurers and reinsurers exposed to natural hazard risks, and the possible role of the federal government in providing a financial backstop to property insurers who provide insurance against natural hazard risks.

The federal government currently plays an important role in catastrophic risk management by providing early warning, emergency assistance, and resources to help long-term recovery. Should the federal government expand its role into both the assessment of the financial risks associated with tsunamis, and the management of such risk, with federal disaster insurance? It has been suggested that a federal role in this area could be justified as necessary to: (1) ensure the adequate capacity and solvency of the insurance industry to meet the growing consumer demand for protection against natural hazard risks; and (2) minimize uninsured losses and, hence, reduce federal outlays for disaster relief and construction costs, as well as ensure stable economic growth and fiscal management.

A similar debate surrounding the creation of federal disaster insurance program occurred following the 1964 earthquake and accompanying tsunami at Alaska's Prince William Sound. A federal flood insurance program — the National Flood Insurance Program (NFIP)<sup>5</sup> — was enacted in 1968 in response to the 1964 tsunami, and Congress later addressed the nation's exposure to earthquake hazards with the creation of the National Earthquake Hazards Reduction Program (NEHRP) in 1977.<sup>6</sup>

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<sup>3</sup> Statement of Charles G. Groat, Director, U.S. Geological Survey before the House Science Committee, *Tsunamis: Is the U.S. Prepared?* hearings, 109<sup>th</sup> Cong., 1<sup>st</sup> sess., Jan. 26, 2005.

<sup>4</sup> Statement of Vice Admiral Conrad Lautenbacher, Jr, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, National Oceanic and Atmospheric Administration, before the Senate Committee on Science, Commerce and Transportation, *The Tsunamis Preparedness Act of 2005*, hearings, 109<sup>th</sup> Cong., 1<sup>st</sup> sess., Feb. 2, 2005, p. 2.

<sup>5</sup> The National Flood Insurance Program was established under the National Flood Insurance Act of 1968 (P.L. 90-448, title XIII, § 1360, Aug. 1, 1968, 82 Stat. 476, codified at 42 U.S.C. §§ 4001-4128).

<sup>6</sup> The NEHRP was established by the Earthquake Hazard Reduction Act of 1977 (P.L. 95-124; 91 Stat. 1098; October 7, 1977). The NEHRP consists of four agencies: Federal Emergency Management Agency (FEMA); National Institute of Standards and Technology (NIST); National Science Foundation (NSF); and United States Geological Survey (USGS). The goals of NEHRP are to: (1) reduce earthquake losses; (2) improve techniques to reduce seismic vulnerability of facilities and systems; (3) improve seismic hazards identification and risk-assessment methods and their use; and (4) improve the understanding of  
(continued...)

Before the creation of NEHRP, there was no coherent federal policy to encourage research on and implementation of ways to reduce earthquake losses. Congress explicitly chose not to implement a federal earthquake insurance program at that time because the justification had not been convincingly made that the earthquake hazards could not be insured by the private sector.<sup>7</sup>

Given that earthquakes and tsunamis have the potential for dramatic but relatively infrequent occurrences, and that some states have filled the gap by establishing public/private insurance partnerships for insuring the “uninsurable” catastrophe risk, is a federal disaster insurance/reinsurance program for earthquakes needed today? Congress may be asked to consider establishing a federal disaster insurance scheme, and at the same time to consider the effects on consumers of insurers having successfully limited their liability to earthquakes and other natural hazard risks — without congressional assistance. Insurers operating in disaster-prone states have taken steps to limit insurance industry liability in future disasters, while individuals and taxpayers are assuming increased risk and financial exposure through the use of narrow policy terms, higher deductibles, and state-sponsored insurance pools in Hawaii, Florida, and California. Moreover, in some states, large national property insurers have created single-state affiliates to segregate the holding company’s capital for catastrophe-related insured losses.<sup>8</sup>

Insurance companies insist that in the aftermath of a series of unprecedented insured losses since 1989 they cannot continue to provide coverage as they have done in the past. They state that to do so would expose them to the possibility of (1) insolvencies or significant loss of earnings and policyholder surplus; (2) forced asset liquidation to generate cash to pay claims; and (3) the risk of having their rating downgraded. Insurers and reinsurers maintain that regulatory constraints in hazard-prone states limit their ability to charge a premium that reflects the actual catastrophe risk exposure, and this discourages sufficient capital from flowing into disaster insurance markets.<sup>9</sup> On the other hand, some consumers complain about exorbitantly expensive earthquake insurance and scaled-back benefits, and choose to go without earthquake insurance on their homes. In California, where the earthquake hazard risk is most pronounced, only 13% of property owners have earthquake coverage.

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<sup>6</sup> (...continued)

earthquakes and their effects. For more information see [<http://www.fema.gov/hazards/earthquakes/nehpr>], visited March 30, 2005.

<sup>7</sup> See Letter of transmittal accompanying the Federal Insurance Administration report issued pursuant to Section V of the Southeast Hurricane Disaster Relief Act of 1965 from George K. Bernstein, Federal Insurance Administrator, to Honorable George W. Romney, Secretary of Housing and Urban Development, dated November 23, 1971. The letter was included as the forward to the Report.

<sup>8</sup> After the 2004 hurricane season and its unprecedented losses, the holding companies of some large national insurers transferred funds to their Florida affiliates to pay claims.

<sup>9</sup> Some economists observe that hundreds of billions of investment dollars could flow from the global capital markets into the catastrophe insurance market if investors could earn reasonable rates of return on these investments.

Members of the 109<sup>th</sup> Congress might opt to examine the affordability and availability of natural disaster insurance for homeowners, and consider proposals for improving insurers' access to capital in the reinsurance, banking, and securities markets in order to ensure adequate capacity and solvency of the industry to meet consumer needs. Some of the policy questions that might arise are: What *quid pro quo* would taxpayers get for providing a financial backstop for the insurance industry? What is the role of state insurance departments vis-à-vis federal control? Is current insurance regulation conducive to creating private sector incentives for mitigation? Who subsidizes whom? These are just some of the policy questions that the 109<sup>th</sup> Congress might be called upon to debate in considering proposals to establish a federal catastrophe reinsurance program.

## Earthquakes, Tsunamis, and Early Warning Systems

Earthquakes and other seismic hazards (e.g., tsunamis, landslides, and volcanic eruptions) are simultaneously a global phenomenon and a specific threat to the U.S. economy, its citizens, and the nation's insurance industry. Most Americans live in areas considered "seismically active," although the degree of earthquake and tsunami risk varies greatly. Each year about 5,000 quakes occur, but only a relatively small percentage cause injuries or damage to property. Over 75 million Americans reportedly live in metropolitan areas that are subject to high or moderate earthquake risk.<sup>10</sup> Potentially damaging earthquakes could occur in many parts of the United States, including the Pacific coast, the Mississippi valley around New Madrid in Missouri, Alaska, Utah, South Carolina, and the New England region centered around Boston. Moreover, earthquakes can also strike in unexpected places. In April 2002, a 5.1 magnitude earthquake struck in the Northeastern United States and part of Canada. The event was centered on the town of Plattsburg, New York. In 1737 and 1884 New York City was hit by 5.1 magnitude earthquakes.<sup>11</sup>

Tsunamis occur infrequently in the United States. The communities at risk are along the U.S. West Coast, Alaska, and the Pacific Region (Hawaii, American Samoa, Guam, the Republic of Palau, the Federated States of Micronesia, and the Republic of Marshall Islands).<sup>12</sup> According to NOAA, during the last 204 years, 24 tsunamis have caused damage in the United States.<sup>13</sup> Although tsunamis pose a particular risk to coastal communities on the Pacific coast, historical records indicate that tsunamis occasionally hit the U.S. northeastern coastal states along the Atlantic Ocean.

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<sup>10</sup> Congressional Natural Hazards Caucus Work Group, *Discussion Paper for the Congressional Natural Hazard Caucus*, available at [[http://www.agiweb.org/workgroup/discussion\\_paper0101.html](http://www.agiweb.org/workgroup/discussion_paper0101.html)], visited March 25, 2005.

<sup>11</sup> "When the Earth Moves," *Reinsurance: Global Risk Analysis*, Feb. 2005, p. 14.

<sup>12</sup> Tsunamis can also travel upstream in coastal estuaries and rivers, and cause damage further inland than the immediate coast.

<sup>13</sup> For more information on the U.S. exposure to tsunamis, see answers to questions posed to Admiral Conrad Lautenbacher, Administrator of NOAA, available at [<http://whitehouse.gov/ask/print/20050114.html>], visited March 29, 2005.

Tsunamis caused property damages in Puerto Rico in 1918 and Newfoundland, Canada in 1922. Scientists are reportedly concerned about the Cumbre Vieja volcano in Las Palmas (Canary Islands). Some geologists believe that a significant volcano eruption in this area could send a tsunami into the eastern seaboard of North and South America.<sup>14</sup>

Unlike tsunamis that can be predicted using underwater sensors, floating data buoys, and radar data from orbiting environmental satellites, earthquakes currently cannot be predicted. Scientists believe that one day earthquakes will be just as predictable as hurricanes, tornadoes, and other severe storms.<sup>15</sup> Research to find ways to predict earthquakes is currently being conducted by the U.S. Geological Survey (USGS) and other federal and state agencies, as well as universities and private institutions. Some experts, particularly those at the National Earthquake Information Center, believe that scientists will ultimately be able to forecast earthquakes. In May 2004, a joint team of scientists from Stanford University and the USGS began drilling a 2.4-mile-deep hole in the San Andreas fault in California to establish the first continuously maintained probe from inside an active earthquake zone. The study is designed to determine whether and how earthquakes can be predicted.

In 1946, a major earthquake and accompanying tsunami at Alaska's Aleutian Island Chain led to a tsunami that caused damage along the west coast of the United States, Hawaii, and Japan. In response, the United States and Japan established the Pacific Tsunami Warning Center (PTWC). The PTWC is the operational center for the International Tsunami Warning System in the Pacific (ITWSP), which comprises 26 member states around the Pacific.<sup>16</sup>

The ITWSP issues warning for Pacific Basin tsunamis. Most countries with a coastline on the Indian Ocean (except Thailand and Singapore) are not members of the ITWSP. This absence of a tsunami detection and warning system, the fact that tsunamis have been infrequent in the Indian Ocean, and that most people were unaware of the approaching waves, underlie the devastating impact of the 2004 Indonesian tsunami. While it took between 90 and 150 minutes after the earthquake for the seismic sea waves to reach the South Asian and East African coastlines, there was no established mechanism to pass warnings to the countries around the Indian Ocean's shores. Among the reasons cited by delegates to the U.N. World Conference

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<sup>14</sup> Morgan O'Rourke, "Danger on the Coast: Coastal Catastrophe Risk," *Risk Management Magazine*, March 2005, p. 32.

<sup>15</sup> Center for Earthquake Research and Information, The University of Memphis, "100% Chance of an Earthquake Today," available at [<http://www.ceri.memphis.edu/public/eqtoday.shtml>], visited March 25, 2005.

<sup>16</sup> The 26 Tsunami Warning System (TWS) participating member states are Australia, Canada, Chile, China, Columbia, Cook Islands, Costa Rica, Democratic People's Republic of Korea, Ecuador, El Salvador, Fiji, France, Guatemala, Indonesia, Japan, Mexico, New Zealand, Nicaragua, Peru, Republic of the Philippines, Republic of Korea, Russian Federation, Samoa, Singapore, Thailand, and the United States. For more information see [<http://www.geophys.washington.edu/tsunami/general/warning/warning.html>], visited Jan. 6, 2005.

on Disaster Reduction (WCDR) held in Kobe, Japan from January 18 through January 22, 2005, for the absence of a tsunami warning and mitigation system from the Indian Ocean Basin region include the complacency that results from the infrequent occurrence of tsunamis in the Indian Ocean; reluctance, for political reasons, among the countries in the region to cooperate; and the cost of coordinating emergency response agencies and maintaining a national communication network to spread the word to coastal communities.

Plans are currently underway within the jurisdiction of U.N. Educational, Scientific and Cultural Organization's Intergovernmental Oceanographic Commission (UNESCO/IOC) to expand the Pacific Ocean's tsunami detection and warning system to the rest of the world's oceans. Delegates to the WCDR agreed to establish within one year a regional Indian Ocean tsunami early warning system that draws on the existing system in the Pacific Ocean. Proposals for a new tsunami early warning system that features technologies yet to be developed will be considered at a later time later when more permanent measures can be taken.<sup>17</sup> On March 5, 2005, UNESCO convened a technical meeting of experts in Paris to build on the work of the WCDR regarding the establishment of a Tsunami Warning and Mitigation System for the Indian Ocean within a global tsunami warning and mitigation system framework.<sup>18</sup> The purpose of the meeting was to bring together experts representing interested member states and relevant regional and international organizations to begin the process of harmonizing and defining the scope and characteristics of early warning initiatives already offered by the United States, Japan, India, France, Germany and Australia following the 2004 tsunami.

The U.S. Government, in coordination with UNESCO, has been actively promoting the creation of an all-hazard<sup>19</sup> global warning system that would provide a comprehensive, integrated international framework for monitoring, detecting, warning of, communicating, and mitigating the effects of natural disasters. Following the World Summit on Sustainable Development in Johannesburg, South Africa in 2002, an ad hoc intergovernmental group, called the Group on Earth Observation, committed itself to build within 10 years the Global Earth Observation System of Systems (GEOSS). The group is led by the United States, Japan, South Africa and the European Commission, with 54 nations participating at the ministerial level. The GEOSS would link observation systems, share information, and establish working relationships with partner countries around the world with the aim of reducing the loss of life and property due to disasters. In July 2003, the United States launched the GEOSS process with the first Earth Observation Summit in Washington, DC, which was followed by the Tokyo Summit in 2004 and the Brussels Summit in February 2005. At the Brussels Summit, the 54 nations adopted the

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<sup>17</sup> Eric Johnson, "U.S. Eyes Lead Role in Tsunami Alert System," *Japan Times*, Jan. 21, 2005, p. 1.

<sup>18</sup> For more information on the followup activities to establish a tsunami warning and mitigation system in the Indian Ocean and other ocean basins, see "International Coordination Group for the Tsunami Warning System in the Pacific," available at [<http://ioc.unesco.org/itsu>], visited March 29, 2005.

<sup>19</sup> The term "all-hazard" includes drought, earthquake, wildfire, flood, typhoon, hurricane, landslide, volcanic eruption, and tsunami.

GEOSS implementation plan for the new global tsunami detection and warning system.

Delegates to the WCDR noted that the major challenge to working internationally to build a global warning system will be bringing together numerous Earth Observation (EO) sources and data sets and creating a network for distribution of data and information products and services that different nations can access quickly and uniformly. This new system will presumably integrate technology from space satellites and observation posts covering oceans, earth, atmosphere and ecosystems. UNESCO announced plans at the WCDR to convene a conference in Bonn, Germany in early 2006 to assess and prioritize the different early warning systems, including the technological, financial, and social issues involved.

The insurance and financial industries have expressed support for a global all-hazards warning system that could predict the behavior of the earth: its weather, climate, oceans, atmosphere, water, land, natural resources, ecosystems, and natural and human-induced hazards. This system would allow them to: (1) use global atmospheric and environmental information to reduce loss of life and property from disasters; (2) enhance the industry's existing catastrophe risk assessment and management capabilities; and (3) support the growing global market for catastrophe risk management. Insurers and reinsurers will likely leverage the new GEOSS capability to make decisions regarding insurance pricing, underwriting, risk transfer, loss mitigation, portfolio optimization, and growth strategies.

## **National Tsunami Hazard Mitigation Program**

Delegates to the WCDR generally agreed that technology is only one part of any tsunami detection and warning system; there must be an associated development of mitigation and preparedness strategies for which governments in the region must assume primary responsibility. For this reason the U.S. Geological Survey, along with NOAA, FEMA and the coastal communities in Alaska, California, Hawaii, Oregon, and Washington, maintain the National Tsunami Hazard Mitigation Program (NTHMP) to address tsunami hazard assessment, warning, and mitigation. The NTHMP hosts the Center for Tsunami Inundation Mapping Effort (TIME), which develops maps of potential tsunami flooding. In addition, each participating state has a tsunami mitigation resource center that provides tsunami education material to the public.

The NTHMP was created following the April 1992 California earthquake/tsunami, when Congress passed legislation to instruct NOAA to work with the Pacific states to design a program to mitigate tsunami risks. The program called for the installation of new technology to detect offshore earthquakes and tsunamis, increased efforts in the area of public education and, as indicated above, the creation of TIME. The NTHMP's Center produces maps of future flooding that are used for delineation of evacuation routes and long-term planning in vulnerable coastal communities.

## NOAA's Tsunami Ready Program

Coastal communities in the United States that face tsunami hazard risks can also participate in the NOAA Tsunami Ready Program, which promotes tsunami hazard education and preparedness. The Program is a collaboration among federal, state, and local emergency management agencies, the public, and the National Weather Service (NWS) to support tsunami awareness and mitigation efforts among communities at risk. Currently, there are 15 Tsunami Ready communities in Hawaii, Alaska, Washington, Oregon, and California.<sup>20</sup> The program, whose goal is to improve public safety during tsunami emergencies, requires communities to establish an emergency operation center, a tsunami hazard plan, a community awareness program, and the ability to both receive and disseminate NWS tsunami warnings (e.g., sirens and local media).

## The Administration's Plan for Improving Tsunami Detection and Warning Systems

On January 14, 2005, the Bush Administration announced plans to commit a total of \$37.5 million to upgrade and expand the U.S. tsunami detection and warning capability as part of GEOS<sup>21</sup>S. The plan calls for: (1) NOAA to deploy 32 new advanced technology Deep-Ocean Assessment Reporting of Tsunami (DART) buoys — 25 in the Pacific and 7 in the Atlantic and Caribbean — for a fully operational tsunami warning system by mid-2007; (2) installing 38 new sea-level monitoring/tide gauge stations; (3) ensuring continuous staffing of the two existing Tsunami Warning Centers; (4) upgrading the Global Seismic Network (GSN), a partnership between USGS and the National Science Foundation, with 128 globally distributed modern seismic sensors to monitor seismic events in tsunami-prone areas; and (5) expand the Tsunami Ready Program to improve community preparedness.

## Insured Losses from the 2004 Indonesian Tsunami

As **Table 1** shows, the Indonesian tsunami of 2004 is the result of the fourth-largest earthquake to strike the earth since 1900 and the strongest since the 1964 Prince William Sound, Alaska, earthquake. While the final figures of the 2004 tsunami are still not available, recent estimates of insured losses for the 2004 event have been placed in the range of \$10-14 billion.<sup>22</sup> This figure does not include the cost of disaster relief and rehabilitation, which will likely run into the tens of billions

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<sup>20</sup> For more information, see [<http://www.magazine.noaa.gov/stories/mag158.htm>], visited March 4, 2005.

<sup>21</sup> For more information on the Administration's tsunami improvement plan, see "U.S. Announces Plan for an Improved Tsunami Detection and Warning System," Office of Science and Technology Policy, Executive Office of the President, available at [<http://ostp.gov/html/tsunamiFactSheet.pdf>], visited March 28, 2005.

<sup>22</sup> Michael Ha and Mark Ruquet, "Insured Tsunami Loss Could Reach \$10 Billion," *National Underwriter: Property & Casualty*, Jan. 10, 2005, p. 6.

of dollars.<sup>23</sup> The Insurance Information Institute in New York reported that the U.S. share of insured losses is not expected to be significant.<sup>24</sup> The expected ratio of insured to the overall economic losses can be estimated on the order of 5-7%, which is consistent with prior economic loss data in disaster-stricken developing countries, where insured losses from natural disasters rarely exceed 3-5% of the total economic loss. Most of the insured losses from the tsunamis would result from damage to the tourism industry, including vacation resort properties, personal accident and travel insurance, as well as claims associated with damage to infrastructure (airports and utilities), port facilities, and marine-related insurance (ships, cargo, oil platforms, offshore facilities).<sup>25</sup>

**Table 1. Ten Largest-Magnitude Earthquakes of the Past Century**

Date	Country or Place	Magnitude
May 22, 1960	Chile	9.5
March 27, 1964	Alaska	9.2
November 4, 1952	Russia	9.0
December 26, 2004	Indonesia	9.0
January 31, 1906	Ecuador	8.8
March 9, 1957	Alaska	8.8
November 6, 1958	Kuril Islands	8.7
February 4, 1965	Alaska	8.7
August 15, 1950	India	8.6
November 11, 1922	Argentina	8.5
February 1, 1938	Indonesia	8.5

**Source:** National Earthquake Information Center, United States Geographic Survey, [<http://wcatwc.gov/tsunamiready/stats.pdf>], visited Dec. 30, 2004.

The reason for the low insurance losses is that the affected countries are relatively poor, which means that individuals and businesses are less likely to have insurance. The insurance penetration in the Asian countries affected by the disaster

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<sup>23</sup> For more information, see CRS Report RL32715, *Indian Ocean Earthquake and Tsunami: Humanitarian Assistance and Relief Operations*, by Rhoda Margesson.

<sup>24</sup> Robert P. Hartwig, *Asian Earthquake and Tsunami: An Insurance Perspective*, (Insurance Information Institute: December 30, 2004), available at [<http://www.iii.org/media/hottopics/additional/asianeearthquake>], visited Jan. 3, 2005.

<sup>25</sup> Charles Fleming, "Insurers May Face Limited Exposure from Tsunami," *Wall Street Journal*, Dec. 28, 2004, p. A8.

ranges from less than \$1 per capita for Bangladesh to \$87 for Malaysia.<sup>26</sup> This level compares to \$1,980 per capita spending on non-life insurance in the United States in 2003.<sup>27</sup>

**Table 2** provides an historical snapshot of the most damaging tsunamis worldwide in terms of deaths.

**Table 2. Most Damaging Tsunamis Worldwide, by Mortality**

Year	Deaths	Location
2004	175,000	South Asia, East Africa
1782	40,000	South China Sea
1883	36,500	South Java Sea
1707	30,000	Tokaido-Nankaido, Japan
1896	26,360	Sanriku, Japan
1868	25,674	North Chile
1792	15,030	South West Kyushu Island, Japan
1771	13,486	Ryuku Trench
1976	8,000	Moro Gulf, Philippines
1703	5,233	Tokaido-Kashima, Japan
1605	5,000	Nankaido, Japan
1611	5,000	Sanrika, Japan
1746	3,800	Lima, Peru
1899	3,620	Banda Sea, Indonesia
1692	3,000	Jamaica
1854	3,000	Nankaido, Japan
1933	3,000	Sanriku, Japan
1674	2,243	Danda Sea, Indonesia
1998	2,182	Papua New Guinea
1923	2,144	Tokaido, Japan
1570	2,000	Chile
1946	1,997	Nankaido, Japan
1766	1,700	Sanriku, Japan
2005	1,000	Sumatra, Indonesia
1964	119	Alaska, United States

**Source:** National Geophysical Data Center, National Oceanic Administration Agency, [<http://wcatwc.gov/tsunamiready/stats.pdf>], visited Dec. 30, 2004.

<sup>26</sup> Robert P. Hartwig, *Asian Earthquake and Tsunami: An Insurance Perspective* (Insurance Information Institute: December 30, 2004), available at [<http://www.iii.org/media/hottopics/additional/asianearthquake>], visited Jan. 3, 2005.

<sup>27</sup> *Ibid.*

## Insurance and Catastrophe Risk Management

The Indonesian tsunami of 2004 is a reminder of the role of insurance, and what happens when little of the total direct damage is covered by insurance. The funds to rebuild in Asia and Africa after the recent tsunami will likely come from foreign donors.<sup>28</sup> Insurance has long played a major role in developed societies as a risk reduction and risk spreading tool that enables activities to take place that might not otherwise occur if an individual or business was forced to individually bear the risks associated with the activity.<sup>29</sup> Insurance is thus an important and indispensable source of funds for compensating disaster victims. It provides financial protection to those living in disaster-prone areas, furnishes victims with rebuilding assistance and emergency living expenses, and reduces income losses in the event of a disaster. Some economists assert that natural disasters can, in some instances, promote an economic stimulus because of the efficient funding and mitigation mechanism in place, and the opportunity to replace aged infrastructure and facilities.<sup>30</sup>

### Catastrophe and Non-Catastrophe Insurance Risks

There are distinct differences between catastrophic versus non-catastrophic insurance risk and these differences are important as Congress considers what role, if any, to pursue in covering the cost of catastrophes. Insurance coverage for non-catastrophe losses is offered in the private market when insurers and reinsurers are confident that they can predict the frequency of claims over time and set prices at a level that allows them to cover expected losses and expenses that achieve an adequate rate of return on capital commensurate with the risk they assume. Actuarial analysis of non-catastrophe losses require sufficient recent (5-10 years) historical claims and exposure data to calculate the expected average incurred loss per future exposure. Insurers will then develop rate structures (and underwriting guidelines) that spread their risks broadly among policyholders in order to offer a price low enough to attract many potential insurers into the market. Claims are paid from funds generated through normal operation cash flow, asset liquidation, debt financing or advance funding from reinsurance. In contrast to non-catastrophic losses, catastrophe exposures such as earthquakes and hurricanes are infrequent and, when the disaster strikes, there are losses to many potential insureds.

From an historical perspective, there have always been two fundamental earthquake insurance problems: (1) the limited number of people who purchase earthquake insurance; and (2) the limited capacity of the insurance industry to handle

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<sup>28</sup> For more information on the humanitarian aspects of tsunami recovery, see CRS Report RL32715, *Indian Ocean Earthquake and Tsunami: Humanitarian Assistance and Relief Operation*, by Rhoda Margesson.

<sup>29</sup> Economists note that insurance could also have the opposite effect of causing losses and increasing the cost of losses for the economy as a whole. That is, the insurance may make people more willing to build or operate in high-risk, flood-prone areas (moral hazard).

<sup>30</sup> Eugene N. Gurenko, "Building Effective Catastrophe Insurance Programs at the Country Level: A Risk Management Perspective," in *Catastrophe Risk and Reinsurance: A Country Risk Management Perspective* (London: Risk Books, 2004), p.15.

the huge losses caused by earthquakes. That capacity is limited because of the potential magnitude of losses, the sporadic and unpredictable nature of earthquakes, and the existing regulatory system that discourages insurers from building reserves for catastrophes by taxing such reserves as profits.<sup>31</sup>

Most economists and regulators would agree that far too few property owners in earthquake zones purchase earthquake insurance. These owners rely instead on good fortune or federal emergency disaster relief assistance.<sup>32</sup> Homeowners typically decide not to purchase insurance or adopt loss-mitigation measures to reduce deaths, injuries, and property damage. Homeowners may decide that disasters will not affect them, utilize short time horizons in determining the expected benefits relative to the up-front costs (rates and deductibles), or compare costs with potential benefits and conclude that loss reduction measures are not good investments.<sup>33</sup>

The second problem with insuring against catastrophes is that the potential magnitude of natural disasters relative to insurer's surplus can be so large and indeterminate that the insurance markets are unable to provide sufficient capacity at acceptable prices. A review of the U.S. insurance industry reveals that its capacity to handle large catastrophic losses may be substantially less than aggregate figures suggests.<sup>34</sup> A repeat of the 1906 San Francisco earthquake or the 1964 Alaska earthquake in a heavily populated area, for example, could cost insurers up to \$500 billion in damages. The "policyholders' surplus" of the entire property and casualty insurance industry stood at about \$370 billion at the end of 2004.<sup>35</sup> Only a fraction of this industry-wide total surplus amount would be available to compensate victims of a major earthquake. Insurers must rely on this same limited pool of capital to pay for other potentially catastrophic and unpredictable risks, such as terrorism, mold, and medical malpractice and asbestos liability claims. Insurers may have to liquidate

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<sup>31</sup> The Financial Accounting Standards Board's (FASB) *Statement of Financial Accounting Standard No 5: Accounting For Contingencies*, prohibits companies from accruing catastrophic reserves unless it was probable that the loss had already occurred. Under the current federal tax provision, premiums collected by insurers that are put in a reserve fund for catastrophes are treated like excess profits and hence taxed. The IRS tax codes currently permit a "loss carry-back" of three years and a "loss carry-forward" of seven years so that insurers can write off losses against taxes paid from three years back and seven years in the future. For more information on the FASB *Statement of Financial Accounting Standard No. 5*, see [<http://www.fasb.org/pdf/fas5.pdf>], visited on March 29, 2005.

<sup>32</sup> Paul R. Kleindorfer and Howard C. Kunreuther, "Challenges Facing the Insurance Industry in Managing Catastrophic Risks," in *The Financing of Catastrophe Risk*, ed. Kenneth A. Froot (Chicago: University of Chicago Press, 1999), p. 149.

<sup>33</sup> *Ibid.*, p. 152.

<sup>34</sup> Property insurance policies that cover households and businesses do not cover damage resulting from earthquakes, land shock waves, or tremors and loss from tidal wave caused by an earthquake (i.e., tsunami). Coverage for earthquake damage is usually provided by an endorsement to a homeowners and business insurance policy.

<sup>35</sup> "Policyholders' surplus" is insurance terminology designating what in other industries is termed companies' "net worth" or "owners' equity." It is a measure of the capacity of insurers to underwrite policies, and it must increase to meet the demands of a growing U.S. economy and claims from hurricanes and other natural hazards.

bonds and other financial assets in order to pay claims, triggering an adverse impact on U.S. financial markets.<sup>36</sup> Alternatively, individual states, notably California and Florida, have put in place an insurance pooling mechanism to address the small- to moderate-sized earthquakes and hurricanes, respectively.

## The Role of Reinsurance

The insurance industry could not function without access to traditional reinsurance. Reinsurance is purchased by insurers to hedge their own insurance portfolios. Almost all insurers purchase reinsurance. A reinsurer assumes part of the risk and part of the premiums originally taken by the insurer, known as the primary insurer. Reinsurance is sold in layers. Reinsurers have their own reinsurers, called retrocessionaries.

Under a typical reinsurance transaction, a primary insurer transfers a layer of the risks (and some of the premiums) to a reinsurer who, in turn, accepts a layer of risk and passes the remaining risk to a retrocessionary. As an illustration, under a 300/100 “excess-of-loss” facultative reinsurance agreement<sup>37</sup> between the primary insurer and a reinsurer, if losses from a specific earthquake exceeds \$300 million, the reinsurer will cover the next \$100 million in losses. An earthquake that costs less than \$300 million is paid entirely by the primary insurer. The reinsurer might choose to transfer to a retrocessionary a portion or layer of the \$100 million. In return for assuming risk, the reinsurer (or retrocessionary) receives a reinsurance premium and agrees to indemnify the insurer (or reinsurer) for claims falling within the terms of the reinsurance agreement.

After the Northridge California earthquake of 1994, large national insurers encountered difficulty in obtaining layers of reinsurance coverage at prices that they considered affordable. As a result, insurers were forced to find new sources to assume catastrophe risk, and they found it in the U.S. equity and debt markets that offered insurers liquidity to expand their capacity to sell catastrophe insurance. Investors, on the other hand, are attracted to securities that transfer catastrophe risk to the capital markets — the so-called “insurance-linked securities” (ILS). They are drawn to ILS because of the level of return depends solely on occurrence of a catastrophe that triggers payment and is insensitive to economic factors like interest rates and credit default that give rise to systemic risk in other types of fixed income investments. Some of the existing barriers to the expanded use of ILS are that they tend to be more expensive than traditional reinsurance. Partly that is because the risk

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<sup>36</sup> Ross J. Davidson Jr., “Working Toward a Comprehensive National Strategy for Funding Catastrophe Exposures,” *Journal of Insurance Regulation*, vol. 7, no. 2 (winter 1998), p. 134.

<sup>37</sup> The two most common types of reinsurance arrangements are treaty reinsurance and facultative reinsurance. Under treaty reinsurance, the reinsurer agrees to assume a certain percentage, up to preset limits, of all risks falling into the categories agreed in advance between the two parties. By contrast, a facultative reinsurer agreement is used for very large risks that treaties cannot absorb, and unique risks for which it is difficult to establish a reinsurance treaty. Under the facultative reinsurance agreement, the reinsurer is free to decline to cover a particular risk.

premium investors demand for assuming unfamiliar types of risk is expensive to structure. Also, they require the creation of offshore special purpose companies. Although the number of ILS transactions are still relatively small, the markets for these financial instruments are expected to grow in the future.

## California Earthquake Authority

Since 1985, residential property insurers in California have been required to offer earthquake insurance coverage to all residential policyholders.<sup>38</sup> This requirement was not a problem for insurers until the Northridge earthquake of 1994, which caused \$15.3 billion in insured losses, according to the Institute for Business and Home Safety (IBHS). After the Northridge earthquake, most insurers either stopped selling new homeowners insurance policies in the state or greatly restricted the sales of such policies. As a result of this lack of available homeowners insurance, the California state legislature in 1996 created a privately financed, publicly managed organization — the California Earthquake Authority (CEA) — to offer primary coverage on shake loss, a structural loss arising from a seismic event. The CEA does not, however, cover losses arising from a subsequent fire, explosion, or water damage (so called non-shake damage). Those perils are covered by a standard homeowners or commercial property policy.

The CEA began providing residential earthquake insurance in December 1996 with a \$10.5 billion funding package. The CEA had about 730,000 policies in force at the end of 2003. In terms of funding, the CEA is structured in layers with a total claims-paying capacity of \$7.2 billion. The funding structure is as follows: the first \$475 million in claims payments would come from the working capital of the participant insurers. These insurers would also be responsible for the next \$2.15 billion in losses, which would be collected as assessments. The higher layers are provided by reinsurance payments (\$2.5 billion). CEA authorized borrowing (\$700 million), which is repaid through policyholder assessments totaling up to 20% of the earthquake premium and post-event assessments on participating insurers.

The number of California residential property owners covered by a CEA earthquake insurance policy has plummeted in recent years. According to the California Department of Insurance, between 1999 and 2003, there was a 51% decline in the number of earthquake policies in the state.<sup>39</sup> In 2004, only 13.3% of California homes had residential earthquake insurance coverage.<sup>40</sup> Some of the reasons cited for the decline are the high cost of supplemental coverages, high deductibles (10-15%), policy limitations, and consumer apathy.<sup>41</sup> California Insurance Commissioner John Garamendi, who stated that the cost of rebuilding after

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<sup>38</sup> California Assembly Bill 2865, the Earthquake Insurance Act (codified at Cal. Ins. Code § 10081 *et seq.*), went into effect on January 1, 1985

<sup>39</sup> California Department of Insurance, *News Release: State Insurance Commissioner John Garamendi Proposes Creation of National Disaster Insurance Program*, October 6, 2004.

<sup>40</sup> Jeff Bertolucci, "Earthquake Policies Dwindle in California," *Los Angeles Times*, November 28, 2004, p. K8.

<sup>41</sup> *Ibid.*

natural disasters is making insurance more costly and less available for many Californians, has proposed the creation of a national natural disaster insurance program.

## Overview of Attempts to Create a Federal Disaster Insurance Program

At various times during the 1990s, concerns were expressed by insurers, reinsurers, policymakers, and researchers about the potential vulnerability of insurance/reinsurance to a catastrophic earthquake, and what role, if any, the federal government should play in financing natural hazard risks. Members of Congress were grappling with such issues as how can the framework of funding sources available for catastrophe insurance be expanded to ensure adequate capacity and solvency of the industry? In response to similar policy concerns following the Indonesian tsunami, and America's continued vulnerability to seismic hazard risks, the 109<sup>th</sup> Congress might be asked to consider legislative proposals to address the availability and affordability of natural disaster insurance for residential and commercial property.

Historically, efforts in both the Executive and Legislative branches of the federal government to create a comprehensive system of federal disaster insurance actually go back 40 years to 1965, when Congress enacted the Southeast Hurricane Disaster Relief Act.<sup>42</sup> In response to Hurricane Betsy in 1965 and the earthquake and tsunami at Alaska's Prince William Sound a year earlier, Section 5 of that act directed the Secretary of Housing and Urban Development to

undertake an immediate study of alternative programs which could be established to help provide financial assistance to those suffering property losses in flood and other natural disasters, including alternative methods of Federal disaster insurance, as well as the existing flood insurance program, and shall report his findings and recommendations to the President for submission to the Congress not later than nine months after the appropriation of funds for this study, except that the findings and recommendations on earthquake insurance shall be reported to the President for submission to the Congress not later than three years after the appropriation of funds for this study.<sup>43</sup>

A federal flood insurance program was enacted in 1968. Another decade ensued before enactment of the omnibus Earthquake Hazards Reduction Act of 1977.<sup>44</sup> The 1977 law signaled a new federal focus on seismic hazard risks.<sup>45</sup> Prompted in part by the 1975-76 predictions of earthquakes in China and California, and the realization that 70 million Americans had settled in high-risk earthquake regions on

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<sup>42</sup> P.L. 89-339; 79 Stat. 1301, Nov. 8, 1965.

<sup>43</sup> *Ibid.*

<sup>44</sup> P.L. 95-124; 91 Stat. 1098, codified at 42 U.S.C. § 7701 *et seq.*

<sup>45</sup> On October 25, 2004, President Bush signed into law the National Earthquake Hazard Reduction Program (NEHRP) Reauthorization Act of 2004 (P.L. 108-360).

both coasts, there was a doubling of federal spending on earthquake preparedness and research into both the physical processes triggering earthquakes and the social and scientific aspects of risk communication and hazard mitigation adoption.<sup>46</sup>

The Federal Insurance Administration (FIA) report issued pursuant to Section 5 of the Southeast Hurricane Disaster Relief Act of 1965, concluded that

earthquake insurance is readily available on one-to-four-family residential dwellings throughout the United States, that earthquake insurance premiums are neither excessive nor unreasonable, that the availability of earthquake insurance on commercial and industrial properties is limited on the basis of the enormous exposure in these areas, that the present deficient state of knowledge and data concerning earthquake occurrences, and the inadequacy or absence of land use and control measures designed to reduce earthquake losses, precludes a program of greater breadth than that offered at present by the private insurance industry. Therefore, we find that direct involvement of the Federal Government in earthquake insurance was unnecessary as to residential properties and infeasible or undesirable as to commercial and industrial properties.<sup>47</sup>

In essence, the FIA recommended that the federal government not implement a national residential earthquake insurance program for three reasons: (1) there was adequate private earthquake insurance to meet public demand; (2) local communities facing the earthquake hazard had not taken the necessary steps to adopt and enforce land use restrictions and building code measures designed to reduce potential earthquake losses; and, (3) earthquake rate maps were inadequate for calculating sound actuarial rates on properties located in hazard-prone areas.<sup>48</sup>

Although the 1971 FIA study took the position that damages caused by a catastrophic earthquake did not require a federal insurance solution, the agency suggested that federal earthquake insurance protection could be provided under certain conditions. The *de facto* conditions for federal participation in a national earthquake insurance program included the demonstrated proof that (1) adequate insurance could not be provided by the insurance industry; (2) the insurance industry's financial resources could not handle the financial consequences of a major disaster; and (3) local communities had adopted and enforced loss reduction measures.

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<sup>46</sup> "Disaster Response: Does the Country Need a New National Strategy?" *CQ Researcher*, vol. 2, no. 38 (October 15, 1993), p. 901.

<sup>47</sup> See Letter of transmittal accompanying the Federal Insurance Administration report issued pursuant to Section V of the Southeast Hurricane Disaster Relief Act of 1965 from George K. Bernstein, Federal Insurance Administrator, to Honorable George W. Romney, Secretary of Housing and Urban Development, dated November 23, 1971. The letter was included as the foreword to the Report.

<sup>48</sup> Department of Housing and Urban Development, Federal Insurance Administration. *Report on Earthquake Insurance to the Congress of the United States Pursuant to Section Five of the Southeast Hurricane Disaster Relief Act of 1965 (P.L. 89-339)*, November 23, 1971.

The Earthquake Hazard Reduction Act of 1977<sup>49</sup> established a multi-agency program designed to develop and disseminate knowledge for reducing the impacts of earthquakes. The act also directed the President to study the appropriate role of compensating the victims of earthquakes and promoting increased mitigation efforts on the part of states and localities, individuals, and private organizations. It did not provide for the establishment of an explicit national earthquake insurance program. The John H. Wiggins Company performed the FIA study required under the terms of the Earthquake Hazard Reduction Act of 1977. The four reports produced for the FIA highlighted the lack of consensus among geologists, seismologists, and insurance experts as to the existence of an earthquake insurance problem and the potential role, if any, for the federal government.<sup>50</sup> Uncertainty and lack of consensus among these experts about a federal role in disaster insurance continued into the 108<sup>th</sup> Congress.

Since the 1980s, Congress has considered several legislative measures to establish a federal catastrophe insurance/reinsurance program, but none has been enacted except with respect to acts of terrorism (a man-made disaster). The 107<sup>th</sup> Congress approved creation of a federal backstop for private-sector terrorism insurance coverage in response to the events of September 11, 2001.<sup>51</sup> The closest Congress came to passage of a federal natural disaster insurance bill was during the 106<sup>th</sup> Congress, when Members debated two major initiatives: H.R. 2749, the Policyholder Disaster Protection Act, and H.R. 21, the Homeowners Insurance Availability Act. (The Senate versions of these bills were, respectively, S. 1917 for and S. 1361.) H.R. 2749 focused on tax policy, allowing insurers to create tax-deferred reserves to fund future catastrophe losses from natural disasters. H.R. 21 would have established a new federal Disaster Reinsurance Fund to provide up to \$25 billion in reinsurance coverage annually to state insurance pools. On November 10, 1999, the House Banking Committee reported the bill on a vote of 34 to 18. Although a vote in the full House was scheduled, the House leadership did not bring the bill to the floor. There was no similar action in the Senate. A similar bill was considered in the 107<sup>th</sup> Congress and hearings were held, but no action was taken in the full House.

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<sup>49</sup> P.L. 95-124.

<sup>50</sup> These four reports are as follows: Dan Anderson, William J. Petak, and Carl E. Widell, *Earthquake Insurance Practices*. Report Prepared for the Federal Insurance Administration (Redondo Beach, CA: J. H. Wiggins Company, 1981); Arthur A. Atkisson and William J. Petak, *Earthquake Insurance: A Public Policy Analysis*. Report Prepared for the Federal Insurance Administration (Redondo Beach, CA: J. H. Wiggins Company, 1981); Jarrell C. Yarbrough, Jean Fuller and Arthur A. Atkisson, *Federal Disaster Assistance and Earthquake Insurance: Problems and Proposals*. Report Prepared for the Federal Insurance Administration (Redondo Beach, CA: J. H. Wiggins Company, 1981); and Arthur A. Atkisson, William J. Petak, and Dan R. Anderson, *Earthquake Insurance Issues Workshop*. Report Prepared for the Federal Insurance Administration (Redondo Beach, CA: J. H. Wiggins Company, 1980).

<sup>51</sup> For more information on the Terrorism Risk Insurance Act of 2002, see CRS Report RS21979, *The Terrorism Risk Insurance Act of 2002: A Summary of Provisions*, by Baird Webel.

The 108<sup>th</sup> Congress considered several major federal disaster insurance bills, but the one approach that received the most attention involved changing federal tax policy to authorize tax-deferred treatment of private insurers' catastrophe reserves. Allowing private insurers to build up catastrophe reserves to pay natural disaster-related claims that have a low probability of occurrence, it is argued, would lower insurers' costs of holding capital and, in turn, lower the premiums they must charge for a given level of disaster coverage. On the other side of the argument is the U.S. Treasury's loss of tax revenue from the insurance industry. Would the lost tax revenue be an acceptable price to pay to achieve the public goal of reducing overall disaster losses? How would someone measure success?

In the 109<sup>th</sup> Congress, Representative Ginny Brown-Waite introduced the Homeowners' Insurance Availability Act of 2005, H.R. 846. This bill is identical to one originally sponsored in 1999 by Representatives Rick Lazio and Bill McCollum.

Prior to Hurricane Hugo in 1989, the insurance industry had not experienced any losses exceeding \$1 billion from a single disaster. Today, a \$1 billion disaster is quite common, predictable, and manageable, but most insurance experts would agree that the \$50-\$100 billion catastrophic event remains a challenge for the U.S. property and casualty insurance industry. The science of estimating probable maximum loss values and capacity limits has come a long way since the 1980s. Insurers now have a much better understanding of solvency and insurability of events and seismic risks. Sophisticated computer modeling techniques are now used to make probabilistic statements about potential losses for any given geographic location under various scenarios and to estimate rates .

## Policy Issues

Congress has been reluctant to enact federal disaster insurance legislation because of a lack of consensus on what will work and concerns about adequate provisions for mitigation and avoidance of unnecessary government intrusion into markets being served by private sector entities. Congressional reluctance to establish a federal natural hazard insurance program has also been based on the recognition that such a program would conflict with sociological, economic, and actuarial principles that emphasize the "true" cost of government programs (the opportunity cost of the funds), the forgone benefits of a competitive insurance marketplace (e.g., cost efficiency and rate competition) and the absence of consumer choice (the ability to decide whether to purchase coverage).<sup>52</sup>

The federal government has historically played an important role in the economy by assuming risks that the private sector either will not undertake at any price, or will accept but at a price so high that most potential beneficiaries will not purchase the coverage. For example, government risk-bearing now occurs in environmental disaster, nuclear-plant accidents, toxic waste dumps, and flooding. Establishing an explicit federal disaster insurance system to ameliorate the potential damages to

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<sup>52</sup> Kleindorfer and Kunreuther, "Challenges Facing the Insurance Industry in Managing Catastrophic Risks," p. 93.

homes and commercial buildings stemming from natural disasters would represent another government risk-bearing program — one that could expose taxpayers to funding demands if program revenues fail to cover costs or returns are lower than expected. Nevertheless, supporters of a federal disaster insurance program argue that it would be justified by the national scope of the disaster problem, and the inability of the private insurance industry to handle high payouts without federal government involvement.

## **Concluding Observations**

The 2004 Indonesian earthquake and tsunami, which killed at least 175,000 people and left an additional 106,000 missing, will likely cause some Members of Congress to assess disaster policy, and, more specifically, the efficacy of a federal disaster insurance/reinsurance program. Economic reasoning holds that there are some situations in which insurance should not be available, or should be so expensive that individuals will not want to buy it. As a society, however, we may consider it too harsh to permit people to suffer the consequences of financial ruin from having built without either the ability or the foresight to insure their property. Consequently, the ultimate choice arguably may not be the optimal level of insurance to produce economic efficiency. Instead, it may be to minimize the costs of disaster relief, given that the government is disinclined to permit anyone to suffer severe hazard losses without some kind of amelioration.

If accepted, the perspective summarized above could well shape the legislative approach. We know that disaster-prone states have filled the gap by establishing state-sponsored insurance mechanisms for insuring the “uninsurable” catastrophic risk. Given that the states have acted to provide catastrophe funding for the small-to moderate-sized hurricane and earthquake, Congress might consider a strict economic approach that calls for fairly mild reforms of the insurance industry — that still allows the possibility of people being uninsured (and not getting relief), and thereby uses that outcome to encourage the public to engage in loss-prevention measures. Alternatively, Congress might consider a potentially economically less efficient approach that calls for the creation of a federal disaster insurance system at the higher layers of coverage. Such legislation might, however, result in over-investment in hazard-prone areas. In pursuing this potentially less efficient solution, the approach might be one of finding the least expensive way of making sure everyone is protected from major economic losses from natural disaster.