Testimony at U.S. Senate Subcommittee on Clean Air and Nuclear Safety hearing, "Examining the Threats Posed by Climate Change."

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Carl Hedde, Head of Risk Accumulation, Munich Re America

Introduction

Good afternoon and thank you for inviting me to testify. I am Carl Hedde, Head of the Risk Accumulation Department at Munich Reinsurance America, Inc. Founded in 1917, Munich Reinsurance America, Inc. is one of the largest reinsurers in the United States. We have earned the A+ (Superior) financial strength rating from A.M. Best Company, and have over 1,000 employees serving our clients from our Princeton, New Jersey campus and regional offices throughout the United States. Our parent company, Munich Re, is one of the world's leading reinsurers, taking on global risks of every type and complexity for insurance companies and large corporations. In addition to my role with the Munich Re Group, I serve on the Board of Directors of the Institute for Business and Home Safety (IBHS), and am the immediate past chairman of the IBHS Board.

One significant component of our business is providing catastrophe risk insurance to our clients. Due to our history of insuring natural catastrophes (Nat Cats), Munich Re was one of the first companies in the industry to recognize the impact that weather-related events and a changing climate could have on its business model and customers.

To address this, the company formed a GEO Risks research unit 40 years ago. The department's goal is to assess scientific research around weather and geophysical events, contribute to scientific discussions with our own research, and feed scientific findings into our business model, where applicable. The GEO Risks group also studies the impact of catastrophic events through a thorough analysis of historical loss patterns. This work helps us to better understand and incorporate this knowledge into our underwriting decisions.

The insurance industry relies heavily on historical loss information to make business decisions. However, the use of historical data assumes that the risk we see today is the same as it was in the past. This is not always the case. If a clear, verifiable trend is identified in relation to a certain risk, the trend must be taken into account in the models for them to yield meaningful risk estimates.

One area where we do see an upward trend is in regard to losses from weather catastrophes, which, over time, have increased in both frequency and severity. In the U.S., socioeconomic changes have played a substantial role in this increase, but do not explain the entirety of the changes. It is likely that changes in climate, whether from natural variability or due to man's influence, are also playing a role in these trends.

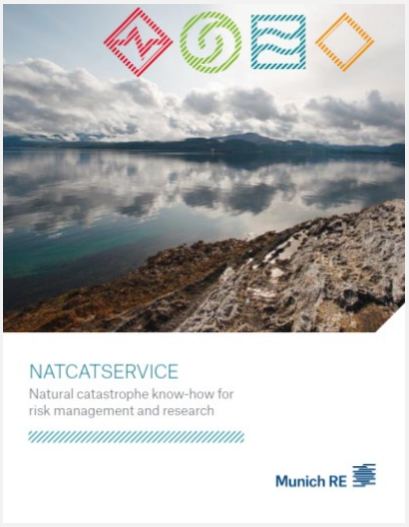
Today, I will provide an update on Nat Cat activity, as well as examples of short- and long-term adaptation efforts for the extreme weather events our country will continue to face.

Munich Re Nat Cat Service Database

The source for the majority of the information I will share is the Munich Re Nat Cat Service database. Comprised of some 35,000 events, it is the most comprehensive Nat CAT database in the world. It includes worldwide data on all relevant loss events from 1980 to today, and data on all relevant loss events since 1970 for the U.S. and some European countries. Approximately 800 - 1,000 new events are recorded and analyzed each year.

Free access to much of the data is available through the Munich Re NatCatSERVICE Download center on the company website (http://www.munichre.com/en/reinsurance/business/non-life/natcatservice/index.html).

MR NatCatSERVICE
The world's largest database on natural catastrophes



The Loss Database Today

- **From 1980 until today all loss events; for USA and selected countries in Europe all loss events since 1970.**
- **Retrospectively, all great disasters since 1950.**
- **In addition, all major historical events starting from 79 AD – eruption of Mt. Vesuvio (3,000 historical data sets).**
- **Currently more than 35,000 events**

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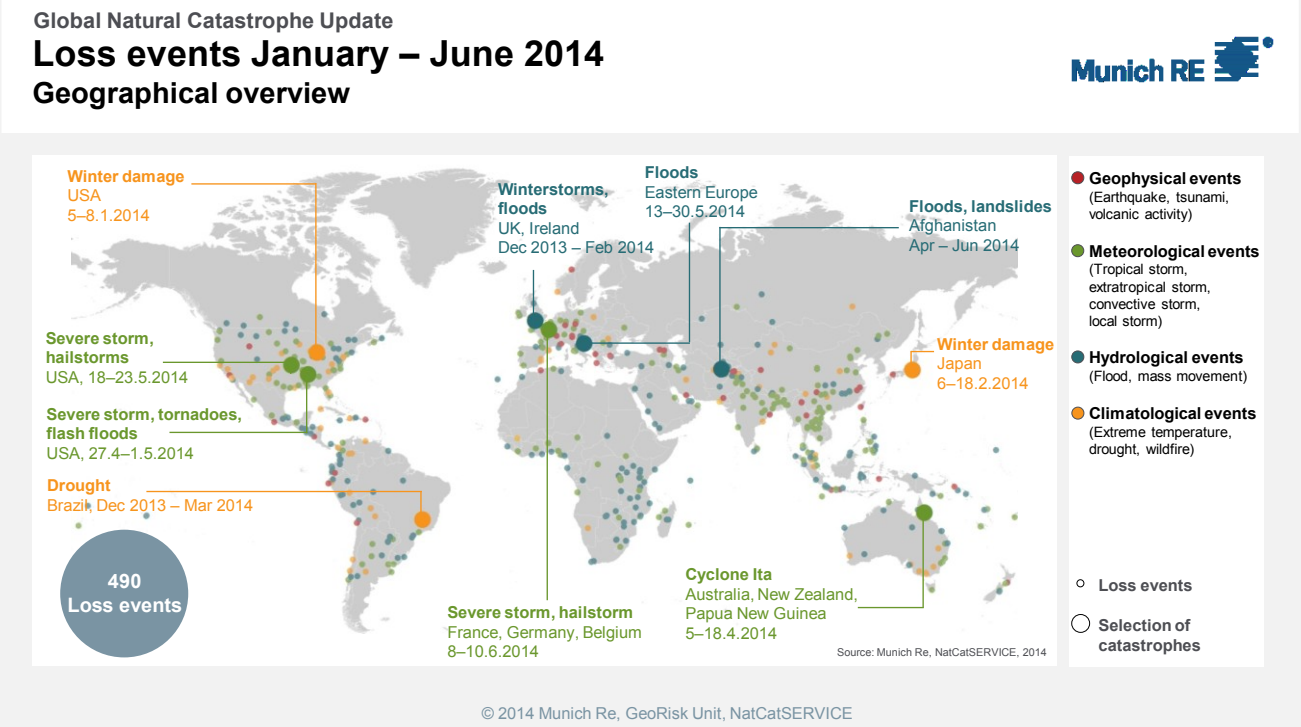
Global Catastrophes First Half of 2014

Globally, there were close to 500 loss events due to Nat Cats in the first six months of 2014. Extraordinarily hard winter conditions affected the US and Japan, while parts of Europe suffered from heavy rainfall, storms and floods.

While it was cold in some parts of the globe during the winter of 2014, it was not cold everywhere. Alaska and Greenland were much warmer than normal, as was most of Europe, north Africa, and China. The average global temperature in January 2014 was 1.17 degrees Fahrenheit warmer than the 20th century average.

Worldwide, direct economic losses totaled $42 billion and insured losses totaled $17 billion for the six month period, well below the six month average of $94 billion for the last 10 years. About 2,700 lives were lost as a result of these global disasters, much lower than the 10-year average.



U.S. Natural Catastrophes First Half of 2014

In the US, 67 Nat Cat events caused over $14 billion in economic losses and over $10 billion in insured property losses during the first half of 2014, accounting for over 60% of the global total. The insured loss total is below the 2000 to 2013 average of $11 billion for the same six-month period.

Insured losses due to thunderstorm related perils, such as tornadoes and hail, during the first six months of 2014, are estimated at $7.8 billion, accounting for almost 80% of the half-year total insured loss. This is the lowest half-year total since 2007, due primarily to prolonged winter conditions across the eastern US, which resulted in a late start of the spring thunderstorm season.

As previously noted, the eastern US experienced a very cold winter. From January to March, Arctic air masses repeatedly moved southward into the US, causing extended periods of unseasonably cold weather. Many cities experienced low temperatures not seen in almost 20 years. The cold air also allowed for the development of numerous winter storm events, some reaching as far south as the Florida Panhandle. In all, the prolonged winter caused an estimated $2 billion in insured losses, well above the 2009-2013 average of $1.3 billion.

Insured losses from other natural perils during the first half of 2014 were minimal, but a few events are noteworthy. Although drought conditions eased in some locations, conditions in California worsened, and the state is now experiencing one of its worst droughts. Dry conditions there caused an early start to the state's wildfire season, with fires scorching 29,000 acres and destroying 60 buildings in San Diego County in May. Continuing drought conditions in the state may increase the likelihood of large fires during the state's usual autumn fire season.

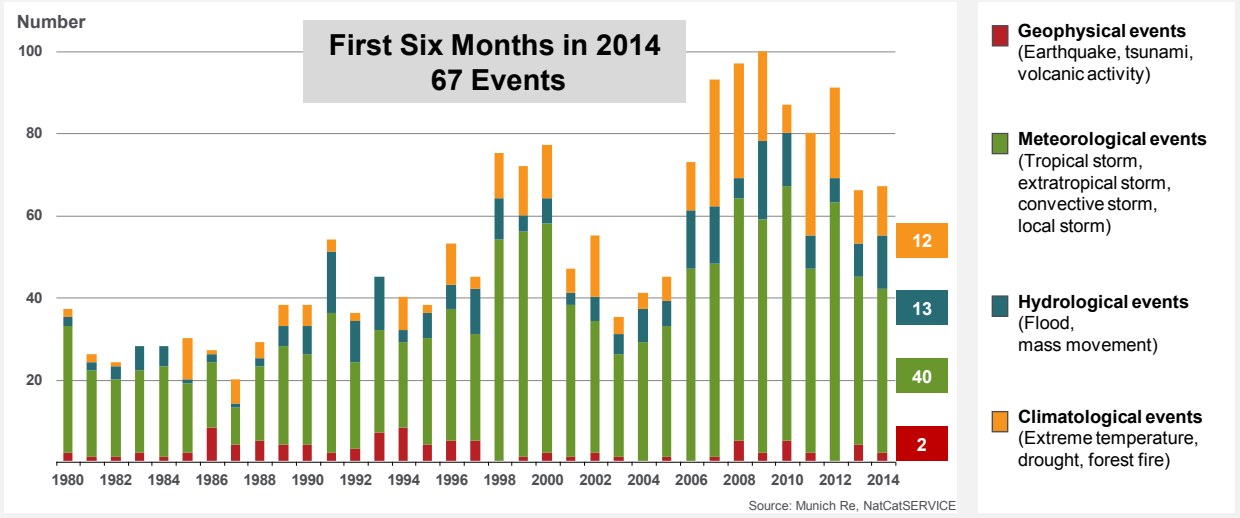
Two geophysical events also caused insured losses during the first half of the year. Excessive rainfall caused a massive landslide in Oso, Washington, that destroyed homes and took 44 lives. And after years of relative quiet, there was a magnitude 5.1 earthquake in the Los Angeles Basin that caused minor insured losses.

Through the first six months of the year, the US did not experience any landfalling Tropical Cyclones. This changed with Hurricane Arthur along the North Carolina Outer Banks during the July 4th weekend. Estimated losses from Arthur are below $250 million, due in part to strict building codes in the region.

US Natural Catastrophe Update

Loss events in the U.S. 1980 – 2014

Number of events (January – June only)



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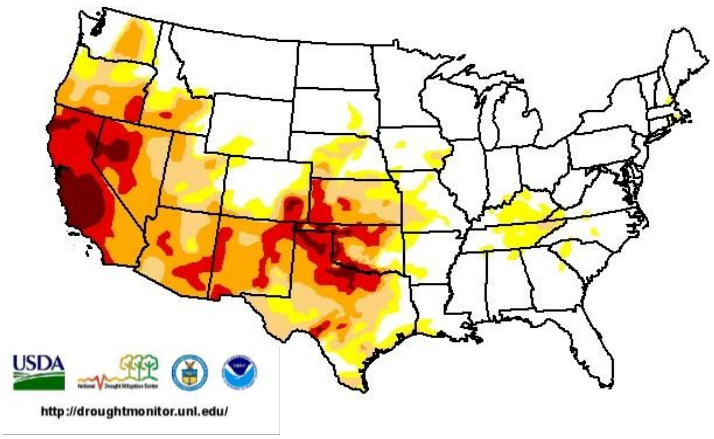
US Natural Catastrophe Update

Current U.S. Drought Conditions



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	58.58	41.42	29.26	20.73	9.38	2.43
Last Week 6/17/2014	58.64	41.36	29.70	21.25	9.71	2.62
3 Months Ago 3/25/2014	56.07	43.93	31.99	19.29	8.10	1.75
Start of Calendar Year 12/31/2013	54.20	45.80	26.01	13.96	3.31	0.31
Start of Water Year 10/1/2013	44.21	55.79	37.21	17.33	2.56	0.24
One Year Ago 6/25/2013	49.41	50.59	38.12	26.78	10.98	3.65

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

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Trends

I would now like to talk about the upward trends we see in relation to Nat Cat events globally and in the US.

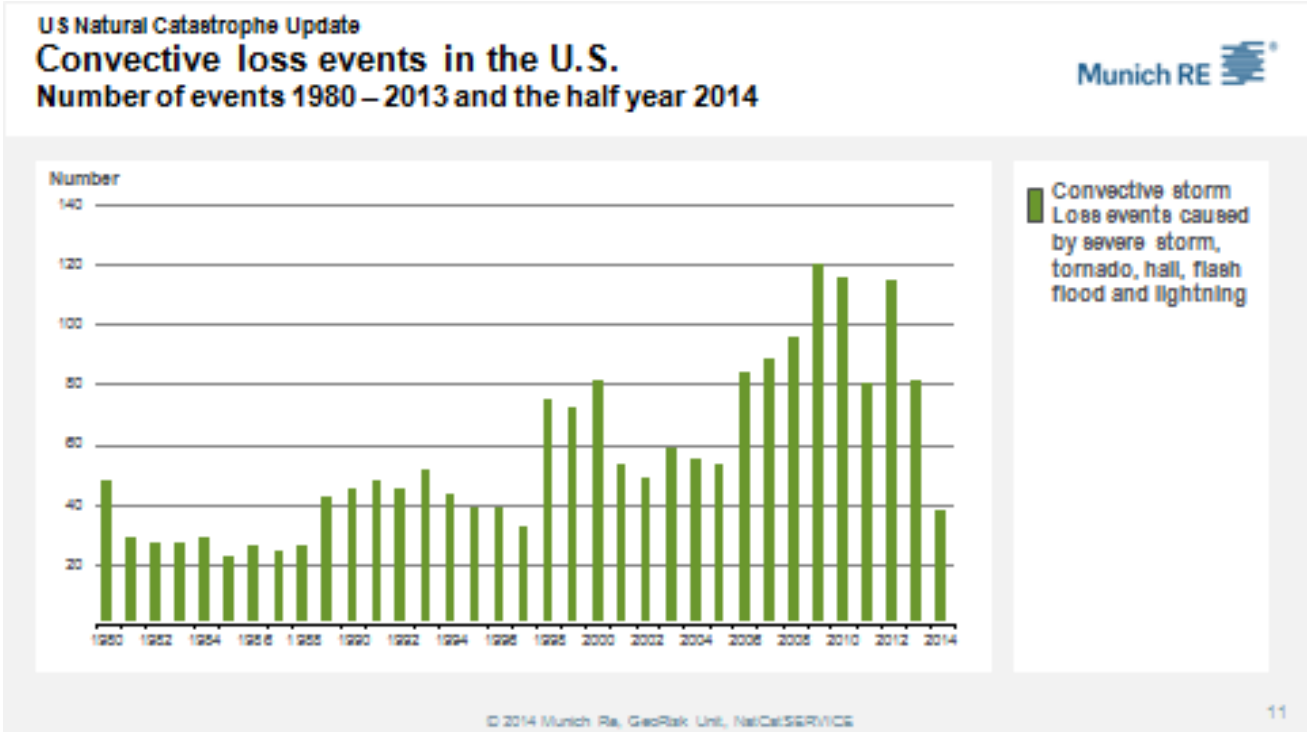
When we look at the worldwide annual totals of geophysical loss events, like earthquakes and volcanic eruptions, we see that they have stayed very constant over the past 35 years. Where we see an upward trend is in the increasing number of weather related loss events around the globe, as well as climatic events, such as drought and heat waves. The US, for example, observed the second highest percentage increase in the period 1980-2013 (after Asia), with respect to the number of weather-related loss events.

As noted previously, a significant proportion of the increase in the number of catastrophe loss events is due to socioeconomic changes in the US over the past few centuries. This is particularly the case for small loss events that either would not have been observed or reported in the past; or for events that occur in locations that only recently have been developed. However, socioeconomics likely do not explain all of the increase we have observed in our data.

For example, our research shows that, since 1970, there has been an increase in the frequency and variability in the large-scale atmospheric conditions that allow severe thunderstorms to develop over the eastern two-thirds of the US. If we then look at normalized losses from large thunderstorm events in the US since 1970 (those causing an economic loss greater than $250m), we can see the same pattern in the loss data as the meteorological data - an increase in the number and variability of large loss events over the latter half of the 1970-2009 period.

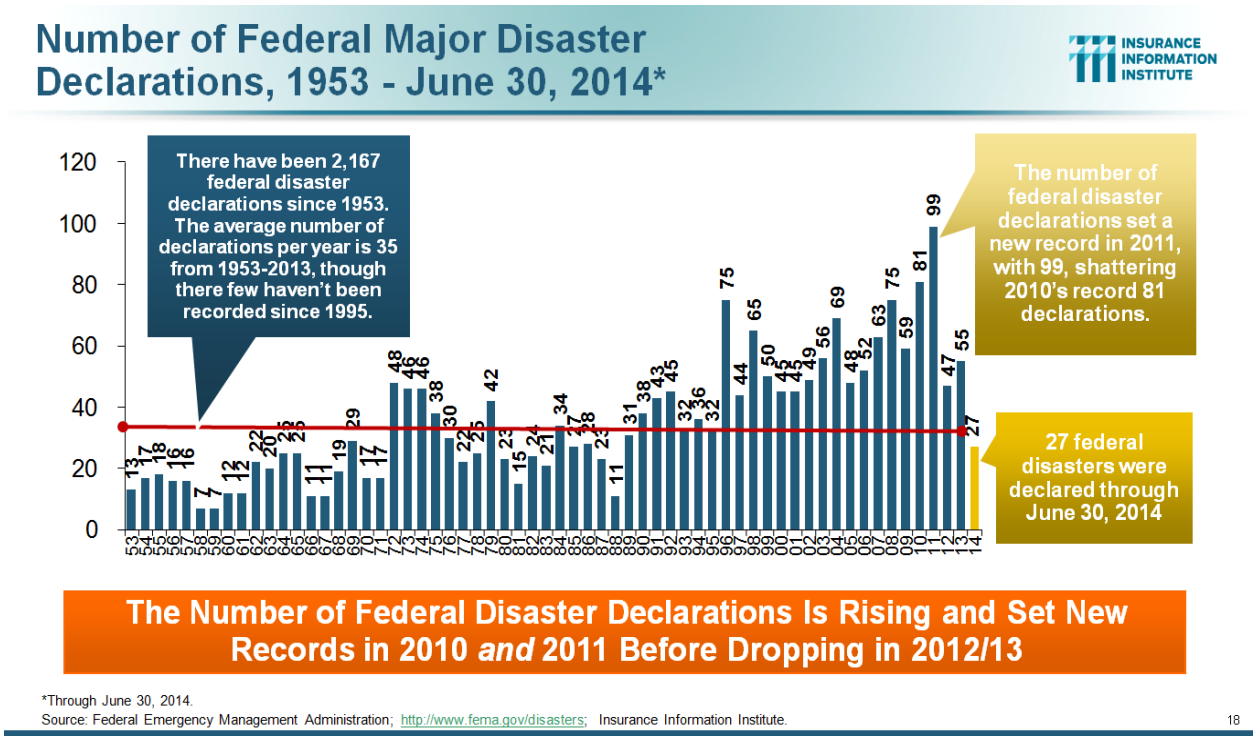
This shared pattern is a “fingerprint” of changes in a meteorological parameter influencing changes in observed losses patterns. In a peer reviewed study by Munich Re, no final attribution of the climatic variability identified in thunderstorm forcing and losses—either to natural climate variability or to anthropogenic climate change—was conclusively arrived at. Nevertheless, the expected impacts of anthropogenic climate change on the forcing of convective storms appear consistent with these findings.

Other perils we note in respect to notable upward trends are drought, flood, and wildfires. According to the Intergovernmental Panel on Climate Change (IPCC), anthropogenic climate change is expected to bring large-scale changes to the hydrological cycle, and in many regions, wet areas are expected to get wetter and dry areas drier. Examples of such patterns are the extended drought over the past decade in the US southwest and California, which in turn has an impact on the potential for large wildfires in the region. Regarding flood, since a warmer atmosphere can hold more water vapor, we would expect in a warmer climate to see more extreme precipitation totals from some rainfall events. This is an effect of a warming climate that we already see in the historical data.



Adaptation

While it is good news that Nat Cats in the US have been relatively mild so far in 2014, we should not forget that there has been no change in the overall catastrophic risk situation of the nation. Our buildings and infrastructure are very vulnerable to Nat Cats, and future large loss events are inevitable, regardless of climate change (though climate change would worsen this situation). We must, as a nation, learn from past loss events, then use what we learn to reduce losses from future events.



Over the past two decades, we have learned that working to prevent losses to buildings is a critical component in reducing catastrophe losses, and should be at the forefront of our considerations. Munich Re, the IBHS, and other insurers have recently begun discussions with the federal government on how to make our country more resilient to extreme weather events. We support a smart, balanced approach that protects the public, but does not stifle business or innovation.

We need to construct homes and businesses that are more resilient in the face of weather events. According to an IBHS test of homes built to state code in Illinois, for less than approximately 3% of the cost of a new home, we can make them more resistant to all but the strongest of windstorms. For every house that is not destroyed by a hurricane or tornado, there is a family that is not temporarily displaced or financially burdened by the event and, most importantly, is more likely to survive the storm. A reduction in damage across whole communities also means that economic life can continue uninterrupted, with less reliance on insurers and the government to recover. In short, building disaster-resistant homes and businesses is a beneficial scenario for everyone, including federal, state and local governments – and taxpayers.

Munich Re actively supports adaptation efforts around the globe. In the US, we encourage stronger building codes which have been shown to decrease risk. For example, homes built in accordance with Florida building codes in effect since 1996 see a 42% reduction in mean damage, as compared to homes built before 1996. Fortunately, adaptation activities have also proven to be cost effective. The investment to make a building more resilient to wind is paid back to the investor many times over through a reduction in future losses. For example, a study by the

National Institute of Building Sciences found that, on average, $1 spent on disaster-risk mitigation and preparedness saves an average of $4 in future losses.

In addition to the IBHS Fortified Home program, Munich Re supports further development of the Resilience STAR Program – a public-private partnership initiated by the Department of Homeland Security, with the goal to build and retrofit homes to be more disaster-resistant. Currently, federal and state governments provide post-event subsidies to citizens in the form of disaster assistance. If other financial incentives, such as government tax credits, rebates, or mortgage considerations were provided to incentivize the building of wind-resilient structures before an event (similar to incentives provided through the Energy Star program for home appliance systems), it would save lives and money. As homes become more resistant to natural catastrophes, losses will decline, and insurance premiums should ultimately reflect the lower risk.

The insurance industry and government can also work together to expand the privatization and insurability of flood risk. Risk-adequate rates and the development of third party commercial flood models will help promote the development of a viable commercial flood marketplace.

Munich Re and the insurance industry help individuals and communities rebuild their lives after extreme events; provide relief for government budgets by sharing in the cost of recovery and rebuilding efforts; make national economies more resilient after catastrophes; provide financial solutions for private sector and governmental/public risks; drive loss prevention strategies based on vast risk management expertise; support research and implementation of prevention measures to reduce risks; and play an active role in raising public awareness of disaster risks and adaptation options.

However, the insurance industry only covers a portion of the loss from natural catastrophes; ultimately taxpayers pay for the rest. As a nation, we need to take steps to reduce the societal impact of weather events as we see greater variability and volatility in our climate. It is in the mutual interest of the federal government and the insurance industry to partner to find solutions in the areas of adaptation and risk transfer. This makes absolute sense from a macroeconomic perspective, as lower subsequent losses will generate savings of several times the investment. Most importantly – these solutions can protect human lives.

Thank you again for providing this opportunity for me to testify.

Munich Re stands for exceptional solution-based expertise, consistent risk management, financial stability and client proximity. This is how Munich Re creates value for clients, shareholders and staff. In the financial year 2013, the Group – which combines primary insurance and reinsurance under one roof – achieved a profit of €3.3bn on premium income of over €51bn. It operates in all lines of insurance, with almost 45,000 employees throughout the world. With premium income of around €28bn from reinsurance alone, it is one of the world's leading reinsurers. Especially when clients require solutions for complex risks, Munich Re is a much sought-after risk carrier. Its primary insurance operations are concentrated mainly in the ERGO Insurance Group, one of the major insurance groups in Germany and Europe. ERGO is represented in over 30 countries worldwide and offers a comprehensive range of insurances, provision products and services. In 2013, ERGO posted premium income of €18bn. In international healthcare business, Munich Re pools its insurance and reinsurance operations, as well as related services, under the Munich Health brand. Munich Re's global investments amounting to €209bn are managed by MEAG, which also makes its competence available to private and institutional investors outside the Group.

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