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go to next page



go to previous page

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PARTNERSHIPS: THE WAY TO PUBLIC SECTOR RISK FINANCING

PUBLIC SECTOR RISK REPORT OCTOBER 2015

1



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TABLE OF CONTENTS

	INTRODUCTION	2
Ι.	GROWING PUBLIC SECTOR DEBT	4
II.	INSURED VERSUS UNINSURED LOSS	7
III.	THE FUNDAMENTAL CHALLENGES IN UNLOCKING PUBLICLY HELD LOSS EXPOSURE AND THE ROLE OF PUBLIC-PRIVATE-PARTNERSHIPS (PPPS)	11
IV.	PRIVATE MARKET DRIVEN INNOVATIONS/SOLUTIONS	17
V.	CLOSING THE PROTECTION GAP	22
VI.	CONCLUSION	31

INTRODUCTION

HEADS OF GOVERNMENT, INTERNATIONAL TRADE ORGANIZATIONS AND PRIVATE-SECTOR RISK BEARERS ARE SEEKING TO RE-EXAMINE ROLES AND RESPONSIBILITIES THROUGH WHICH SOCIETIES CAN BETTER MANAGE THESE COMPLICATED RISKS.



The impact that catastrophic loss can have on the fiscal position and tax base of government entities across the globe is significant. Impacted areas can take decades to recover when economic recovery is limited. Approximately 73 percent or USD 2.7 trillion of natural catastrophe losses globally between 1970 and 2014 were uninsured. The creation of private sector pre-financing options will not only relieve the burden on taxpayers and in turn, public finances, but will migrate the management of these catastrophes to insurance and reinsurance companies where claims handling and risk management is core to their operations. This allows local economies to come back on line more quickly.

The role of government in the financing of risk varies widely from country to country. In many countries, government entities have elected to retain, assume or backstop insurance risk. Historically, these decisions have been driven by many factors.

Difficulties in securing affordable insurance for remote risks, such as earthquake or tropical cyclone, have led individuals to forgo coverage. Where private market insurance was available but constrained, some government entities provided facilities to offer insurance coverage directly to individuals. Usually such facilities were intended to act as markets of last resort. However, by charging premiums lower than those of professional insurers, many of these facilities have become markets of first choice. While the approach was designed as a solution to underinsurance and lack of availability of insurance, a significant gap remains between what government has been able to cover through premiums and the actual exposure it holds.

Heads of government, international trade organizations and private-sector risk bearers are seeking to re-examine roles and responsibilities through which societies can better manage these complicated risks. As governments across the globe examine new methods to manage and transfer this risk to the private sector there are many developments underway to support this changing paradigm. In addition to public private partnerships (PPPs), an increase in capital entering the (re)insurance market and advancements in improving the measurability of risk have led to the introduction of innovative risk transfer solutions.

This report examines the shifting economic and risk landscapes that are driving public sector entities to consider new approaches to risk financing. We explore the increasing ability of the private sector to assume public sector risk and the important role technology plays to help stakeholders identify, evaluate and finance risk. In later sections in the report we highlight risk transfer solutions and mechanisms for terrorism risks, government and private sector initiatives for flood and US residual market facilities as significant providers of some of the most wind- and earthquake-exposed property insurance in the United States.

	Limited Private Sector Shift toward greater risk transfer driven by capital convergence, innovation, public sector risk tolerance & public-private partnerships						Limited Public Sector	
Role	Burden of uninsured losses	Government monopoly as prime solution provider	Use of private sector distribution	Use of private sector reinsurance	Government owned or residual market insurer	Provider of reinsurance capacity to private sector	Government backstop	Market regulation
Examples	Disaster Relief FEMA World Bank	FEMA	NFIP – WYO Crop MPI NZ EQC	US Residual Markets Fonden – Mexico CEA CCRIF MTA	FL Citizens Crop MPI	FHCF Australian Terror Pool	TRIPRA Pool Re UK TCIP Turkey	Solvency II ORSA Dodd-Frank

T-1 | SPECTRUM OF GOVERNMENT HELD INSURANCE RISK

I. GROWING PUBLIC SECTOR DEBT

TODAY, MOST PUBLIC SECTOR BUDGETS GLOBALLY DO NOT ACCOUNT FOR THE POTENTIAL IMPACT OF LARGE CATASTROPHIC LOSS.

Many governments today are straining under public debt and many of the most catastrophically exposed governments are in the worst financial position. This is particularly true for countries exposed to the perils of flood, tropical cyclone and earthquake. Compounding this situation are demographic and economic trends that are adding additional pressure on already stressed balance sheets, both in emerging and developed economies.



F-1 CHANGE IN DEBT-TO-GDP RATIO.¹ 2007-14

1. Debt owed by households, non-financial corporations, and governments.

2. 2014 debt for advanced economies and China, 4Q13 data for other developing economies.

Source: Haver Analytics; national sources; McKinsey Global Institute analytics.



Between 2007 and early 2014, global debt grew by USD 57 trillion with almost 45 percent of the expansion coming from government spending (USD 19 trillion in advanced economies and another USD 6 trillion from developing economies).¹ Governments in advanced economies borrowed heavily to offset the effects of the global financial crisis (GFC) of 2008. Eight years following the GFC, economies have not yet deleveraged.

For example, according to the US Congressional Budget Office (CBO), spending on Medicare, Medicaid and Social Security already accounts for 60 percent of the US federal budget and is poised to drive federal debt to unsustainable levels unless fundamental changes are introduced. The CBO projects public debt² growth of more than 100 percent over the next two decades.³ Furthermore, at the state level, many governments are also challenged by high levels of debt while carrying significant exposure to catastrophic perils such as hurricane, winter weather and earthquake risk.



F-2 US PUBLIC DEBT AS A PERCENTAGE OF GDP

Sources: Congressional Budget Office and Office of Management and Budget.

Today, most public sector budgets globally do not account for the potential impact of large catastrophic loss. While these losses could materially impact the gross domestic product (GDP) of emerging economies, they also have the potential to impact developed economies as well.

Looking ahead, demographic shifts and aging populations, emerging markets and their exposures and an interconnected global economy with increasing political risks will all bring increased pressure to bear on public sector finances.

This pertains to both unfunded sources of risk exposure that rely on post-event risk financing and to publicly sponsored insurance programs that are demonstrably under-funded.

- 2. Defined as debt borrowed from credit markets and intra-government debt.
- 3. US Congressional Budget Office, 2015.

^{1.} McKinsey Global Institute Report: Debt and (Not Much) Deleveraging, February, 2015.

II. INSURED VERSUS UNINSURED LOSS

BY THEIR NATURE, UNINSURED RISKS ARE RARELY EXPLICITLY RECOGNIZED BY THE ULTIMATE HOLDERS OF THE RISK AND ARE NOT MANAGED APPROPRIATELY PRE-EVENT.



F-3 | OVERALL LOSSES AND INSURED LOSSES 1980-2014

* Values adjusted for inflation using the Consumer Price Index (CPI) of each country.

Sources: Munich Re NatCatSERVICE.







There are a number of factors that contribute to the gap between economic loss and insured loss and as new risks emerge such as climate change and political risk, this gap will only continue to widen.

T-2 | FACTORS CONTRIBUTING TO THE GAP BETWEEN ECONOMIC AND INSURED LOSSES

1. Low Insurance Penetration

- There may be socioeconomic differences between advanced markets and emerging markets – average premium per capita in advanced markets is USD4,000, representing 8 percent of GDP, but under USD200 in emerging markets, representing 3 percent of GDP.
- Even in advanced markets where earthquake and flood insurance is not mandated, take-up rates are low. Public perceptions of risk, and the corresponding cost and protection afforded by an insurance policy do not align.

2. Losses from risks beyond the limits of insurability

- Un-modeled or unmeasurable risk and tail events
- Moral hazard and adverse selection
- Risk retention, deductibles and coverage limitations
- · Climate change is increasing the frequency of catastrophic events

3. Unidentified and unknown exposures

• Emerging risks such as climate change, environmental catastrophe, solar storms and cyber exposures and other unforeseen risks that have not been identified and the impact on exposure and potential losses are unknown.

Source: Guy Carpenter

The cost of uninsured events frequently falls on governments through disaster relief, welfare payments or in the form of government bailouts.

By their nature, uninsured risks are rarely explicitly recognized by the ultimate holders of the risk and are not managed appropriately pre-event. An exacerbating factor around certain uninsured risks stems from the lack of exposure measurement and systematic risk mapping, which could provide insight into risk mitigation and risk financing options.

Globally, most funding for hazard mitigation is made available post event, which in turn is coupled with an over-reliance on post-event financing. For example, during the period of 2011-2014 in the United States, the US Federal Emergency Management Agency (FEMA) granted only USD 223 million in pre-disaster mitigation grants compared to USD 3.2 billion in post-disaster grants.⁴ Since 2000, globally there has been over USD 1,600 billion in uninsured loss from natural catastrophes (70 percent of total losses) requiring various forms of post-event funding and loss financing or held directly by those impacted.⁵



In Europe, The European Union Solidarity Fund (EUSF) was established to provide financial assistance to European Union (EU) countries facing major natural disasters. In the 13 years it has been in existence, the EUSF has paid EUR 3.8 billion (Italy and Germany have received 60 percent of that amount) to supplement the countries' own public expenditures on essential emergency operations. These payments represent 4 percent of the total damage bill and do not include losses to private property, which are assumed to be otherwise insured by private markets. The EUSF encourages risk mitigation but is essentially a post-loss mechanism with finite funding. The exposure beyond the limited financial resources of EUSF, for example, a large event – potentially affecting multiple countries, falls back to the EU countries at a time when their capacity to fund loss is stretched and financial tolerance varies from country to country.

A recent study by AIR Worldwide indicates that a one-in-100 year earthquake in California could result in USD 75 billion of damage to residential properties. After accounting for insurance take-up, applying deductibles and insurance limits the corresponding estimated insured damage is only USD 9 billion, meaning 88 percent of the loss would be unfunded.⁶ If an individual's property sustains damage that exceeds the equity in the property (the United States has an average loan-to-value ratio for single family residences that is over 72 percent⁷), that homeowner may simply walk away from his or her home mortgage, shifting the financial burden to lending institutions, primarily the Federal Housing Finance agencies. Without the homeowner to mitigate loss, carry out repairs and continue to make mortgage payments, the ultimate economic loss multiplies. This creates a larger economic problem for the public sector to manage.

Despite this exposure to significant loss there is no urgency on the part of public sector entities or lenders to address the matter. As a result, we are left with an environment ripe for greater utilization of private sector monies.





6. AIR Worldwide: "Twenty Years After Northridge – Can We Fix Earthquake Insurance in California" and "Who Will Pay for the Next Great California Earthquake?" both 2014.

 Federal National Mortgage Assoc. and Federal Home Loan Mortgage Corp.: Summary statistics for single family residences at June and July 2015, respectively. III. THE FUNDAMENTAL CHALLENGES IN UNLOCKING PUBLICLY HELD LOSS EXPOSURE AND THE ROLE OF PUBLIC-PRIVATE-PARTNERSHIPS (PPPS)

EQUAL MOTIVATION FROM PUBLIC SECTOR AND PRIVATE SECTOR PARTICIPANTS CAN BE BENEFICIAL TO UNLOCK PUBLIC RISK AND "DE-RISK" PUBLIC BALANCE SHEETS.



Despite growing awareness of the challenges associated with managing risk, there is much work to do in bringing together the public and private sectors to solve for this growing need. Fortunately, all potential participants acknowledge that in the current environment collaborating to develop solutions will benefit all stakeholders. For example, involvement on the part of the (re)insurance industry in sustainable partnerships to manage risks held by government has become more pronounced. Insurers from across the globe, representing 20 percent of world premium volume with USD 14 trillion in assets under management, have partnered with the United Nations to strengthen the industry's commitments to sustainable development and to establish Principles for Sustainable Insurance (PSI). PSI launched a Global Risk Map⁸ to highlight the economic and social cost of natural disasters. Insurers have committed to concrete actions on risk management, insurance products, investment, partnerships and disclosure frameworks that support disaster risk reduction, climate change adaptation and mitigation. The Principles are part of the insurance industry criteria of the Dow Jones Sustainability Indices and FTSE4Good.⁹ The process must start somewhere and if incremental steps can start across the fundamental challenges, sustainable traction can be built over time.



F-4 PERCENTAGE OF INSURED VERSUS UNINSURED NATURAL CATASTROPHES (2000-2015)

Source: Sigma World Insurance Database and Guy Carpenter.



F-5 | PRE-DISASTER MITIGATION ALLOCATIONS AND HAZARD MITIGATION GRANT PROGRAM AWARDS FROM FISCAL YEARS 2011-2014



Source: GAO analysis of FEMA data. | GAO-15-515.

Equal motivation from public sector and private sector participants can be beneficial to unlock public risk and "de-risk" public balance sheets. If any of the three sides of the public-private partnership are missing (government, industry and community), the formation of a sustainable structure may be challenging. For example, efforts in the Netherlands to protect personal and business interests against flood demonstrate how a lack of balance between the parties can derail the process to form a workable PPP solution. The Dutch Association of Insurers proposed "making flood risks insurable at an acceptable price for small and medium size companies and consumers." However, for the purpose of cost sharing, the scheme required mandatory participation. The plan, rejected by the country's regulators for antitrust reasons, remains uninitiated.







RISK AWARENESS

Identifying, prioritizing, selecting, executing and monitoring results of risk management projects are essential. As noted by the US Government Accountability Office in their post Hurricane Sandy review, an investment strategy would help the Federal Government enhance resilience for future disasters. Unless a clear risk-return framework is established, the opportunity to reduce publically held exposure will be challenging and the inertia around the status quo could endure until loss events occur that force reactionary funding from the public sector.¹⁰

Unless mandated, there is little motivation to spend pre-loss dollars on risk mitigation or financial hedges. This is apparent time and time again in the way flood, wildfire and earthquake exposures are addressed in many regions of the world. Utilizing a variety of tools such as tax credits, cost sharing, risk pooling, risk mitigation and other incentives, individuals can be prompted to be more proactive.¹¹

There is also a prevailing myth that government relief will be adequate for a resilient recovery. However, this is often not the case. If more citizens recognized that government cannot possibly protect their property to the level needed to restore them to pre-disaster levels, they would be more engaged in actively seeking alternatives. The need for risk awareness and education is obvious. Both the public and private sector can play leadership roles in building community awareness of exposure to extreme events and their consequences. As noted above, the United Nations Environmental Program PSI Initiative has launched the Global Risk Map, a publicly accessible online tool that highlights the economic devastation caused by tropical storms, floods and earthquakes over the past 115 years and helps identify areas of greatest vulnerability. The map achieves this by assessing relevant data on natural disaster events, social and economic exposure and resilience, risk modeling and insurance penetration and density. This high level view of risk is a starting point but it should culminate at the local level to appreciate and mitigate the risk.

Risk awareness and education is a starting point, but by itself is not a solution. For instance, forty years of educational effort to promote awareness of flood risk in the United States has had little impact on insurance purchasing as evidenced by a 1 percent take-up rate outside of designated flood zones where mandatory purchase of flood insurance exists.¹² Education and awareness is important, but cost effective insurance solutions and risk mitigation incentives are required to make meaningful progress towards community resilience.





 US General Accountability Office: Hurricane Sandy, An Investment Strategy Could Help the Federal Government Enhance National Resilience for Future Disasters, 2015

- National Academies Press: Building Community Disaster Resilience Through Private-Public Collaboration, 2011.
- 12. Rand Corporation, 2006.



RECONCILING CORPORATE CULTURE AND GOVERNMENT BUREAUCRACY

Differing approaches between the accountability and transparency required of public entities and near term profit expectations of the private sector can result in culture clashes. (Re)insurance support is a function of profit potential over time. The following factors should be considered to align the competing interests of public and private sector entities:

- Sustainable partnerships with the private sector should provide adequate potential for risk return. Private business models do not provide for unlimited risk bearing and are cautious about accepting major risks beyond their control. "Public-private partnerships are not about funneling dollars to development projects; it's about creating win-win business models."¹³
- Governmental entities that go down the path of public-private-partnerships must also recognize that private sector (re)insurance may not be positioned to address every need. The handling of terrorism insurance in the United States is a good example. Under the terms of the Terrorism Risk Insurance Program Reauthorization Act (TRIPRA), the insurance sector, through the program's deductibles and triggers, carries much of the conceivable exposure that is presented by a potential conventional attack. However, the capital of the entire industry could certainly be threatened by an attack that involved nuclear devices. By providing a governmental back-stop a balance has been achieved between the public and private sectors whereby the insurance industry has continued to provide coverage to its customers. Regardless of the arrangements reached through such programs, the supporting roles of government and the private sector should be defined so that all stakeholders have an understanding of roles and responsibilities.¹⁴ Read more about government supported risk transfer solutions for terrorism on page 18 of this report.

"BIG DATA" AND INFORMATION MANAGEMENT CHALLENGES

Advances in technology have made data storage economical and convenient. The vastness of available data may make it useable well beyond the purpose of its original collection. However, its vastness may also make harnessing it a challenge. Robust data sets and data sharing across sectors coupled with collaboration in data mining techniques can yield new insights into risk factors and build solutions for risk management and mitigation.

Clear and specific data use guidelines are needed to assist both the public and the private sectors in establishing and navigating data management processes. Often the private sector has not allocated capital to certain risks simply because there is insufficient data to quantify the risk. While data can provide significant insights into risk and drive solution innovation, there is often a reluctance to share data but that may be overcome if the deliverables and the associated benefits are clearly identified for potential users and the public.

When underlying data is incomplete or incorrect the reasonableness of quantitative solutions becomes more uncertain and consideration should be given about the reasonableness of the output. Another challenge when accessing public entity data is the protection of privacy. Personal information can be easily parsed from "big data" in advance of a quantitative exercise. Understanding the entities' confidentiality requirements is a fiduciary responsibility before any analytical undertaking.

These considerations should be seen as challenges rather than impediments.

The value of combining data inventories is immeasurable when addressing questions of risk mitigation through land use management, potential for pre-loss risk transfer and post-loss funding.



RATES THAT REFLECT RISK

Insurance marketplaces that are stable and viable in the long-term succeed when insurers offer policies and coverages at premium rates that are appropriate and are subject to the requirements and standards of not being excessive, inadequate or unfairly discriminatory. At the same time, premium rates should be balanced and take past and prospective loss and expense experience into consideration. When these factors are not successfully accomplished, a public sector solution often emerges.

Looking beyond the expected loss component of rate, private insurers set risk loads with consideration to both the amount of downside risk as well as the correlation of this risk across all policies. More specifically, for two policies with the same expected loss, but one having a maximum loss ten times greater than the other, one would expect to pay more for the policy with the greater downside. For two policies with equal expected loss and maximum downside loss, the insurance company will charge more for the policy that correlates with other policies that produce loss at the same time, as these policies have greater probability of pressuring both investor returns and insurer financial stability. The rate-setting process determines the risk preferences perceived by insureds – riskier choices command higher premium rates. While actuarially fair, the process may create outcomes deemed socially unfair and worthy of subsidization. Irresponsible subsidization can result in inequities and threatens the success of insurance mechanisms.

Rate setting outcomes for public sector solutions may be significantly complicated by social considerations and discussions around disparate outcomes. If rates do not appropriately reflect loss costs, risk loads and expenses, consumers' perceptions of the risk they carry may be distorted. When the subsidization is understood, supported and stable, subsidies can help provide balance and in turn play a role in long-term solutions. Unfortunately, sometimes subsidized prices entice new consumers to engage in sub-optimal behaviors, increasing the size of the subsidy needed and compounding the risk mitigation challenge. The size of this increased subsidy is sometimes not recognized for years, until there is a demand to pay that may be frequently greater than any accumulated reserves, if specifically funded at all.

When the subsidy is no longer supported that may signal the need for a transition period to unsubsidized rates or privatization, such as regulated rate increase caps to allow consumers to adjust. Also, hazard mitigation activities might be instituted, applying to a specific home/policy where the structure is physically elevated to reduce flooding or community/nationwide initiatives such as rebuilding flood walls or engineering flood solutions.

Destruction caused by catastrophes is often exacerbated by inadequate construction practices and questionable land use planning decisions in both emerging and developed economies. Following the 2004 Indian Ocean earthquake and tsunami, The Hyogo Framework for Action identified the need to incorporate disaster risk reduction in reconstruction efforts following disasters.¹⁵The United Nations cites this event as the first to draw global attention to the issue.

Community resiliency is a recognized and key theme around the issue of disaster risk management, and "building back better" is a means to address the poor decisions of the past.

Unfortunately, communities often find that they lack the financial resources to proceed, and as a result, ambitious reconstruction projects lose momentum as communities revert to the status quo.



IV. PRIVATE MARKET DRIVEN INNOVATIONS/SOLUTIONS

MANY (RE)INSURANCE LEADERS BELIEVE THE INDUSTRY CAN PLAY A SIGNIFICANT ROLE IN A RAPIDLY CHANGING GLOBAL RISK LANDSCAPE WITH PRE-LOSS FINANCING SOLUTIONS DESIGNED TO SPREAD RISK, RELIEVE THE BURDEN ON PUBLIC FINANCES AND IMPROVE THE RESILIENCY OF COMMUNITIES.



The 2015 Global Insurance Forum addressed the topic "Filling the Protection Gap."¹⁶ During the conference, key speakers noted the growing divide between the economic losses societies are facing and the role of the insurance industry. Many (re) insurance leaders believe the industry can play a significant role in a rapidly changing global risk landscape with pre-loss financing solutions designed to spread risk, relieve the burden on public finances and improve the resiliency of communities.

Beyond the (re)insurance sector, others are calling for change as well. The G7 "Leaders Statement" commented on the need for action on climate change: "Urgent and concrete action is needed to address climate change …. Mobilization of private sector capital is also crucial for achieving this commitment and ….. building resilience against the effects of climate change …. We will aim to increase by up to 400 million the number of people in the most vulnerable developing countries who have access to direct or indirect insurance coverage against the negative impact of climate change related hazards by 2020 ….. To do so we will learn from and build on already existing risk insurance facilities such as ….. the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and other efforts to develop insurance solutions and markets in vulnerable regions…."¹⁷

Innovative risk financing solutions are being delivered that address geo-political and longevity risk as well as risk associated with natural catastrophes. There are growth opportunities for the private sector to be even more innovative in its approaches to engage government entities with appealing products. Creative business models will be required for (re)insurers to have maximum impact in PPPs.

TERRORISM

A number of countries provide for government supported terrorism risk transfer solutions to manage global threats of terrorism. The actual mechanisms employed are a spectrum between loan and direct support, as illustrated in the chart below.



F-6 | COMPARISON OF GOVERNMENT INTERVENTION WITH RETROCESSION PURCHASES

Solutions are being brought to bear that address important needs in both developed and emerging economies. For example the Turkish Catastrophe Insurance Pool, Mexico's Fund for Natural Disasters and the risk financing solutions being deployed by certain US residual markets are accessing new forms of risk capital to manage the potential devastating impact of natural catastrophe events caused by tropical cyclones and earthquakes. There are a number of initiatives underway to bring more robust risk financing solutions to similar challenges, such as the growing risk presented by flooding in the United Kingdom.

Community-level insurance programs are clear examples of industry innovation that can serve as the switch to initiate broader market change. These utilize index insurance products and pay out benefits if a pre-determined event occurs (a quake with an intensity of a certain level, or a certain rainfall level).¹⁸ Such products provide solutions for many different types of stakeholders:

1. Benefits come from low-income stakeholders who streamline distribution and reduce administrative processes without compromising product and service quality. Simply downscaling existing homeowners coverage for low-income consumers will likely not work since the expense of administering such a product, burdened by the need for individualized loss assessments and expensive overheads would exceed the available premium. However, the micro-insurance model is one potential approach that addresses these expenses in various ways.

One risk transfer solution, international terrorism pools, have been established to meet the needs of the specific individual country they support, often reflecting specific terrorist threats within each country. As is the case with The Terrorism Risk Insurance Act in the United States, coverage provided by international terrorism pools is typically triggered by a national governmental declaration of the occurrence of a terrorism event. Some pools purchased private reinsurance to protect their exposures, which has brought benefits. In 2014, pools that purchased private reinsurance experienced price decreases because capacity increased in the marketplace in the absence of major terrorism losses.¹⁹





National Flood Insurance Program: Report to Congress on Reinsuring NFIP Insurance Risk and Options for Privatizing the NFIP, 2015.
 Marsh: 2015 Terrorism Risk Insurance Report.



- Blue Marble Microinsurance, an insurance industry consortium and venture incubator, demonstrates industry
 initiative to bring insurance solutions to emerging countries. The consortium consists of American International
 Group, Inc., Aspen Insurance Holdings Limited, Guy Carpenter & Company, LLC (a wholly owned subsidiary of
 Marsh & McLennan Companies, Inc.), Hamilton Insurance Group, Ltd., Old Mutual plc, Transatlantic Reinsurance
 Company, XL Catlin and Zurich Insurance Group. Blue Marble is committed to launching 10 microinsurance
 ventures over the next 10 years to deliver solutions that address the risk management needs of the underserved.
 Through collaboration and innovative technology enabled platforms, Blue Marble seeks to improve sustainability
 by expanding the role of insurance in society. These ventures will consider unique distribution methods, local
 partnerships, product development and impact services. Blue Marble is evaluating solutions for Africa, Latin
 America and emerging Asia; risk awareness and technology is an essential pillar in its deployment.
- 2. The CCRIF was the first multi-country risk pool. Utilizing a combination of (re)insurance and capital market financing, it is designed to limit the financial impact of excess rainfall, tropical cyclone and earthquake.

RISK FINANCING FOR FLOOD: EMERGING OPPORTUNITIES

Flood is the largest contributor to catastrophic loss worldwide. Recent initiatives from Guy Carpenter and Marsh & McLennan Companies, both involving the peril of flood, demonstrate the diversity of approaches that can be brought to bear. In the United Kingdom, we are involved in a project where the insurance industry is working in concert with the government to adjust the industry's approach to the peril of flood and maintain the private sector's role as the source of insurance protection without a resultant increase in the public sector's liability. In the United States, a project is being sponsored by FEMA and the US Congress to determine how the National Flood Insurance Program (NFIP) might be privatized and how it might utilize reinsurance to support its risk management efforts, and thereby move potential loss exposure off the public balance sheet.

UK FLOOD - AN INNOVATIVE MARKET BASED SOLUTION

For people living at high risk of flooding, finding affordable home insurance is becoming increasingly difficult and the problem is likely to get worse without action. The Association of British Insurers and the UK government formulated a plan following large scale flood events that highlighted the impact of severe flooding on homeowners and communities. The UK government's preferred approach was the introduction of legislation that would create a flood reinsurance scheme – known as Flood Re – to help support households at highest flood risk with minimal market distortion. The households will be able to access affordable cover through the competitive home insurance market with a managed transition to more risk-reflective pricing over a 25 year period. The scheme provides support in the parts of the home insurance market that need it, which is likely to be around 2 percent of customers living in areas with the greatest risk of flooding. The Flood Re model depends on a statutory levy paid for by the UK insurance industry.

US FLOOD - THE ROAD AHEAD

The NFIP is the primary underwriter of flood insurance policies in the United States. The program was established in 1968 through the passage of the National Flood Insurance Act.

Since its formation, the NFIP has never utilized any financial risk transfer mechanism. Rather, it has relied on the US Treasury to fund deficits when event losses exceeded its net premium balance. From the mid-1980s until Hurricane Katrina in 2005 the NFIP was financially self-supportive. Despite years that produced deficits and required borrowing to respond to claims, the NFIP managed to repay the loans with interest.

Hurricane Katrina in 2005 was a seminal event that produced over USD16 billion of losses to the NFIP, which together with Hurricanes Rita and Wilma, produced a deficit of over USD17 billion at the end of 2005. As part of the Biggert-



3. African Risk Capacity is a regional insurance pooling mechanism whose mission is to help African Union Member States better anticipate extreme weather events and protect the food security of vulnerable populations. Nine countries are expected to be covered in 2015 and the aim is to increase this number to over 20 in the next four years.

Parametric derivatives, in the form of adequate and affordable products for risk-prone communities, may be a partial answer for private sector (re)insurers assisting countries affected by catastrophe to actually engage in "building back better." Complex situations that entail multiple stakeholders, many of whom have competing interests, call for solutions that are flexible and varied so that they can be tailored over time around shifting dynamics.

Permanent solutions backed by sustainable catastrophe capacity are needed for governments and communities to remove untoward hazard risk from their balance sheets in a manner that enables the private sector to handle the risk in a sustainable way.

Waters Act, which reauthorized the NFIP in 2012, Congress tasked FEMA with addressing the financial shortfalls of the program. In late 2012 the NFIP's deficit position was further exacerbated by Hurricane/Tropical Storm Sandy – expanding the NFIP deficit to the US Treasury to USD24 billion.

Legislation mandated the Flood Insurance Risk Study (FIRS). The project sought support to evaluate the potential means by which the NFIP might privatize either fully or partially, how the NFIP might utilize reinsurance to support its risk management processes and how the NFIP's claims-paying ability would evolve under certain economic scenarios as the program implemented change. Guy Carpenter, acting as the lead contractor, brought together a consortium of companies including Oliver Wyman and Marsh, sister companies of Guy Carpenter, as well as third-party partner companies AIR Worldwide and JBA Consulting to respond to FEMA's request for proposals.

The major themes of the response included the following:

- Privatization Study: An analysis of the private sector's capacity and appetite to provide flood insurance found that greater private sector involvement would promote innovation through market competition potentially leading to improved product offerings, lower prices for consumers and greater flood insurance penetration. It would also reduce the government's direct flood risk exposure and create new product demand for (re)insurers and the capital markets.
- Reinsurance Study: As demonstrated by the US residual market facilities and other international catastrophe-exposed government sponsored facilities that utilize reinsurance, reinsurance can complement the risk financing structure of the NFIP. A combination of insurance and reinsurance, including insurance-linked securities risk-transfer facilities, should be employed by the NFIP to reduce and manage its risks.

Though there are many potential benefits to a private market for flood insurance, the transition is clearly not without obstacles. Today, catastrophic loss potential and insufficient insurance premiums to cover the losses remain paramount concerns. Historically, private insurers chose not to underwrite flood risk because it was difficult to measure and quantify and subsequently difficult to price adequately, with the potential for extreme losses.

A major challenge for the NFIP is risk-based rating. Insurers need to have the freedom to rate and sell products at appropriate prices. There is a need for higher NFIP rates, obvious because of its deficit, in order to promote private sector engagement. To strengthen flood insurance finances in the United States risk weighted rates are needed, which ideally would equate to risk-based rates. If this cannot be achieved then other mechanisms for filling the gap should be studied. For example, in the United Kingdom, levies will be used to help finance sustainable flood insurance – those less exposed pay less, but everyone contributes. In the United States some have suggested "means-tested" vouchers to help those unable to afford their flood premiums. These and other tools should be employed provided they support and are consistent with a long-range plan to construct sustainable solutions to flood risk financing.

V. CLOSING THE PROTECTION GAP

11

a.

USING TECHNOLOGY IS CRITICAL WHEN PARTNERING GOVERNMENTS WITH THE PRIVATE SECTOR. THESE TOOLS BRING TOGETHER THE RISK KNOWLEDGE AND HISTORICAL DATA OF THE PUBLIC SECTOR WITH RISK MANAGEMENT TECHNIQUES OF THE INSURANCE INDUSTRY.



We have identified seven preconditions essential in the movement towards resiliency and de-risking public sector exposure.

- 1. Leadership with a clear mandate to act. This requires that risk management efforts and administration must be appropriately funded, staffed and/or supported by organizations that bring the requisite expertise required to achieve the objectives that have been established.
- 2. Accountability supported by adequate resource allocation that is structured in a manner to cut through government bureaucracy and the overlapping centers of responsibility that typically exist across governmental agencies.
- Transition from an overreliance on post-event financing to proactive community resiliency efforts, which encompass "build back better" concepts that are supported by appropriate pre-event risk financing programs.
- 4. Addressing realities of human nature through education, risk awareness and incentives for insurance and risk mitigation.
- 5. Unlocking the wealth of information in publically held data sources for the greater good.
- 6. Product creativity and continuity from the private sector.
- 7. Collaboration and a holistic approach through public-private partnership models that provide clear identifiable benefits to all stakeholders.

Two of the most important enablers in transferring risk to the private sector and de-risking public sector balance sheets are the emergence of robust risk analytics and the growth and abundance of risk capital.

These trends will support broader product offerings and greater market stability around which the private sector can close the protection gap.



RISK ANALYTIC TOOLS

Public sector-related data can be expansive, containing census data, property risk characteristics, historical loss information, risk rating matrices and natural hazard event scientific tracking. In order to facilitate packaging the sometimes unwieldy data in a way that is useful for risk decision making, utilizing outside resources to improve data transparency can be valuable. Public sector resources devoted to building tools that measure risks that are perceived as "uninsurable" can unlock private sector funding.

The private insurance sector also has detailed data on claims, premium patterns and rating trends. In addition to the data itself, the private (re)insurance sector has dedicated financial and intellectual resources that can develop and refine computer models to simulate various kinds of catastrophic losses, such as earthquake, tornado, terrorism, hurricane and flood. The private sector is also able to apply the simulations to portfolios of similar risks that have been combined in order to determine the amount of potential loss a specific community would experience in today's dollars if faced with historical storms.

Regardless of the economy, developed or emerging, underlying risk data is the foundation for robust use of technology. The more detail collected for pertinent risk characteristics, the more precise the technical evaluation will be. It is important to work with an experienced analyst to identify critical risk characteristics that are necessary for the varying tools and regions. With proper data input, use of tools and technology is the foundation for effective risk management strategies.

Data and sophisticated analytic tools are essential for evaluating risk. Data and the tools provide consistent and validated assessment of risk that can be replicated by third parties during risk transfer negotiations. For the risk taker the ability to monitor exposure data and intersect it with big data that informs risk decisions is critical. Visualizing risk accumulations with mapping data, satellite imagery and surveillance drone output is critical for monitoring and managing risk accumulations. In addition to exposure management, catastrophe models are used to simulate events most likely to impact a portfolio of risks. Output can then be used to properly price risk and protect capital.



F-8 | BASIC ANATOMY AND ELEMENTS OF AN EARTHQUAKE RISK MODEL

Source: Guy Carpenter.



Financial models are then constructed to consider the cost of capital with and without risk transfer. These tools are essential in optimizing portfolios and capital for an entity – private or public.

F-9 EXAMPLE: VISUALIZING A LANDFALLING HURRICANE'S WIND-SPEED BANDS AND VALUES OF EXPOSED RISKS USING GC ADVANTAGEPOINT[®]



Source: GC Analytics[®].

In addition to internal risk management, models are typically used in risk transfer negotiations. Both traditional and alternative risk markets require extensive analysis of portfolios when considering risk transfer. Sharing a portfolio's standardized model output is critical to imparting the loss potential of a particular portfolio from which risk-capital can be unlocked to support the risk financing needs of a reinsurance buyer. Using technology is critical when partnering governments with the private sector. Whether partnering with developed or emerging economies, these tools bring together the risk knowledge and historical data of the public sector with risk management techniques of the insurance industry. The result is an enhanced understanding of risk that provides stability and attracts partners.

The issues and attention to US flood and the National Flood Insurance Program (NFIP) data crystalizes the value of this kind of partnership. Risk and claims data from NFIP can be used to refine first generation quantitative tools that measure flood risk, and in the process unlock more private sector risk-capital to support the risk management needs of the NFIP.

Academic institutions also have intellectual resources and tools to assist with mapping and building actuarially respected models. For example, the Florida Office of Insurance Regulation funded a team of experts from five in-state universities, the National Oceanic and Atmospheric Administration and the National Institute of Standards and Technology, to build, test, calibrate, validate and provide independent review of the Florida Hurricane Public Loss Model.

25



US RESIDUAL MARKETS

The US residual property insurance market segment is comprised of Fair Access to Insurance Requirements (FAIR) Plans, Beach and Windstorm Plans and two state run insurance companies – Florida Citizens Property Insurance Company (Florida Citizens) and Louisiana Citizens Property Insurance Corporation (Louisiana Citizens). These insurance facilities grew out of the civil strife in the 1960s to ensure continued access to insurance in urban areas. Over time they have evolved and their mandate has grown beyond their urban focus. Today these facilities are significant providers of some of the most wind- and earthquake-exposed property insurance in the country.

Between 1990 and 2011, total exposure to loss in the FAIR Plans expanded by 1,679 percent, growing from USD 40.2 billion to a peak of USD 715.3 billion.²⁰ Since 2011, however, FAIR plan exposure, of which Florida Citizens comprises over 50 percent, has declined 38 percent from its 2011 peak to USD 445.6 billion. In addition to its efforts to transfer insurance policies to the private sector through its policy de-population efforts, Florida Citizens has been expanding its use of private sector reinsurance, including catastrophe bonds, to manage its hurricane exposure. Louisiana Citizens, another legislatively created insurer of last resort for Louisiana, has been moving in the same risk reduction direction as well through the use of depopulation and premium rate changes. Since 2011, exposure of the US residual markets has come off its peak, declining 30 percent between 2011 and 2013.

As the risk capital landscape has evolved and expanded, and reinsurance pricing has come down in the United States, a number of the larger residual market facilities have been expanding their access to reinsurance. Residual market facilities across 14 states, including those with significant exposure to hurricane and earthquake, utilize reinsurance as a component of their risk financing programs. Guy Carpenter, which has a dedicated team of professionals from its various business segments (Analytics, Strategic Advisory, capital markets and treaty broking) that focus on the needs of residual market facilities in the United States, is involved with facilities in 10 of the 14 states.

F-10 RESIDUAL MARKET REINSURANCE PURCHASERS

Residual Markets that Purchase Reinsurance:

- Alabama
- California (CEA)
- California FAIR Plan
- Florida
- Georgia
- Kentucky
- Louisiana
- Massachusetts
- Mississippi
- New York
- North Carolina
- Rhode Island
- South Carolina
- Texas
- Virginia



Source: Residual market websites and discussions with their respective representatives.



The recent 2015 reinsurance renewals in this area demonstrated further expansion in the manner and means by which these insurance providers utilize private-sector capital to support their businesses. Traditional reinsurance remains a core component of most residual market risk financing programs. Typically these risk financing plans will also rely on retained profit, assessments and debt facilities in concert with the various forms of reinsurance to manage their exposures. The utilization of alternative risk financing capital through catastrophe bonds and/or collateralized reinsurance continues to grow with eight of 12 facilities that utilize traditional reinsurance also accessing risk transfer capacity through catastrophe bonds and/or collateralized reinsurance to help manage their loss exposures. The chart below details the increasingly diverse set of risk financing approaches employed by 11 coastal markets.

	Self- Insurance	Assessments		Risk Transfer		Debt Financing	
	Members' Equity/Retained Earnings	Recoupable Member Company	Non-recoupable Member Company	Policyholder	Traditional Reinsurance	Alternative Reinsurance	Pre-/Post-Event Bonding
AIUA	\checkmark		\checkmark		\checkmark		
FL Citizens	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark
GUA			\checkmark		\checkmark		
LA Citizens	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark
MPIUA	\checkmark		\checkmark		\checkmark	\checkmark	
MWUA	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
NCIUA/JUA	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
RIJRA	\checkmark		\checkmark		\checkmark		
SCWHUA			\checkmark		\checkmark	\checkmark	
TWIA	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
VPIA	\checkmark		\checkmark		\checkmark		

T-3 RESIDUAL MARKET OVERVIEW – COMPARISON OF RISK FINANCING RESOURCES

Source(s): Residual Markets Websites

Through their risk financing efforts residual markets are looking to achieve a number of goals. First and foremost to reduce the likelihood of assessments to insurers and policyholders following an event that depletes their claims paying ability. As capital has expanded and providers of this capital have become more comfortable with the exposure and modeling metrics defining the risks, product offerings have expanded as well. When Guy Carpenter works alongside residual market customers, we look to determine the optimal mix of capital sources required to place the risk financing program at the most cost efficient terms possible regardless of source.



The work that Guy Carpenter has done for the FEMA Flood Insurance Risk Study (FIRS) in the United States shows the potential benefits of collaboration in developed countries to construct solutions for more sustainable flood insurance protection. NFIP policy and claims data was provided to build feasibility studies for NFIP privatization. Probabilistic flood and storm surge modeling was combined with non-modeled aspects of NFIP claims. Using actuarially sound techniques, Guy Carpenter projected the long term financial position of the NFIP reflecting the impact of reforms on future revenue and the program's deficit with and without reinsurance. The participation of the entities that have the capabilities to evaluate, construct and support complementary product offerings or risk financing solutions for the NFIP will be critical to developing sustainable public-private flood solutions in the United States. Collaboration brings expert technology and best practices from a variety of sources to develop short- and long-term solutions for the overall benefit of society.

EVOLUTION OF RISK CAPITAL

The continued flow of new capital into the (re)insurance industry constitutes the largest change to the sector's capital structure in recent memory. New capital has entered the market through investments in insurance-linked securities (ILS) funds, sidecars, hedge fund-backed reinsurance companies and collateralized reinsurance vehicles. Investors have increasingly been attracted to low correlation returns from catastrophe risk relative to traditional capital markets risks and the attractive yield for the measured (re)insurance risk relative to other investments, particularly in the current low inflation, low yield era.

Guy Carpenter's estimate of dedicated reinsurance sector capital as of July 1, 2015 is approximately USD 400 billion of which the convergence capital, including catastrophe bonds, industry loss warranties, collateralized reinsurance and sidecars is USD 66 billion.



F-11 ESTIMATED EVOLUTION OF DEDICATED REINSURANCE SECTOR CAPITAL – 2013 TO 6M 2015



Insurers and public sector buyers are benefiting from the increased supply of catastrophe capacity from reinsurers and are also turning to capital markets and convergence capital solutions to supplement their traditional reinsurance placements. Catastrophe bonds have provided new sources of risk capital where traditional reinsurance markets were not positioned to increase the capacity commitments they made.

Catastrophe bonds issued by public sector entities currently account for nearly 30 percent of the USD 22 billion of total risk capital outstanding in the catastrophe bond market. Further, there is a strong pipeline of potential new entrants taking advantage of the streamlined issuance process while existing public sector entities have renewed and repeated their use of catastrophic bonds and/or collateralized reinsurance. Some are beginning to tranche maturity dates to mitigate refinancing risk.

A summary of public sector catastrophe bond issues is included in the Appendix of this report on page 33.

The Texas Windstorm Insurance Association (TWIA), California Earthquake Authority (CEA) and Florida Citizens exemplify these trends. TWIA has USD 1.1 billion of catastrophe bond capacity in-force representing almost 50 percent of its total risk transfer limit. CEA has USD 850 million of catastrophe bond capacity that represents 20 percent of its total risk transfer limit. Florida Citizens has USD 2.05 billion of catastrophe bonds in-force for the 2015 hurricane season, which represents 53 percent of their total limit purchased. For Florida Citizens, their ability to adequately finance risk has reduced the threat of post-event premium assessments to private-market policyholders (including those who are not Florida Citizens policyholders, including but not limited to homeowners, auto and specialty and surplus lines policies) as a result of Florida Citizens' policy losses from one or more hurricanes.

The fact that significant market capacity now exists to shift the burden from taxpayers to diversified markets is a welcome option to the politically unpalatable post-event scenarios faced by many public entities.

Competition has increased as capital sources entering the reinsurance market have expanded. Buyers of reinsurance have seen costs come down and coverage flexibility increase across the range of reinsurance products available to them. Innovative cover triggers such as the one devised for the Metropolitan Transportation Authority (New York MTA), National Railroad Passenger Ltd. (Amtrak), the Turkish Catastrophe Insurance Pool and the CCRIF demonstrate the ability of the catastrophe bond market to respond to the unique needs of public sector entities. Improved liquidity features and multi-peril loss triggers are being utilized with greater regularity to refine and increase the utility of these products. At the same time, aggregate coverage protection, broader reinstatement and occurrence definition features, as well as innovative coverage features such as second or third-event coverage have been made available by traditional reinsurance practitioners as they look to position themselves against the evolving capital landscape.





The convergence of (re)insurance with the capital markets is a significant development for the private sector's ability to assume and diversify catastrophe risk and assist in de-risking public sector entities. While the growth of this form of reinsurance capital has been strong, it still represents less than 20 percent of total reinsurance capital. When compared with the USD 30 trillion of global pension funds' assets under management, the current level of capital market involvement in ILS is only 0.22 percent of total global pension assets under management. The risk bearing potential of capital markets that now exists for new insurance risk is enormous. The challenge will be to create motivation to transfer risk through a process of risk identification, cost allocation and development of a conduit to transfer risk.

F-12 | PENSION FUND CAPITAL UNDER MANAGEMENT AND ALLOCATIONS INTO REINSURANCE

Global Pension Fund Assets Under Management \$30 Trillion



Source: Guy Carpenter, JP Morgan Asset Management

VI. CONCLUSION

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We have seen significant growth in public sector entities transferring risk to the reinsurance market utilizing traditional risk transfer structures and alternative risk transfer structures such as collateralized reinsurance and catastrophe bonds.

The use of risk transfer capacity is instrumental in many ways. It provides significant savings to public sector entities in years with outsized loss activity and it supplements and protects loss reserve funds/surplus built in years where losses have not exceeded retained premium.

As public entities strive to reduce public debt, there is a clear benefit derived from limiting the risk that natural perils can pose to a state's balance sheet. Governments may be spared the enormous costs following catastrophic loss events. They gain enhanced flexibility to finance economic and social development and build infrastructure, reducing the likelihood of increased taxation and/or assessments/surcharges as a result of the adverse events. These solutions also allow local economies to recover more quickly.

Guy Carpenter, GC Securities^{*} and the Marsh & McLennan Companies are committed to helping our clients understand the evolving landscape while supporting their efforts to engage and take advantage of the promising business opportunities. Moving forward, we believe these opportunities will expand as public and private sector entities work more closely to address the challenges societies must identify and resolve.







APPENDIX

T-4 | SUMMARY OF PUBLIC SECTOR CATASTROPHE BOND ISSUES

Sponsor	Bond Name	Amount	Trigger	Coverage Area/Perils/Details
The California Earthquake Authority	Embarcadero Re Ltd. (2011, 2012) Ursa Re Ltd. (2014, 2015)	USD 1,250,000,000	Indemnity; Annual Aggregate	California Earthquake
Caribbean Catastrophe Risk Insurance Facility	World Bank – CCRIF 2014-1	USD30,000,000	Modeled Loss; Annual Aggregate	Caribbean Hurricane and Earthquake
Citizens Property Insurance Corporation (FL)	Everglades Re Ltd. (2012, 2013, 2014) Everglades Re II Ltd. (2015)	USD2,800,000,000	Indemnity; Per Occurrence (2012, 2013); Annual Aggregate (2014, 2015)	Florida Hurricane
First Mutual Transportation Assurance Company, captive of New York Metropolitan Transportation Authority	MetroCat Re Ltd. (2013)	USD200,000,000	Parametric; Per Occurrence	Storm Surge; Northeast. First bond to include storm surge as a peril
FONDEN (Mexico)	CAT-Mex Ltd. (2006) MultiCat Mexico Ltd. (2009, 2012)	USD765,000,000	Parametric; Per Occurrence	Mexico Earthquake; Mexico Hurricane
Louisiana Citizens Property Insurance Corporation	Pelican Re Ltd. (2012) Pelican Re Ltd. (2013) Pelican III Re Ltd. (2015)	USD365,000,000	Indemnity; Per Occurrence (2012, 2013); Annual Aggregate (2015)	Louisiana Named Storms
Massachusetts Property Insurance Underwriting Association	Shore Re Ltd. (2010) Cranberry Re Ltd. (2015)	USD396,000,000	Indemnity; Per Occurrence (2010) Annual Aggregate (2015)	Massachusetts Named Storms, Severe Thunderstorms, and Winter Storms
NCJUA/NCIUA	Parkton Re Ltd. (2009) Johnston Re Ltd. (2010, 2011) Tar Heel Re Ltd. (2013)	USD1,207,000,000	Indemnity; Per Occurrence (2009, 2010, 2011); Annual Aggregate (2013)	North Carolina Named Storms
PRIL, a wholly owned captive of Amtrak	PennUnion Re Ltd. (2015)	USD275,000,000	Parametric; Per Occurrence	Northeast storm surge and wind as a result of Named Storms; Northeast Earthquakes
State Compensation Insurance Fund	Golden State Re Ltd. (2011) Golden State Re II Ltd. (2014)	USD450,000,000	Modeled Loss; Per Occurrence	California Earthquake (Workers Compensation)
Taiwan Residential Earthquake Insurance Pool	Formosa Re Ltd. (2003)	USD100,000,000	Indemnity; Per Occurrence	Taiwan Earthquake
Texas Windstorm Insurance Association	Alamo Re Ltd. (2014, 2015)	USD1,100,000,000	Indemnity; Annual Aggregate	Texas Named Storms
Turkish Catastrophe Insurance Pool	Bosphorus 1 Re Ltd. (2013) Bosphorus Ltd.	USD500,000,000	Parametric; Per Occurrence	Earthquakes affecting Turkey

Source: GC Securities

GUY CARPENTER'S PUBLIC SECTOR SPECIALTY PRACTICE/ INNOVATIVE SOLUTIONS

Guy Carpenter's Public Sector Specialty practice is a global team focusing exclusively on the unique risk management needs of governmental agencies and entities.

- Guy Carpenter's affiliate, GC Securities*, a division of MMC Securities Corporation, pioneered some of the industry's most
 innovative catastrophe bonds on behalf of public entities, governmental entities and residual market clients. In 2015 yearto-date, we structured and placed a second catastrophe bond transaction totaling USD700 million (the largest catastrophe
 bond completed in 2015 year-to-date) for the Texas Windstorm Insurance Association, providing protection against Named
 Storms affecting Texas; the third catastrophe bond for Louisiana Citizens; the second catastrophe bond for Massachusetts
 Property Insurance Underwriting Association (MPIUA), which assisted MPIUA in converting its entire reinsurance program
 to an annual aggregate structure and provides protection against Named Storms, severe thunderstorms and winter storms;
 and the first catastrophe bond to ultimately benefit Amtrak (the second transaction of its kind after we successfully placed
 a similar catastrophe bond for the New York Metropolitan Transportation Authority in 2013), a Marsh client, which provides
 protection from storm surge and wind from Named Storms and earthquakes.
- Guy Carpenter advises governments in the area of flood risk management as demonstrated by our engagements with Flood Re in the United Kingdom and the completion of the Flood Insurance Risk Study on behalf of the National Flood Insurance Program and the Federal Emergency Management Association in the United States. We have also brought many tools to the market to manage flood risk in Europe and Asia Pac.
- Guy Carpenter assists residual market mechanisms in the United States, helping address exposures presented by the perils of wind and earthquake. We work with facilities that are located in 10 of the 14 states that utilize these facilities.
- On a worldwide basis, Guy Carpenter's Agriculture Specialty practice develops comprehensive reinsurance solutions for agriculture risk. Numerous facilities in this segment of the insurance market have been sponsored by or are governmental entities.
- Finally, we have been actively involved in managing and consulting on terror risk, with involvement in many of the established country pools that exist around the globe.

Guy Carpenter provides a full suite of solutions that can be tailored and customized based on client preferences and needs. Guy Carpenter has the expertise and tools to identify, quantify and help predict the magnitude of risk for the participants in risk transfer transactions.

GC ReBIDSM, Guy Carpenter's proprietary, real-time, online reinsurance auction platform, was designed primarily for the needs of government and public entities. The auction design ensures that the best price is achieved when spending public monies. For those entities subject to strict procurement rules, the instantaneous nature of electronic communication, the transparency of the reinsurance procurement and the auditable nature of the solution facilitate adherence to complex procurement regulations required of governments.

GC MarketplaceSM is a web-based placement solution that facilitates all reinsurance transactions in a dynamic, consolidated view where all correspondence and submissions are organized in one place in one format. Guy Carpenter brokers are able to advise clients, as they track real time quoting behavior of individual markets and marketplaces, by line of business and by region. Clients' decision making is enhanced through this platform, which has over 2,500 reinsurance underwriters participating.

The **GC AdvantagePoint**[®] platform provides portfolio risk management that transforms data and Guy Carpenter's analytics into actionable business strategy to achieve optimal portfolio mix, establish better underwriting discipline and profitable growth.

- GC AdvantagePoint uncovers and visualizes geographic concentrations of risks within a portfolio including potential hazard risk such as terrorism, earthquake, coastal windstorm and/or flood.
- The platform delivers real-time weather event tracking to identify the potential consequences of a catastrophe with "what if" scenario planning to help risk managers set their cat response deployment and manage the claims process.

Provides more-informed risk selection with an in-depth view of a new policy prior to binding through accumulation, hazard
assessment and other metrics delivered direct within the underwriting system.

GC CAT-VIEWSM is Guy Carpenter's satellite-based catastrophe evaluation service that helps conduct rapid loss assessments for major natural catastrophes. The latest imaging and analysis technology provides initial loss estimates within days, enabling quick response to a catastrophe event. By overlaying geocoded client risk location data the solution helps insurers identify which policies have been affected by an event, such as flood, deploy loss-adjusting capabilities and form early estimates of the quantum of loss.

GC Securities* provides capital and M&A advisory services to help clients make the most of their growth opportunities, with the capital advisory services focusing on raising capital (debt or equity), utilizing excess capital, accessing alternative capital and forming new companies. We offer capital markets-based insurance risk transfer solutions for public, governmental and quasi-governmental entities. GC Securities' clients also benefit from Guy Carpenter's deep knowledge and understanding of the (re) insurance industry – intellectual capital accumulated over decades by focusing singularly on the (re)insurance industry.

STRATEGIC ADVISORY (ERM & CAPITAL MODELING SERVICES)

Guy Carpenter's team of enterprise risk management (ERM) professionals provides expertise in both qualitative and quantitative aspects of ERM discipline.

Capital Modeling Advisory

Through our capital modeling services we work with companies to develop in-house capital models. Our standardized service, BenchmaRQ[®], is a prebuilt model that uses industry data and proprietary risk models to enable relative risk profiling and peer analytics. For companies developing their own sophisticated models for accurate absolute risk profiling, Guy Carpenter offers MetaRisk[®] timeline-based capital modeling software.

ORSA Advisory

Guy Carpenter helps clients address ORSA compliance issues, including designing the ORSA Summary Report, applying capital modeling metrics and establishing ERM governance frameworks. We provide the ORSA Readiness Assessment, a resource to management for gap analyses and developmental roadmaps.

Risk Tolerance Advisory

Drawing on our deep knowledge and experience, we assist with the design and review of risk appetite and tolerance statements, which are effectively the company's self-identified speed limits.

Risk Benchmarks Research Advisory

Our Risk Benchmarks Research is based on proprietary analyses of financial results of thousands of insurers over more than 30 years, supplying companies with metrics and insights on market dynamics and techniques used to model insurance risk.

INNOVATIONS

Continuing to bring innovations to the (re)insurance industry and increase private sector involvement, Guy Carpenter is developing a reinsurance product that would allow consumers to purchase additional coverage as little as 48 hours before a hurricane makes landfall. The concept is an innovative way to protect coastal-area residents ahead of major storms while also putting abundant industry capital to work. Companies would use meteorological and risk modeling data to track an approaching hurricane and offer clients the opportunity to buy excess-layer coverage. If the hurricane makes landfall over the client's area, the company would automatically pay claims regardless of whether the storm actually caused property damage. The product is still in the early stages of development.



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ABOUT GUY CARPENTER

Guy Carpenter & Company, LLC is a global leader in providing risk and reinsurance intermediary services. With over 50 offices worldwide, Guy Carpenter creates and executes reinsurance solutions and delivers capital market solutions* for clients across the globe. The firm's full breadth of services includes line-of-business expertise in agriculture; aviation; casualty clash; construction and engineering; cyber solutions; excess and umbrella; excess and surplus lines; healthcare & life; marine and energy; mutual insurance companies; political risk and trade credit; professional liability; property; public sector; retrocessional reinsurance; surety; terrorism and workers compensation. GC Fac® is Guy Carpenter's dedicated global facultative reinsurance unit that provides placement strategies, timely market access and centralized management of facultative reinsurance solutions. In addition, GC Analytics®** utilizes industry-leading quantitative skills and modelling tools that optimize the reinsurance decision-making process and help make the firm's clients more successful. For more information, visit www.guycarp.com and follow Guy Carpenter on Twitter @GuyCarpenter.

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