Spotlight on: Catastrophes - Insurance issues

Catastrophes

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Overview

The term “catastrophe” in the property insurance industry denotes a natural or man-made disaster that is unusually severe. An event is designated a catastrophe by the industry when claims are expected to reach a certain dollar threshold, currently set at $25 million, and more than a certain number of policyholders and insurance companies are affected.

In the United States, over the 20-year period, 1997 to 2016, events involving tornadoes, including other wind, hail and flood losses associated with tornadoes made up 39.9 percent of total catastrophe insured losses, adjusted for inflation. Hurricanes and tropical storms were a close second largest cause of catastrophe losses, accounting for 38.2 percent of losses, followed by other wind/hail/flood (7.1 percent) and winter storms (6.7 percent). Terrorism and fires, including wildland fires, accounted for 5.9 percent and 2.0 percent of catastrophe losses, respectively. Civil disorders, water damage and utility services disruption combined represented about 0.2 percent of losses.

Disaster losses along the coast are likely to escalate in the coming years, in part because of huge increases in development. One catastrophe modeling company predicts that catastrophe losses will double every decade or so due to growing residential and commercial density and more expensive buildings.

Man-made catastrophes such as the attacks on the World Trade Center can also cause huge losses. The attacks led Congress to pass the Terrorism Risk Insurance Act (TRIA) in November 2002. Since its initial enactment, the terrorism risk insurance program has been revised and extended three times. The most recent extension—the Terrorism Risk Insurance Program Reauthorization Act of 2015 (TRIPRA)—ensures its continuation until December 31, 2020. TRIA provided a federal backstop for commercial insurance losses from terrorist acts, making it easier for insurers to calculate their maximum losses for such a catastrophe and thus to underwrite the coverage. TRIPRA renews TRIA. From its inception the program was designed as a terrorism risk sharing mechanism between the public and private sector—with an overwhelming share of the risk being borne by private insurers, a share that has increased steadily over time. Today, all but the very largest (and least likely) terrorist attacks would be financed entirely within the private sector.

The typical homeowners insurance policy covers damage from a fire, windstorms, hail, riots and explosions—as well as other types of loss such as theft and the cost of living elsewhere while the structure is being repaired or rebuilt after being damaged. Commercial property insurance policies generally cover the same causes of loss with some variation, depending on the coverages selected. Flood and earthquake damage are excluded under homeowners policies —separate policies are available—but are covered under the comprehensive portion of the standard auto policy, which more than 75 percent of drivers who buy auto liability insurance purchase. Each year about 7 percent of homeowners file claims.

Recent developments

- **Global Losses 2019:** Aon tallied 409 natural disasters worldwide in 2019, including 158 flooding events and 114 severe weather events. There were 33 tropical cyclones and 32 earthquakes, with winter weather, wildfires, European windstorms, droughts and other perils accounting for the remaining events. Insured losses from natural catastrophes in 2019 totaled $71 billion as of January 2020, down from $100 billion in 2018. Typhoons Hagibis and Faxai—both in Japan—were the largest insured losses in 2019, resulting in $9 billion and $6 billion in losses, respectively.

- **Global Losses 2018:** Aon tallied 407 natural disasters worldwide in 2018, including 116 flooding events and 112 severe weather events. Insured losses from natural catastrophes in 2018 totaled $98 billion as of September 2019, down from $147 billion in 2017. However, it was still the fourth costliest year on record in 2019 dollars. Typhoon Jebi in Japan was the largest insured loss in 2018, resulting in $12.5 billion in losses.

- **U.S. Losses 2019**: P/C insurance industry catastrophe losses in the United States in 2019 dropped by about half (52 percent) to $24.4 billion from $50.9 billion in 2018, according to PCS. Insured losses in 2017 were the highest since PCS began collecting insured loss data in 1949. The number of catastrophes rose to 61 in 2019 from 55 in 2018. The number of catastrophes in 2019 was the highest number of catastrophes in any year with a threshold of $25 million or more in insured losses.

- **Hurricanes 2019:** The 2019 season yielded 18 named storms, six of which became hurricanes, including three major ones (Category 3 or higher, with maximum sustained winds of at least 111 mph). A typical year has 12 named storms, six hurricanes, and three major hurricanes. Hurricane Dorian became a hurricane on August 28 near St. Thomas, U.S. Virgin Islands. By August 30, Dorian had strengthened to a Category 4 storm and became an historic Category 5 storm on September 1 as it made landfall over the Abaco Islands in the Bahamas and later on Grand Bahama Island. Dorian continued to pound the Bahamas into September 3 with devastating wind, rain and storm surge. Insured losses resulting from Hurricane Dorian in the Caribbean are expected to be near $2 billion. Dorian weakened to Category 3 and moved close to Florida's east coast by September 4 bringing storm surge resulting in beach erosion and flooding, and later affecting South and North Carolina. On September 6 Dorian weakened to a Category 1 storm and made landfall at Cape Hatteras, North Carolina, bringing wind, storm surge and flooding to North Carolina and Virginia on its way to New England. Dorian made landfall over Nova Scotia on September 7 as a Category 1 hurricane. Catastrophe modelers estimate industry insured losses in the United States from Dorian to total between $500 million and $1.6 billion. This range includes reinsurance and NFIP losses.

- **Hurricanes 2018:** During the 2018 Atlantic hurricane season 15 named storms formed. Eight of those storms became hurricanes and two of those, Florence and Michael, became major storms, Category 3 and above. Florence, the third hurricane of the season, reached Category 4 status. Florence directly caused 22 deaths in the United States. Catastrophe modelers have estimated that insured losses from Hurricane Florence would range from $2.0 billion to $5.5 billion. Hurricane Michael became a strong Category 5 storm and made landfall in the Florida

Panhandle. It was the strongest hurricane to ever hit the Florida Panhandle and the second known category 5 landfall on the northern Gulf Coast. Michael caused 16 deaths in the United States. The Insurance Information Institute (I.I.I.) estimates that total U.S. insured losses from Hurricane Michael totaled between $9 billion and $12 billion in dollars when it occurred.

- **Wildfires 2019:** The 2019 wildfire season was not as active as 2018. However, in late October significant fires broke out throughout California, leading to the evacuation of over 200,000 people and the declaration of a state of emergency. In 2019 there were 50,477 wildfires compared with 58,083 wildfires in 2018, according to the National Interagency Fire Center (NIFC). About 4.7 million acres were burned in 2019 while there were 8.8 million acres burned in 2018.

- **Wildfires 2018:** In 2018 there were 58,083 wildfires, compared with 71,499 wildfires in 2017, according to the National Interagency Fire Center (NIFC). About 8.8 million acres were burned in 2018, compared with 10 million in 2017. The Mendocino Complex Fire broke out on July 27 in Northern California and grew to be the largest fire in state history with 459,123 acres burned. The Camp Fire broke out in Butte County, Northern California on November 8 and became the deadliest and most destructive fire on record in the state. According to Cal Fire statistics 85 people perished, about 153,000 acres were burned and 18,800 structures were destroyed. The I.I.I. estimates that insured losses from the Camp Fire totaled between $8.5 billion and $10.5 billion in dollars when it occurred.

- **Earthquakes 2019:** In 2019, the sparsely populated Ridgecrest City section of California was struck by a pair of significant earthquakes. On July 4 a 6.4-magnitude “foreshock” earthquake hit the area, followed by a stronger 7.1-magnitude quake the following day, along with a number of aftershocks. The 7.1 quake was the largest to hit the state in 20 years. According to Karen Clark and Co., insured losses from the quakes are estimated to total less than $40 million.

- **Man-made disasters 2019:** Man-made disasters accounted for $6 billion in global insured losses in 2019, down from $9 billion in 2018, according to preliminary data from Swiss Re.

- **Reducing catastrophe Losses:** In March 2014, overcoming earlier efforts by the construction industry to oppose stronger standards, Mississippi passed legislation to upgrade its building codes. Mississippi was one of 18 hurricane-prone states evaluated by the Insurance Institute for Business and Home Safety (http://www.disastersafety.org) for the effectiveness of its building codes.

- The institute is also partnering with the Department of Homeland Security in pilot projects to develop buildings that can better withstand strong winds. Some insurers offer discounts for homes built to the stronger standards.

- **Residual Markets:** In Florida, concentrated efforts to reduce the policy count of Citizens Property Insurance Company is paying off. The insurer of last resort’s policy count is now below one million for the first time since 2006.

- **Florida Hurricane Catastrophe Fund:** The catastrophe fund offers the state's property insurers reduced-cost reinsurance. Currently the fund has the capacity to provide $17 billion in coverage. Although a reinsurance deal could raise premiums for property owners slightly, it would also reduce the risk of the state having to assess taxpayers if the fund ran out of money to pay insurers' claims in the event of a major hurricane.

Top 10 Costliest Catastrophes, United States (1)

($ millions)

Rank	Date	Peril	Location
1	Aug. 2005	Hurricane Katrina	AL, FL, GA, LA, MS, TN
2	Sep. 2017	Hurricane Maria (3)	PR, USVI
3	Sep. 2017	Hurricane Irma (3)	AL, FL, GA, NC, PR, SC, USVI
4	Aug. 2017	Hurricane Harvey (3)	AL, LA, MS, NC, TN, TX
5	Sep. 2001	September 11: Fire, Explosion: World Trade Center, Pentagon terrorist attacks	NY, VA
6	Oct. 2012	Hurricane Sandy	CT, DC, DE, MA, MD, ME, NC, NH, NJ, NY, OH, PA, RI, VA, VT, WV
7	Aug. 1992	Hurricane Andrew	FL, LA
8	Jan. 1994	Northridge, CA earthquake	CA
9	Sep. 2008	Hurricane Ike	AR, IL, IN, KY, LA, MO, OH, PA, TX
10	Oct. 2018	Hurricane Michael (3)	AL, FL, GA, MD, NC, SC, VA

(1) Property losses only. Excludes flood damage covered by the federally administered National Flood Insurance Program. Ranked on dollars when occurred. As of September 30, 2020.
(2) Adjusted for inflation through 2019 by the Insurance Information Institute using the GDP implicit price deflator.
(3) Insurance Information Institute estimate based on data from catastrophe risk modelers, reinsurance companies, the Property Claims Services unit of Verisk Analytics, the Federal Emergency Management Agency of the U.S. Department of Homeland Security, and the Florida Office of Insurance Regulation. These estimates are preliminary because the organizations involved periodically resurvey the events, and the severity of losses and other factors create a high level of uncertainty surrounding the ultimate loss figures.

Source: Insurance Information Institute, catastrophe risk modelers, reinsurance companies, U.S. Department of Homeland Security, the Florida Office of Insurance Regulation,
the Property Claim Services® (PCS®) unit of ISO®, a Verisk Analytics® company, and the U.S. Bureau of Economic Analysis.

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Estimated Insured Property Losses, U.S. Catastrophes, 2010-2019 (1)

Year	Number of catastrophes	Number of claims (millions)	Dollars when occurred ($ billions)	In 2019 dollars (2) ($ billions)
2010	34	2.4	$14.3	$16.7
2011	30	4.9	33.6	38.5
2012	26	4.0	35.0	39.3
2013	29	1.8	12.9	14.2
2014	32	2.1	15.5	16.8
2015	40	2.0	15.2	16.4
2016	43	3.0	21.7	23.0
2017	46	5.3	106.5	111.0
2018	55	3.0	50.0	50.9
2019	61	2.3	24.4	24.4

(1) Includes catastrophes causing insured property losses of at least $25 million in 1997 dollars and affecting a significant number of policyholders and insurers. Excludes losses covered by the federally administered National Flood Insurance Program. As of April 17, 2020.
(2) Adjusted for inflation through 2019 by the Insurance Information Institute using the GDP implicit price deflator.

Source: Property Claim Services® (PCS®), a unit of ISO®, a Verisk Analytics® company; Bureau of Economic Analysis.

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Catastrophes By Quarter, 2019 (1)

($ millions)

Quarter	Estimated insured losses	Number of catastrophes
1	$4,432	11
2	9,416	19
3	5,958	17
4	4,640	14
Full year	**$24,446**	**61**

(1) Includes catastrophes causing insured property losses of at least $25 million in 1997 dollars and affecting a significant number of policyholders and insurers.
Excludes losses covered by the federally administered National Flood Insurance Program.

Source: The Property Claim Services® (PCS®) unit of ISO®, a Verisk Analytics® company.

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Top 10 Costliest Hurricanes In The United States (1)

($ millions)

				Estimate
Rank	Date	Location	Hurricane	Dollars when occu
1	Aug. 25-30, 2005	AL, FL, GA, LA, MS, TN	Hurricane Katrina	$4
2	Sep. 19-22, 2017	PR, USVI	Hurrican Maria (3)	25,000-30
3	Sep. 6-12, 2017	AL, FL, GA, NC, PR, SC, UV	Hurricane Irma (3)	25,000-30
4	Aug. 25-Sep. 1, 2017	AL, LA, MS, NC, TN, TX	Hurricane Harvey (3)	18,000-20
5	Oct. 28-31, 2012	CT, DC, DE, MA, MD, ME, NC, NH, NJ, NY, OH, PA, RI, VA, VT, WV	Hurricane Sandy	18
6	Aug. 24-26, 1992	FL, LA	Hurricane Andrew	15
7	Sep. 12-14, 2008	AR, IL, IN, KY, LA, MO, OH, PA, TX	Hurricane Ike	12
8	Oct. 10-12, 2018	AL, FL, GA, MD, NC, SC, VA	Hurricane Michael (3)	9,000-12
9	Oct. 24, 2005	FL	Hurricane Wilma	10
10	Aug. 13-14, 2004	FL, NC, SC	Hurricane Charley	7

(1) Property losses only. Excludes flood damage covered by the federally administered National Flood Insurance Program. Ranked on dollars when occurred. As of September 30, 2020.
(2) Adjusted for inflation through 2019 by the Insurance Information Institute using the GDP implicit price deflator.
(3) Insurance Information Institute estimate based on data from catastrophe risk modelers, reinsurance companies, the Property Claims Services unit of Verisk Analytics, the Federal Emergency Management Agency of the U.S. Department of Homeland Security, and the Florida Office of Insurance Regulation. These estimates are preliminary because the organizations involved periodically resurvey the events, and the severity of losses and other factors create a high level of uncertainty surrounding the ultimate loss figures.

Source: Insurance Information Institute, catastrophe risk modelers, reinsurance companies, U.S. Department of Homeland Security, the Florida Office of Insurance Regulation, the Property Claim Services® (PCS®) unit of ISO®, a Verisk Analytics® company, and the U.S. Bureau of Economic Analysis.

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Top 10 Costliest Wildland Fires In The United States (1)

($ millions)

			Estimated insured loss	
Rank	Date	Name, Location	Dollars when occurred	In 2019 dollars (2)
1	Nov. 8-25, 2018	Camp Fire, CA (3)	$8,500-$10,500	$8,700-$10,700
2	Oct. 8-20, 2017	Tubbs Fire, CA (3)	7,500-9,700	7,800-10,100
3	Nov. 8-22, 2018	Woolsey Fire, CA (3)	3,000-5,000	3,100-5,100
4	Oct. 8-20, 2017	Atlas Fire, CA (3)	2,500-4,500	2,600-4,700
5	Dec 4-23, 2017	Thomas Fire, CA (3)	1,500-3,500	1,600-3,600
6	Oct. 20-21, 1991	Oakland Hills Fire, CA	1,700	2,900
7	Oct. 21-24, 2007	Witch Fire, CA	1,300	1,600
8	Jul. 23-Aug. 30, 2018	Carr Fire, CA (3)	1,000-1,500	1,000-1,500
9	Oct. 25-Nov. 4, 2003	Cedar Fire, CA	1,060	1,400
10	Oct. 25-Nov. 3, 2003	Old Fire, CA	975	1,300

(1) Property losses only for catastrophic fires. Effective January 1, 1997, ISO's Property Claim Services (PCS) unit defines catastrophes as events that cause more than $25 million in insured property damage and that affect a significant number of insureds and insurers. From 1982 to 1996, PCS used a $5 million threshold in defining catastrophes. Ranked on dollars when occurred. As of September 30, 2020.
(2) Adjusted for inflation through 2019 by the Insurance Information Institute using the GDP implicit price deflator.
(3) Insurance Information Institute estimate based on data from catastrophe risk modelers, reinsurance companies, the California Department of Insurance, and the Property Claims Services unit of Verisk Analytics. These estimates are preliminary because the organizations involved periodically resurvey the events, and the severity of losses and other factors create a high level of uncertainty surrounding the ultimate loss figures.

Source: Insurance Information Institute, catastrophe risk modelers, reinsurance companies, the California Department of Insurance, the Property Claim Services® (PCS®) unit of ISO®, a Verisk Analytics® company, and the U.S. Bureau of Economic Analysis.

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Top 10 States For Wildfires Ranked By Number Of Fires And By Number Of Acres Burned, 2019

Rank	State	Number of fires	Rank	State	Number of acres burned
1	California	8,194	1	Alaska	2,498,159
2	Texas	6,892	2	Arizona	384,942
3	North Carolina	3,872	3	Idaho	284,026
4	Georgia	3,158	4	California	259,148
5	Oregon	2,293	5	Texas	215,493

Rank	State	Number of fires	Rank	State	Number of acres burned
6	Florida	2,121	6	Washington	169,743
7	Arizona	1,869	7	Florida	122,500
8	Montana	1,474	8	Utah	92,380
9	Washington	1,394	9	Nevada	82,282
10	Alabama	1,107	10	New Mexico	79,887

Source: National Interagency Fire Center.

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Background

Megacatastrophes: The insurance industry tracks catastrophes to monitor claim costs, assigning a number to each catastrophe. Each claim arising from the event is tagged so that total industrywide losses can be tabulated. The term catastrophe is often used in the property insurance industry in a narrow way to mean a catastrophic event that exceeds a dollar threshold in claims payouts. This figure has changed over the years with inflation and the increase in development of areas subject to natural disasters. Starting in 1997 the catastrophe definition was raised from $5 million to $25 million in insured damage.

While $25 million is a large figure to most people, there have been five catastrophes that fall into the megacatastrophe category, greatly exceeding that amount.

The first two, Hurricane Andrew (1992) and the Northridge earthquake (1994), were both watershed events in that they were far more destructive than most experts had predicted a disaster of this type would be. The third, the terrorist attack on the World Trade Center in 2001, altered insurers' attitudes about man-made risks worldwide.

Hurricane Katrina (2005), the fourth catastrophe, is not only the most expensive natural disaster on record but also an event that intensified discussion nationwide about the way disasters, natural and man-made, are managed. It also focused attention on the federal flood insurance program, see report on Flood Insurance, as did Hurricane Sandy, the fifth catastrophe, which hit the New York metropolitan area in 2012. While Hurricane Katrina was a stronger storm and caused more damage ($41,100 billion when it occurred compared with $18.750 billion) Hurricane Sandy hit a more populous area so more people, as many as 15 percent of the total U.S. population, experienced the impact of the storm.

Hurricane Andrew: Hurricane Andrew, which hit the Bahamas and Southern Florida August 23-24, 1992, and then moved across the Gulf of Mexico to strike portions of Louisiana and other southeastern states on August 25-26, was the costliest natural disaster in U.S. history before Hurricane Katrina. With peak wind gusts of almost 200 mph, the hurricane flattened whole

communities, leaving in its wake a wasteland of debris. Eleven property/casualty insurers became insolvent due to Hurricane Andrew (10 in Florida and one in Louisiana) and others were financially impaired. Some of the state's largest homeowners insurance companies had to be rescued by their parent companies and others had to dig deep into their surplus to pay Hurricane Andrew claims. Allstate, for example, paid out $1.9 billion, $500 million more than it had made in profits from its Florida operations from all types of insurance and investment income on those funds over the 53 years it had been in business. In total there were 680,239 claims, including 161,400 for damage to automobiles.

The Northridge Earthquake: The Northridge earthquake measured 6.8 on the Richter scale. It jolted the San Fernando Valley, 20 miles northwest of downtown Los Angeles, on January 17, 1994, causing more than 60 deaths and 12,000 injuries and destroying some 8,000 homes. More than 114,000 buildings were damaged and some 430,000 claims were filed. In both natural disasters, Hurricane Andrew and the Northridge earthquake, homeowners accounted for the bulk of claims and claim dollars.

The Destruction of the World Trade Center: The World Trade Center disaster impacted many kinds of insurance companies, particularly commercial lines companies. Claims were also filed with life insurance companies as well as personal lines insurers. The number of people known to have died as a result of the attacks on the World Trade Center complex has been officially set at 2,976. More than 35,000 claims were filed in New York State alone, according to the New York Department of Insurance. Broken down by type, two-thirds were commercial claims and one third personal, mostly property claims. Lost income and extra expense claims for the cost of getting the business back on track, part of property insurance, represented more than one quarter of the dollars paid out. More than 5,600 workers compensation claims were filed. Other claims were paid by insurance companies to businesses that suffered indirect losses in other parts of the country. These were not reported to the New York Insurance Department.

Other large U.S. man-made disaster losses in the last two decades include those stemming from the Los Angeles riots in 1992, at $775 million, and the World Trade Center bombing in 1993, at $510 million, see charts above.

Hurricane Katrina: Katrina, the storm that most affected attitudes about managing natural disaster risk, made landfall first in Florida on August 25, 2005 as a Category 1 storm, then gathered strength as it crossed the warm waters of the Gulf of Mexico, ultimately hitting Louisiana on August 29 as a strong Category 3 storm. The hurricane generated more than 1.7 million claims, more than half of the total in Louisiana. The bulk of the claims, 1.2 million, were for personal property. There were 346,000 claims for damaged vehicles and some 156,000 commercial claims. Claims payments to businesses accounted for half of the $41.1 billion bill for insured losses when the hurricane occurred.

Katrina left more devastation and a higher reconstruction bill in its wake than any previous storm, in part because of extensive commercial and residential development along the Gulf Coast; the record breaking storm surge, reported to be as high as 29 feet in some areas; and the concentration of energy related and other high value businesses in its path. Katrina's

hurricane force winds at landfall covered a wide area, extending for 250 miles, twice as far as Hurricane Andrew. Because the damage was so severe and widespread, the demand for materials and skilled labor quickly exceeded the readily available supply, pushing up construction prices and hence the cost of property insurance claims.

The 2005 hurricane season exposed many weaknesses in the nation's preparedness for megadisasters. For example, many people in flood zones had failed to buy flood insurance, see report on flood insurance, and many communities in harm's way did not have or had not enforced strong building codes, which would have reduced the amount of wind damage. In addition, the disasters drew attention to the need to reconsider land use patterns in areas most vulnerable to storm damage. And as has happened after other major disasters, many small businesses that suffered damage from the storms failed to reopen, in part because they hadn't bought business income (also known as business interruption) and extra expense insurance which would have helped cover income lost when the business was shut down and the expense of getting back on track after the reconstruction period.

Hurricane Sandy: Hurricane Sandy made landfall near Atlantic City along the New Jersey shore on October 29, 2012. Although the storm inflicted heavy damage over a wide area, in part because it collided with another storm, when it hit land it was no longer officially categorized as a hurricane but as a post-tropical cyclone. Hurricane deductibles, which require homeowners to pay a percentage share of the storm damage, therefore, did not apply. Hurricane Sandy prompted a reevaluation of how the New York metropolitan area prepares for and deals with major disasters.

The National Hurricane Center attributed 72 deaths directly to the storm and at least 87 more deaths indirectly due to conditions and accidents caused by the storm. The highest storm surge measured by tide gauges in New Jersey was 8.5 feet over normal levels at Sandy Hook and the highest in New York was more than 12.5 feet at Kings Point on the western edge of the Long Island Sound. Sandy was an extraordinarily large hurricane, according to the agency, with wind gusts felt as far west as Wisconsin and as far north as Canada. Sandy damaged or destroyed about 650,000 homes and knocked out power to 8.5 million customers, the report notes. As with Hurricane Katrina, significant damage was caused by flooding.

Creating a Federal Backstop: After Hurricane Katrina several proposals were introduced to create a federal backstop but, as with bills to add wind coverage to the flood insurance program, none were enacted. Environmental groups joined with a group of insurers in opposing these bills, which both saw as promoting growth in coastal areas prone to storm damage. However, some large insurers supported the concept.

The insurance industry is divided about a federal role. Some say that under the current system the federal government (and hence taxpayers) pay for rebuilding in any case through government grants and low interest loans and that the funds would be better spent in an organized and predictable fashion. Other insurers say that worldwide there is enough reinsurance capacity to protect U.S. primary insurers against catastrophe losses and that people who choose to live in disaster-prone areas should not be protected from the cost of their

decisions through subsidies from people who choose to live in a less risky location. They believe the solution is for Congress and state legislatures to develop more stringent building codes and tax incentives for homeowners to prepare for hurricanes.

Hurricanes: A hurricane's winds revolve around a center of low pressure expressed in millibars, or inches of mercury, and the entire system moves slowly. Hurricanes are categorized on the Saffir/Simpson intensity scale, which ranges from 1 to 5, reflecting a hurricane's wind intensity. Below is the Saffir-Simpson Hurricane Wind Scale.

The Saffir-Simpson Hurricane Wind Scale

Category (1)	Sustained wind speed (mph)	Wind damage	Historical example
1	74-95	Very dangerous winds will produce some damage	Hurricane Dolly, 2008, South Padre Island, Texas
2	96-110	Extremely dangerous winds will cause extensive damage	Hurricane Frances, 2004, Port St. Lucie, Florida
3	111-129	Devastating damage will occur	Hurricane Ivan, 2004, Gulf Shores, Alabama
4	130-156	Catastrophic damage will occur	Hurricane Charley, 2004, Punta Gorda, Florida
5	157 or higher	Catastrophic damage will occur	Hurricane Andrew, 1992, Cutler Ridge, Florida

(1) Category 3 or higher storms are classified as "major."

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Hurricane Center.

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A windstorm becomes a tropical storm when average wind speeds reach 39 mph. The hurricane season runs from June 1 to November 30, but the height of the season is from mid-August to mid-October.

The number and severity of hurricanes seems to run in cycles. Experts now think these cycles are influenced by what is known as the Tropical Multi-Decadal System. Since 1995 conditions have been favorable for increased hurricane activity, as they were during another active period, 1950-1970. Three climatic factors are thought to influence the development of hurricanes. First, during an active period the amount of rainfall during the monsoon season in the Sahel region of West Africa just below the Sahara Desert is higher than average, and rainfall is lower than average over the Amazon basin, creating favorable conditions for winds associated with the development of hurricanes. Second, sea-surface temperatures in the tropical Atlantic Ocean

and Caribbean Sea are very warm. Third, La Nina causes lower than average sea-surface temperatures in the equatorial Pacific. Between 1947 and 1969, a rainy period in the Sahel, 17 major hurricanes (Category 3 or greater) struck the East Coast of the United States, compared with 10 between 1970 and 1991, when the Sahel was experiencing a drought.

New research suggests that the degree of hurricane activity in the Atlantic Basin is not a proxy for the number of storms that are going to make landfall along the U.S. coastline. According to researchers at AIR Worldwide, the probability of landfall is linked most closely to a storm's genesis, or where it forms, rather than the number of tropical storms in the Atlantic. Genesis patterns change from year to year. The key to understanding why in some years the number of storms making landfall in the United States is high and in others it is low is to compare long-term genesis and storm tracking patterns, the AIR study notes.

Florida is the state most vulnerable to hurricanes. Reliable records on hurricanes only go back to the 1870s. Sketchy accounts of earlier disasters exist in ship's logs and journals. Now, geologists, supported in part by insurers, hope to add to the written record by examining sediments at the bottom of coastal lakes and marshes. During a hurricane, sand and shell debris get swept into these waters. Research so far suggests that between 1,000 and 2,000 years ago, there were five or six Category 4 and 5 hurricanes in the Florida panhandle.

Data compiled by the National Oceanic and Atmospheric Administration (NOAA) on the 30 most powerful storms over the period 1900 to 1996 show that more than 40 percent of the damage they caused occurred in southeast Florida. Of the 158 hurricanes that hit the United States, 47 hit Florida and 26 of those struck the Southeast Florida coast.

Recently, computer simulation models have been developed that can mesh long-term disaster information with current demographic data to produce potential claims losses for any given geographical location under various scenarios. This information allows insurers to better differentiate between high- and low-risk areas in states such as Florida, where formerly, in times of less sophisticated risk delineation, the entire state may have been considered high risk. In addition, computer programs designed to help underwriters evaluate a building's potential damage from windstorms allow insurers to price industrial property insurance coverages more accurately. The ability to generate such information has also led insurers to reassess their business strategies.

But quality and type of building construction are not the only factors that influence the extent of damage a windstorm can cause. Others include the number and type of trees in an area and the type of soil, both of which affect the potential for losses due to falling trees. Soft woods, such as pine, tend to have shallow roots so that they are more easily uprooted than hard woods like oak, particularly in places with sandy soil. Storm surges will cause more damage where the developed land is close to sea level rather than elevated.

Coastal Development: In 2017, 94.7 million people, or almost one-third of the total U.S. population, lived in coastal counties along the Atlantic and Pacific Coasts and the Gulf of Mexico, according to the U.S. Bureau of the Census. The U.S. coastal county population grew

15.3 percent from 2000 to 2017. The Atlantic region was the most populated of the three coastal regions, with 129 counties where 44.4 million people lived, and accounted for 13.6 percent of the total U.S. population. The Pacific region was the second most populous, with 70 counties, 34.4 million people and 10.6 percent of the U.S. population. The counties along the Gulf of Mexico was the smallest coastal region, with 56 counties, 15.8 million people and 4.9 percent of U.S. population.

Counties along the Gulf of Mexico grew the fastest between 2000 and 2017, where the population grew 26.1 percent, compared with 15.7 percent for the total United States. One of the Gulf counties, Harris County, Texas, had the fastest population growth of any county in the United States. In counties along the Pacific Coast, population grew 13.5 percent and in counties along the Atlantic Coast, population grew 13.2 percent. Noncoastline county population grew at about the same rate as the total United States, at 15.9 percent.

The growth and concentration of property values in hurricane-prone areas has pushed to the forefront of public policy debates the issue of coastal development and hidden insurance subsidies. Subsidies exist in various aspects of the property insurance transaction.

First, they exist where rates for property insurance are no longer commensurate with risk because it is politically unpalatable to raise rates to actuarially justified levels.

Second, there are subsidies in the pooling arrangements that were set up to make sure people living along the coast can obtain property insurance. When these pools have insufficient funds to pay claims, the shortfall may be picked up by insurance companies, which may then pass the cost on to all property insurance policyholders in the state through explicit policy surcharges, as in Florida, or indirectly in the form of higher property insurance rates.

Third, the federal flood insurance program has paid out millions of dollars to rebuild structures in high-risk zones known as repetitive loss properties, where the cost of claims over the years may have totaled much more than the home was worth. This has contributed to the program's deficit and to continued building in high-risk areas.

Atlantic And Gulf Of Mexico Coastline County Population, 2000-2017

Year	Population (millions)	Year	Population (millions)
2000	51.9	2009	55.9
2001	52.5	2010	56.4

- The Atlantic and Gulf of Mexico Coasts are vulnerable to damage from tropical storms and hurricanes.
- According to the National Climatic Data Center, between 2000 and 2017, hurricanes costing $10 billion or more in total losses occurred in seven of those 18 years: 2004 (Hurricanes Charley, Frances, Ivan and Jeanne), 2005 (Katrina, Rita and Wilma), 2008 (Ike), 2011 (Irene), 2012 (Sandy), 2016 (Matthew) and 2017 (Harvey and Irma).
- Hurricane Maria, which caused an estimated $91.8 billion in total losses in Puerto Rico and the U.S. Virgin Islands, was not included in the tally above because it did not occur in the continental U.S.

Year	Population (millions)	Year	Population (millions)
2003	53.0	2011	57.0
2004	54.0	2013	58.1
2005	54.5	2014	58.7
2006	54.5	2015	59.3
2007	54.9	2016	59.8
2008	55.4	2017	60.2

Source: U.S. Census Bureau, V.2017 Population Estimates and 2000 to 2010 Intercensal Estimates.

U.S. Population By Coastline Region, 2017

		Population		
Region	Number of counties	Number (millions)	Percent of total U.S.	Percent change, 2
Atlantic	129	44.4	13.6%	
Pacific (1)	70	34.4	10.6	
Gulf of Mexico	56	15.8	4.9	
Total coastline	255	94.7	29.1	
Noncoastline	2,887	231.1	70.9	
Total United States	**3,142**	**325.7**	**100.0%**	

(1) Includes Alaska and Hawaii.

Source: U.S. Census Bureau, V.2017 Population Estimates and 2000 to 2010 Intercensal Estimates.

According to CoreLogic, storm surge is ocean water that is pushed ahead of a storm and can cause severe damage. States along the U.S. Gulf of Mexico and Atlantic Basin are potentially vulnerable to storm surge damage. The latest CoreLogic report shows that in 2019, there were 7.3 million coastal homes along the Gulf and Atlantic Coasts, worth almost $1.8 trillion, at risk for storm surge damage. Along the Gulf Coast, 3.1 million homes are at risk from storm surge, and another 4.1 million homes along the Atlantic Coast are at risk. The reconstruction cost value of homes at risk for storm surge damage is $668 billion along the Gulf of Mexico in the United States and $1.1 trillion along the highly populated Atlantic Coast. The reconstruction cost is

based on the 100 percent destruction of the residential structure, using a combined cost of construction materials, equipment and labor costs by geographic location.

U.S. Storm Surge Risk, Gulf and Atlantic States, 2020

	Single-family residential homes potentially affected (1)		Multi-family residential hom
Storm surge risk level (3) (Storm category)	Number of units	Reconstruction cost value (4) ($ billions)	Number of units
Category 1	804,316	$195.10	24,924
Category 2	2,546,714	631.48	87,139
Category 3	4,656,483	1,142.89	165,317
Category 4	6,198,017	1,520.88	236,221
Category 5	7,110,779	1,709.77	252,657

(1) Residential structures less than four stories, including mobile homes, duplexes, manufactured homes and cabins.
(2) Apartments, condominiums and multi-unit dwellings.
(3) The risk categories are cumulative and increase in value from Category 1 to Category 5. Category 1 represents the higher risk of damage from a weak hurricane; Category 5 includes Categories 1 to 4 and the low risk of damage from a Category 5 hurricane.
(4) Represents the cost to completely rebuild including labor and materials by geographic location.

Source: CoreLogic®, a property data and analytics company.

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Catastrophe Deductibles: After Hurricane Andrew, with computer-based models of storms, coastal development patterns and increasing values all indicating how vulnerable insurers were to large weather-related losses, homeowners insurers had difficulty finding the reinsurance coverage they needed to protect their own bottom line. Many homeowners insurers couldn't obtain reinsurance coverage unless they agreed to greatly reduce their potential maximum losses from such events through higher deductibles. These deductibles exist in regions prone to hail as well as hurricane damage. They are generally equal to a percentage of the structure's insured value as opposed to a straight dollar amount, such as $1,000. Eighteen states and the District of Columbia have what have become known as hurricane deductibles.

Percentage deductibles for windstorm losses, which may be mandatory in some coastal areas of a state, vary from 1 percent of the home's insured value to 15 percent, depending on many factors that differ from state to state, and sometimes from insurer to insurer, including the home's insured value and the "trigger," the nature of the event to which the deductible applies. In some states or portions of a state, policyholders have a "buy back" option — paying a higher

premium in return for a traditional dollar rather than percentage deductible. The percentage deductibles may apply to the entire state or just part of it (see Hurricane and Windstorm Deductibles paper).

For hail damage, in addition to instituting percentage of limits deductibles, some insurers in some states are providing coverage for roofs on a depreciated (actual cash value) basis, rather than replacing a damaged roof with a new one. Some are offering a discount for hail- resistant roofs or imposing a surcharge for roofs that are not hail resistant to encourage people to replace old roofs with new, less damageable ones.

Earthquakes: On the West Coast, earthquakes represent the greatest threat. Statistics show that since 1900, earthquakes have occurred in 39 states and have caused damage in all 50. About 5,000 quakes can be felt each year, with some 400 capable of causing damage to the interior of buildings and 20 capable of causing structural damage. A repetition of the 1906 San Francisco (7.8 in magnitude) could cause as much as $100 billion in insured damage. However, a major earthquake on the East Coast, though more unlikely, could cause much greater damage. Because earthquakes in the eastern part of the country tend to be thrust-fault quakes, which produce an up-and-down motion rather than the horizontal side-to-side common in California, damage could be 10 times greater, according to seismic experts. The degree of damage also depends on other variables such as the structure of the building and soil conditions (see Earthquakes: Risk and Insurance Issues paper).

California insurers collected only $3.4 billion in earthquake premiums in the 25-year period prior to the Northridge earthquake and paid out more than $15.3 billion on Northridge claims alone. After the Northridge earthquake, insurers were reluctant to offer homeowners insurance because they feared additional earthquake exposure could potentially bankrupt them. In response to this crisis in the homeowners insurance market, in 1995 California lawmakers passed a two-part bill that allowed insurers to offer a new earthquake policy with a maximum deductible of 15 percent and created a privately funded, state-run earthquake pool.

Earthquake Insurance: Insurers doing business in California must offer earthquake insurance to their homeowners insurance policyholders, either a policy from the California Earthquake Authority (CEA) or, if they do not participate in the pool, a policy that they underwrite. Several dozen companies now write earthquake insurance in California in addition to the CEA. The CEA became operational in December 1996, with a $10.5 billion funding package. The CEA could now pay claims caused by a quake more than twice as destructive as Northridge since with each passing earthquake-free year, its claims paying ability increases. Passage of the CEA legislation opened up the homeowners market (see Earthquake paper). More recently, the CEA created a supplementary policy to broaden coverage. Nevertheless, only a small portion of the state's property owners buy earthquake insurance and the percentage appears to grow smaller as the time span since the last major quake increases.

Tornadoes: Each year, about 1,200 tornadoes with gusts of wind as high as 200 mph touch down in the United States. Tornado intensity is measured by the Fujita scale, which runs from 0 through 5, the most damaging, based on the maximum speed of three-second wind gusts and

the potential for damage. The scale incorporates 28 different damage indicators based on damage to a wide variety of structures from shopping malls to trees. Though generally not as costly in terms of insured values as hurricanes because they strike a more limited geographic area, tornadoes are more frequent. They can cause severe damage and, particularly before the advent of tornado warnings, many deaths. In the decade 1965-1974 they were responsible for an average of 141 deaths each year, compared with 107 in the 10 years 2002-2011. This average was pushed up by the unusually high number of deaths in 2011 (553).

The peak of the tornado season is April through June or July. Spring tornadoes tend to be more severe and strike the Southeast, which is more densely populated than the Great Plains, thus causing more deaths than those in the summer months. In addition, the South has more mobile homes than other regions. Mobile homes are vulnerable to tornado damage.

Since 1990 the number of tornadoes has generally exceeded 1,000 a year. In the three preceding decades, the only year in which there were more than 1,000 tornadoes was 1973, when 1,102 were reported. This increase may reflect greater ability to detect tornadoes.

Wildland Fires: Fire plays an important role in the life of a forest, clearing away dead wood and undergrowth to make way for younger trees. But for much of the last century, fire-suppression policies focused on extinguishing wildfires as quickly as possible to preserve timber and, increasingly, real estate. These policies have led to the accumulation of brush and other vegetation that is easily ignited and serves as fuel for wildfires. In an effort to reduce the incidence of wildfires, increasingly fire officials are promoting “prescribed burns” to eliminate the accumulated debris. In recent years, most of the large fires with significant property damage have occurred in California, where some of the fastest developing counties are in forested areas. However, wildfires are a growing threat in other states, particularly when there is a drought, as more homes are built in woodland areas that were once wild.

Over the past decade, the number of acres burned has increased as drought, record-setting heat and the build-up of dead trees and undergrowth together with residential development have combined to heighten the risk of fire. According to a University of Wisconsin study, in the West more than 8.6 million new homes have been built within 30 miles of a national forest since 1982.

A scientific study published in the September 4, 2007 issue of the Proceedings of the National Academy of Sciences examined the role houses play in the spread of wildfires. It found that making entire neighborhoods of homes fire resistant slows down the spread of fire. The likelihood of fires spreading from one site to another is dictated in large part by the amount and proximity of fuel—flammable materials such as dry undergrowth, trees that burn easily and unprotected wooden structures. When houses are not fire resistant, they add greatly to the fuel load and potential for the fire spreading because they quickly burn down to the ground. When homes are fire resistant, not only are they less likely to burn but they also act as a fire break, reducing the ultimate size of the fire and enabling it to be brought under control more easily. The Insurance Institute for Business & Home Safety (IBHS), (www.DisasterSafety.org) a group supported by the insurance industry, has conducted research into how construction, building

components, landscaping practices and homeowner behavior play a role in the spread of wildfires, using data from insurance companies that insured structures in the “burn zone,” regardless of whether or not they sustained damage.

Fire damage is covered under a homeowners insurance policy whatever the cause of the fire, unless the person insured under the policy commits arson by intentionally setting fire to the structure. As a result of the greater potential for fire losses where homes are built on mountainous and forested sites, insurers are increasingly requiring homeowners whose property is at risk to take precautions to slow the spread of fire. Such measures include installing fire-resistant roofs and creating a “defensible zone” around the home by removing debris, overhanging tree branches and other items located close to the building that can become fuel for a fire.

Building Code Enforcement and Other Damage Mitigation Measures: In the mid-1980s, a study of the damage caused by Hurricanes Alicia (1983) and Diana (1984), two storms of roughly equal size and intensity, found that the level of building code enforcement affected the cost of claims. Hurricane Alicia hit Texas, causing $675 million in insured damage, of which close to 70 percent was attributed to poor code enforcement. By contrast, Hurricane Diana hit North Carolina, where codes were effectively enforced. Researchers found that only 3 percent of homes in that state suffered major structural damage as result of the hurricane. (Insured losses for North and South Carolina totaled $36 million.) This research and a similar assessment of losses in South Carolina after Hurricane Hugo prompted the National Committee on Property Insurance, now the Tampa-based Insurance Institute for Business & Home Safety (www.DiasterSafety.org) to study coastal municipal building code departments in southern states. Researchers found that building officials and inspectors in about half of the communities surveyed were not enforcing the building code wind-resistance standards on their books.

In South Florida, which has one of the strongest building codes in the country, experts estimated that between 25 and 40 percent of Hurricane Andrew losses were avoidable. A Dade County, Florida, grand jury report issued in December 1992 confirmed that much of the damage was due to lax code enforcement, warning that it was a long-standing problem in the state and that the quality of rebuilding in the hurricane devastated area might be even lower.

As a result, the insurance industry began to develop a building code compliance rating system, similar to its fire protection rating system, which dates back to 1916. Under the fire protection classification program, each local fire department's firefighting capability is ranked according to various factors, such as water supply and whether its firefighters are fulltime paid employees or volunteers. The final ranking is incorporated into the property insurance premium rate structure. The building code enforcement ranking process takes into account such things as the size of the building code enforcement budget relative to the amount of building activity, the professional qualifications of building inspectors and past code enforcement levels, with special emphasis on mitigating losses due to natural disasters. Insurers can now offer discounts on property insurance for new construction in communities that enforce accepted building codes. Communities are regraded for building code enforcement every five years.

Through the Insurance Institute for Business and Home Safety (www.DisasterSafety.org) insurers are sponsoring building construction that better withstands natural disasters. Named "Fortified... Home," the program specifies construction, design and landscaping guidelines for homes (and eventually businesses) in areas subject to windstorms, hailstorms and earthquakes. The current program applies to homes now being built. There is also a retrofitting program for existing structures. In Florida, such houses cost from 4 to 9 percent more to build. Surveys show that on average people are prepared to pay up to 6 percent more for a disaster resistant dwelling.

The concept behind this program is twofold: to keep the structure intact and to protect those inside from outside debris, which turns into dangerous missiles in a storm. The more secure the structure, the less storm-generated debris there will be. Some states are initiating programs to help consumers “fortify” their homes themselves, sometimes requiring insurers to offer homeowners insurance discounts for improvements. Efforts to reduce catastrophe damage are not confined to hurricane-prone regions. Homes in areas vulnerable to other types of catastrophes can be protected also and even if discounts are not offered, hail and wildfire-resistant roofs and measures taken to reduce earthquake-related damage make structures in high-risk areas more readily insurable, and because there is generally less damage, lessen the frustrations involved in getting back on track after a disaster.

Reinsurance: Just as individuals and businesses buy insurance to protect their assets, primary insurers, the companies that sell insurance to consumers, buy reinsurance to protect their bottom line. Reinsurance is sold in layers, reaching up into the millions of dollars to protect insurance companies from possible, but statistically highly unlikely events, such as a $100 million court award or an extraordinary number of homeowners claims as a result of a hurricane or a fast-spreading brush fire.

Retentions and coinsurance, through which insurers share the risk at various levels with their reinsurers, as well as coverage amounts have increased dramatically over the past decade. It is now patently evident that the cost of catastrophes, both natural and man-made, can be in the tens of billions of dollars. Hurricane Katrina cost more than $40 billion but a hurricane hit to Miami or a major terrorist attack could cost much more.

Before September 11, terrorist coverage was provided to commercial policyholders essentially without charge because the risk of an attack was considered remote. Immediately following the disaster, reinsurers said they would no longer offer terrorist coverage to the insurance companies they reinsure because they could not price this unprecedented risk. Legislation that made the federal government the reinsurer of last resort for major terrorist attacks was passed by Congress in November 2002 and extended in 2005 for two more years, making it easier for insurers to calculate maximum losses and therefore to underwrite the coverage (see paper on Terrorism Risk and Insurance). The program was reauthorized by Congress at the end of 2007 for another seven years.

The shortage of catastrophe reinsurance capacity in the United States following Hurricane Andrew, particularly for large national insurance companies, also prompted insurers, reinsurers, investment banks and others to look for new ways to spread the risk of natural disasters (see

Reinsurancepaper). Increasingly, the capital markets are being seen as a large resource that can be tapped to cover claims at the higher levels (after reinsurance has been exhausted) where there is a low probability of loss. The advantage to investors is diversification. Catastrophe losses are unrelated to the usual speculative risks, which are generally economic. While the number of transactions involving the capital markets is still relatively small, some observers expect catastrophe risk to be securitized and made available to investors on a regular basis.

Pricing: The price of an insurance policy reflects the costs of paying claims covered by that policy, as well as an insurance company's costs for such items as reinsurance. Not surprisingly, reinsurance costs as well as direct claims costs are lower where the risk is low. For example, if a community has a good fire department and ready access to water to extinguish fires, serious fires in that community will likely be fewer than in similar communities that lack a good fire department. The same principle applies to windstorms: premiums will reflect the normal level of windstorm claims in a given community.

How does the insurance industry deal with extraordinary costs such as the $40.6 billion in insured losses for Hurricane Katrina? Prior to Hurricane Andrew, insurance companies accounted for hurricanes and other catastrophes with a special premium amount known as a "catastrophe loading" to spread the risk over a period spanning 30 to 40 years. Sometimes they used data from several states subject to the same kind of catastrophes to develop the average annual cost of catastrophes. However, since the mid-1990s more sophisticated computer modeling techniques have become available. Insurers now base their rates, in part, on sophisticated computer models that combine meteorological data with their own exposure data. The meteorological data show the probability of a natural disaster occurring in a particular geographical area and the exposure data indicate how many of the company's policyholders are likely to be affected and to what extent, i.e., what the insurer's potential losses from that event are likely to be. Models can also assess the losses a specific company or building might sustain in a terrorist attack.

Insurance for High Risks: The risk of flood, earthquake or landslide damage is not covered under the typical property damage policy. Because the nature of the risk is different, insurers have created special policies.

With auto and homeowners insurance, a very large number of people are exposed to the same risks but only a random few in any geographic area ever experience a loss. Thus the premium of each policyholder is relatively low. With the risk of landslides, floods and earthquakes the situation is reversed. For example, with landslides, few people are exposed to these events but where there is a risk, many living in the area are likely to suffer when a landslide occurs. And only the people in an area vulnerable to landslides are likely to purchase the coverage. So the premium needed to cover all the potential claims must be high. When the premium is high, fewer people purchase it. The same is true with flood and earthquake insurance.

Special Catastrophe Programs: Disaster Damage Coverage in Developing Countries

The Caribbean: Established in 2007, the Caribbean Catastrophe Risk Insurance Facility (CCRIF is an insurance pool that covers hurricanes and earthquakes for its 16 Caribbean member nations and their territories. In 2009 the European Union made a donation to the CCRIF joining the World Bank, the Caribbean Development Bank and a number of developed nations in contributing to the facility's reserve pool. The reserves paid for start-up costs. Japan funded the initial feasibility study.

The CCRIF acts as a mutual insurance company, allowing member nations to combine their risks into a diversified portfolio and purchase reinsurance or other risk transfer products on the international financial markets at a saving of up to 50 percent over what it would cost each country if they purchased catastrophe protection individually. In addition, since a hurricane or earthquake only affects one to three countries in the Caribbean on average in any given year, each country contributes less to the reserve pool than would be required if each had its own reserves.

Members pay premiums based on their probable use of the pool's funds. As countries raise building standards to provide better protection against disasters, premiums will decrease.

Parametric Claim Paying Systems: Because the CCRIF uses what has become known as parametric insurance to calculate claim payments, claims are paid quickly. Under a parametric system, claim payments are triggered by the occurrence of a specific event that can be objectively verified, such as a hurricane reaching a certain wind speed or an earthquake reaching a certain ground shaking threshold, rather than by actual losses measured by an adjuster, a process that can take months to complete. Payout amounts are derived from models that estimate the financial impact of the disaster. As a form of deductible that encourages risk mitigation, participating governments are only allowed to purchase coverage for up to 20 percent of their estimated losses, an amount believed to be sufficient to cover initial needs. In the United States, the first parametric model was sold to the Alabama Insurance Underwriting Association, the state's wind pool, in 2010.

Mexico and MultiCat: In October 2009 the Mexican government became the first to use the World Bank's MultiCat bond program, when it sold $290 million in catastrophe bonds to cover potential damage from earthquakes and Pacific and Atlantic hurricanes. MultiCat provides a common documentation, legal and operational framework for issuing catastrophe bonds, the World Bank says, offering developing countries a cost-effective way to transfer disaster risk to the private sector and lessen the financial and economic impact of natural disasters. A growing number of entities in the public sector have purchased catastrophe bonds recently.

This type of catastrophe bond is known as a disaster recovery bond, see Reinsurance. Disaster recovery bonds are a new type of risk financing tool for the public sector, similar to business income insurance for businesses. They provide short-term liquidity after a catastrophic event, allowing government entities to function and begin recovery efforts at a time when the disaster has shut down much of the economy and its main source of revenue. The bonds are purchased by investors, who receive a good return except when payments to the issuer of the bond are triggered by the occurrence of the event insured against.

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