2020 Catastrophe Review

EXECUTIVE SUMMARY

RMS Event Response Report

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Introduction

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Director, RMS Event Response

A series of typhoon landfalls in the Philippines in late 2020 resurrected the notion of "disaster fatigue" in local media. This effect is likely not limited to just the Philippines – many in the worldwide (re)insurance industry understandably entered 2021 suffering from disaster fatigue.

Most personal and professional lives have undoubtedly been changed by the COVID-19 pandemic. Our thoughts are with those who have been personally affected by this virus, and we look forward to brighter days ahead, with the release of vaccines. Our industry still faces questions regarding the potential financial impacts of COVID-19 and its effects on claims settlement of natural disasters in 2020. It may still be some time before we have concrete answers.

What is already clear, however, is that 2020 was an exceptionally busy year for natural catastrophes. As we now know, pessimistic forecasts of a very active Atlantic hurricane season proved to be, in fact, optimistic. No forecast could foresee the most active season on record, including 30 named storms and 13 hurricanes. Despite experiencing the most named storms to make landfall in the contiguous United States (12), we were spared an industry-changing event such as an Andrew or a Katrina. RMS® projects that the year's six landfalling U.S. hurricanes will cause insured onshore property loss between US$19 billion and US$30 billion, which would make it the costliest season since 2017.

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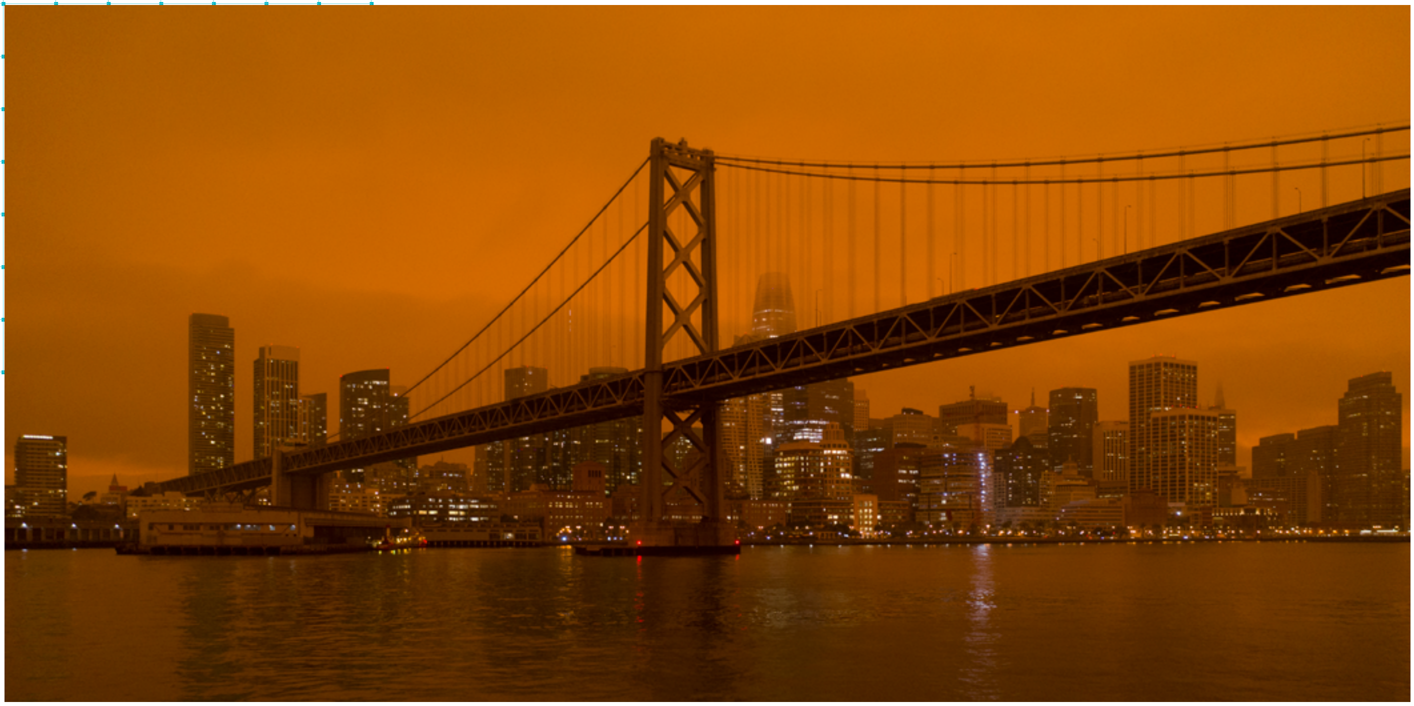
Hurricanes were not the only record-setting phenomenon this year: California, a state with a history of memorable wildfires, suffered its most destructive fire season ever, in terms of total area burned, including five of its six largest fires on record. Similar records were set in Oregon, Washington, and Colorado. Some fires burned entire communities to the ground, in scenes eerily reminiscent of Paradise, California, two years ago. RMS expects that the western U.S. wildfires caused between US$7 billion and US$13 billion in insured damage.



Smoke from the California wildfires settles over the San Francisco Financial District on September 9, 2020, turning the sky dark orange. (Photo CC BY-2.0, Christopher Michel)

Add in several destructive severe convective storms – including a tornado in Nashville, a derecho in Iowa, and an Easter-season outbreak across the Midwest – and the U.S. was the focal point for insured catastrophes in 2020.

In Asia, this year's La Niña event caused more typhoons than usual in South Korea, the Philippines, and Vietnam, with the Philippines in particular hit quite hard. Japan, meanwhile, caught a typhoon respite after two years of exceptional impacts, but the island of Kyushu experienced record-breaking rainfall and floods.

But regardless of the total financial costs, these catastrophes wreaked havoc on property and livelihoods around the world. RMS remains committed to playing its part in helping insurers begin the rebuilding process. In 2020, our Event Response team monitored over 120 catastrophic events, responding to over 40 of the most severe events with custom exposure-based or loss-based products.

One certainty in uncertain times remains the RMS commitment to live event response, ensuring support for our industry and the broader society during critical moments – especially in a year full of them.

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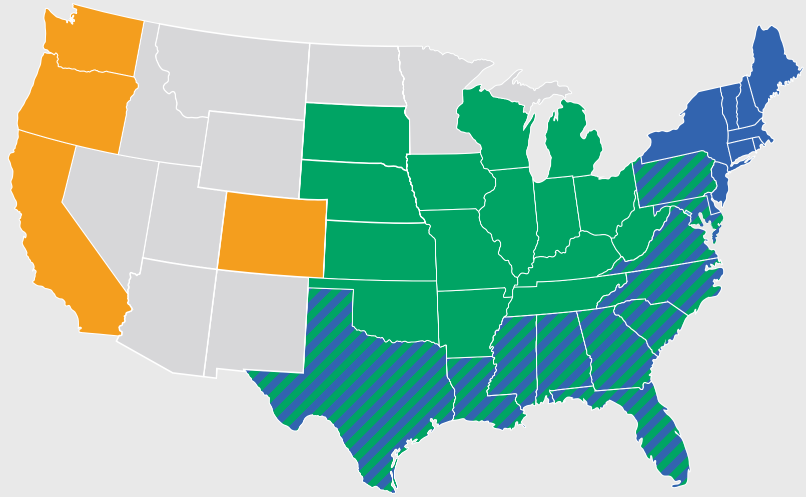
Major Event Loss Estimates Around the Globe

United States

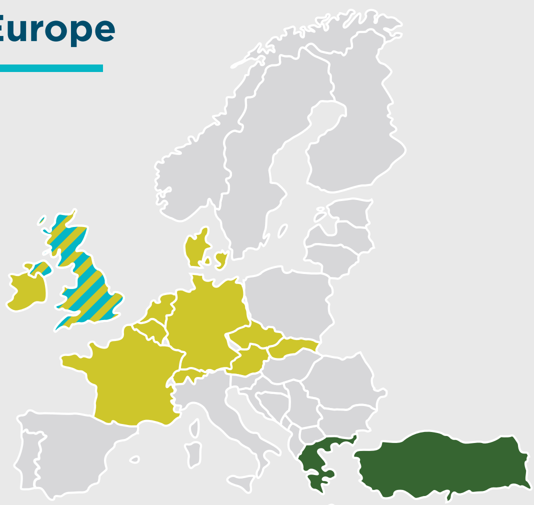
Western U.S. Wildfires:
US$7–13 Billion
RMS Estimate

Severe Convective Storms:
US$30 Billion
Market Estimates[1]

Six Landfalling Hurricanes:
US$19–30 Billion
RMS Estimate



Europe



Windstorm Ciara/Sabine:
€1.1–1.8 Billion
RMS Estimate

U.K. Floods:
£375 Million
Market Estimates[2]

Offshore Izmír Earthquake:
~US$100 Million
Market Estimates[3]

Asia-Pacific

Pacific and Indian Ocean Tropical Cyclones:
- Amphan
- Bavi
- Goni
- Hagupit
- Maysak
- Molave
- Vamco
- Vongfong

Typhoon Haishen and Kyushu, Japan Floods:
~US$2 Billion
Market Estimates[4]

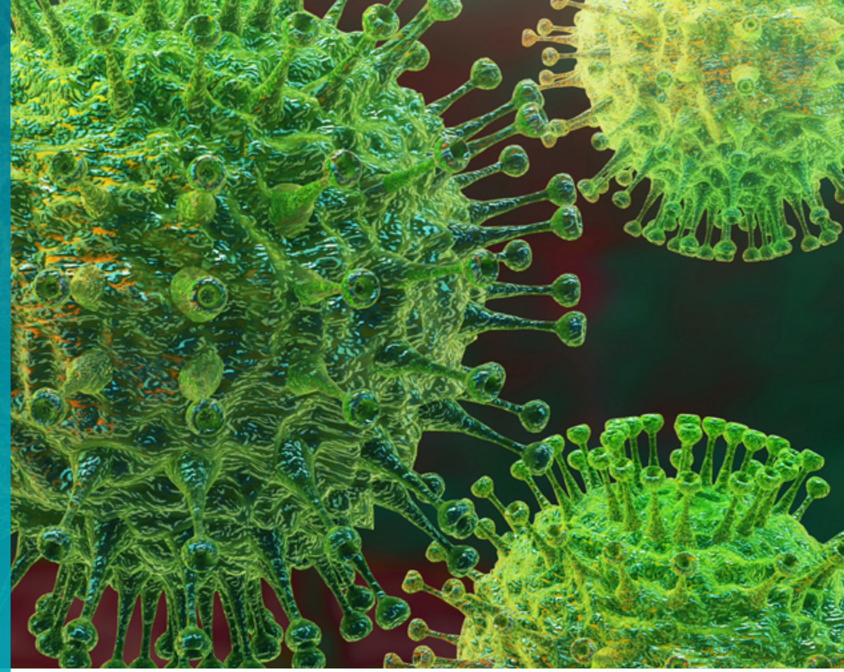
Australia Bushfires:
~US$1.5 Billion
Market Estimates[5]

Australia Hailstorms:
~US$3 Billion
Market Estimates[6]

[1] Munich Re
[2] PERILS
[3] PERILS
[4] General Insurance Association of Japan (GIAJ)
[5] PERILS, ICA
[6] PERILS, ICA

COVID-19: A Look Back at a Year in the Pandemic

Gordon Woo
Catastrophist, RMS



It was back in January 2020 when I wrote a blog about the emergence of a novel coronavirus and the first cases emanating from Wuhan in China. An emerging infectious disease pandemic is the most systemic of all risks, as all 7.8 billion people in the world are vulnerable. The past year has been inevitably dominated by the COVID-19 pandemic, and I have written an overview in the 2020 Catastrophe Review. Entering the second year of this pandemic, according to Johns Hopkins University, so far there have been 103.5 million reported cases of COVID-19, and 2.2 million deaths.

We tend to reference the great influenza pandemic of 1918-19 as the last pandemic, a disease which killed at least 50 million, more people than the First World War. As a consequence, pandemic preparedness for many governments has been predominantly focused on influenza. Most western countries had not experienced SARS (severe acute respiratory syndrome) before.

SARS in 2003

In 2003, a serious outbreak in China of an emerging coronavirus offered a potential blueprint on how to tackle COVID-19. The source of the SARS human infection was a civet cat infected with SARS by a bat. Virological investigations in bat caves in Yunnan Province, in southwestern China, have since revealed that the bats there harbor numerous coronaviruses, including an abundant diversity of SARS-like coronaviruses. In the report, I detail the potential origins of SARS-CoV-2.

SARS is highly lethal: 10 percent of those infected died in the 2003 outbreak. There are differences between SARS and the current SARS-CoV-2, but the approach to contain it now feels familiar. Through diligent and effective contact tracing, the spread of SARS in Southeast Asia and beyond was halted within about six months, and the total number of cases was limited to about 8,000. So, with our knowledge of SARS in 2003, did this shape our approach to tackle the current pandemic, and what successes have we seen?

Reliance on Non-Pharmaceutical Interventions

An essential parameter for epidemiological modeling is the reproduction number (R), which is the average number of people infected by an individual. To quash the R number, as with SARS in 2003, for much of this pandemic we have relied on nonpharmaceutical interventions (NPI). In the absence of NPI, R for COVID-19 is well above 1, which is the threshold for exponential growth of the contagion, with the number

Those countries that had the manufacturing capacity for rapid mass diagnostic testing of COVID-19 have been successful at suppressing the coronavirus.

of cases doubling over a number of days. Easy aerosol transmission of the coronavirus, and the high prevalence of asymptomatic infection, contribute to the high intrinsic value for R.

A basic public health strategy for containing an infectious disease is to test people for the disease, isolate those who have the disease, trace the contacts, and place the diseased in quarantine – and all of these interventions have a long historical record in pandemic response.

Those countries that had the manufacturing capacity for rapid mass diagnostic testing of COVID-19 have been successful at suppressing the coronavirus. A key metric is the number of tests undertaken to find a case of infection. Taiwan, New Zealand, South Korea, and Vietnam have been able to achieve high scores for this test metric and minimize the number of cases.

Social distancing measures help to reduce R, but inevitably, as we have seen, extending to "lockdown" measures causes significant societal and economic disruption. Places of social gathering may be forced to close, and citizens may be instructed to stay at home, avoiding contact with others outside their own household.

There are also many factors influencing the progression of population mortality from COVID-19. Prior to the attainment of population immunity through mass vaccination, the dynamics of the COVID-19 crisis might be represented as a series of waves. All major pandemics have had multiple waves, associated with virus mutation, seasonal weather factors, school reopening, and relaxation of social distancing measures.

The severity of NPI has been guided in each country by the need to prevent an exponential growth in hospitalizations, which would exhaust medical resource capacity, specifically the number of available intensive care units. With a subsequent reduction in hospitalizations, popular pressure to ease NPI restrictions allows the cycle of infection to persist until halted by a vaccine. The use of NPI measures therefore affects mortality, and modeling depends crucially on the stochastic variability in the choice and effectiveness of NPI measures, which all have a major human behavioral dimension.

Any scale of lockdown is a blunt instrument for coronavirus control compared with identifying and isolating those infected, then tracing and quarantining their contacts. Poor contact tracing and noncompliance with quarantine can elevate the reproduction number R and allow the coronavirus to spread exponentially. Conversely, as demonstrated in Southeast Asia, the diligent isolation of sources of contagion can decrease R and suppress the spread of COVID-19.

Looking at Taiwan in particular, it has a population of 23 million but suffered only a few deaths from COVID-19. This was achieved using modern cell phone technology to trace contacts and electronic fencing to ensure 99.7 percent compliance with quarantine. By comparison, until September 2020, U.K. quarantine compliance was only 11 percent, according to an academic survey.

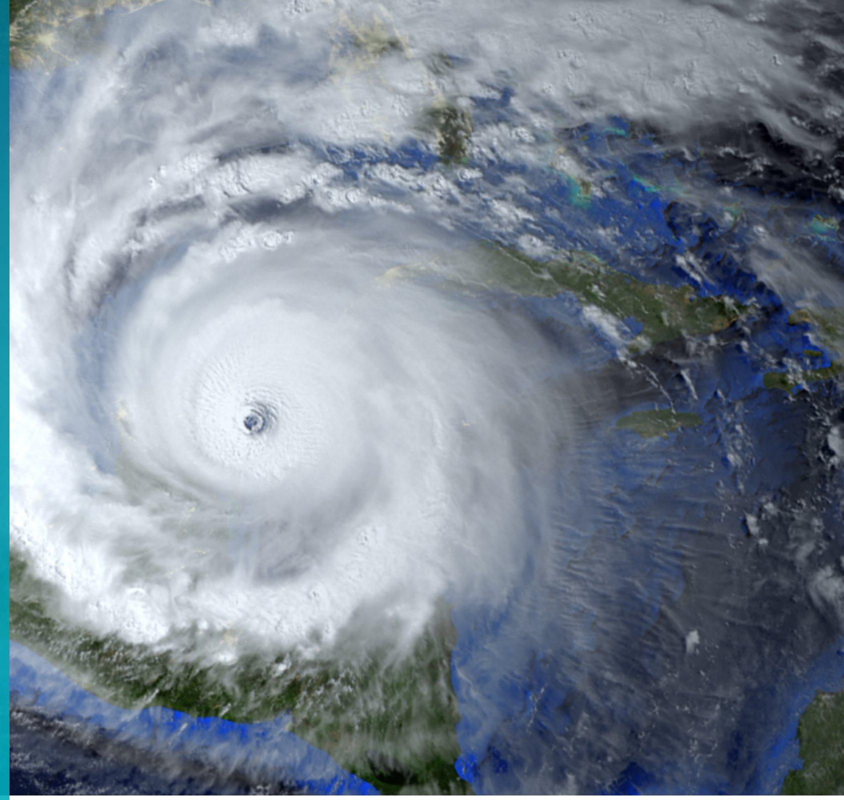
Effective Vaccines

The rapid development – and now distribution, of effective vaccines, and efficacious drugs, now provide new weapons in addition to NPI measures, to provide immunity especially to those particularly vulnerable to COVID-19. The age profile of adult mortality from COVID-19 approximately reflects that of mortality in general; vulnerability increases progressively above middle age, and severe illness among those with comorbidities as typically associated with aging. In the report, I also examine case fatality rates for different countries.

For the insurance industry, this pandemic is still "work in progress" – as a consequence of COVID-19, during 2020 insurers paid out on event cancellation, travel, trade credit, and business interruption policies, as well as life and health policies. With the global COVID-19 crisis ongoing, the extent of insured losses from COVID-19 is still evolving. A discussion will be deferred to the RMS Catastrophe Review of 2021. Apart from paid claims, this will cover aspects of ongoing litigation relating to businesses and organizations that have suffered business disruption as a result of forced closures.

RMS continues to keep clients updated with new pandemic projections. For more information, please contact sales@rms.com as we look to 2021 and the introduction of vaccines and continued adherence to NPI measures to chart a course out of the worst of the pandemic. ■

Gulf Coast Takes Brunt of Record 2020 Hurricane Season



James Cosgrove
Senior Modeler, RMS
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As the most active North Atlantic hurricane season on record, 2020 had a total of 30 named storms –surpassing the previous record of 28 set during the extremely damaging and costly 2005 season. The 2020 season also provided more than twice as many hurricanes than would normally be expected, with a total of 13. During the year, the entire U.S. Gulf and Atlantic coastlines – from Texas to Maine – were on storm alert and under at least one tropical watch or warning (inclusive of hurricane, tropical storm, and storm surge watches or warnings).

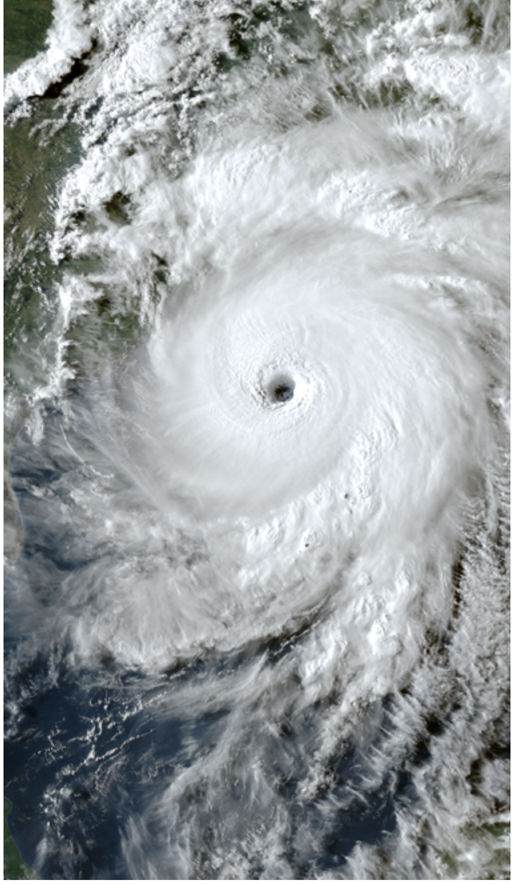
There was potential for such a relentless season to cause significant disruptive losses for the (re)insurance industry. However, the total financial impact from the 2020 storms was relatively limited due to multiple near misses of urban areas and overlapping events. RMS industry loss estimates for all of 2020's storms were roughly on par with losses from just one of the 2017 season's major events.

Of the year's 30 named storms, 12 tropical cyclones made landfall over the continental United States, breaking the previous record of nine, which had stood since 1916. A record-equaling six hurricanes made landfall. The northern Gulf Coast, and Louisiana in particular, bore the brunt of the 2020 season, experiencing six tropical cyclone landfalls. Louisiana saw a record-breaking five named storms. Three of these – Laura, Delta, and Zeta – made landfall at hurricane intensity in the span of just a few weeks, a new record for the state.

In addition, several intense hurricanes made landfall over the same area of coastline in quick succession. In the midst of a global pandemic, this sounds like a worst-case scenario. But for parts of the northern Gulf Coast this year, particularly Louisiana, it was a reality.

Laura and Delta: A Double Blow

In Louisiana, Hurricane Laura and Hurricane Delta made landfall within 15 miles (24 kilometers) and six weeks of each other. Hurricane Laura was the first major hurricane (Category 3 or stronger) of the season. It made landfall near Cameron, Louisiana, close to the Louisiana/Texas border, as a strong Category 4 major hurricane in the early hours of August 27 with maximum sustained wind speeds of 150 mph (240 km/hr). This intensity made Laura the strongest hurricane to make landfall in the state of Louisiana since the Last Island Hurricane in 1856 and the strongest hurricane on record to make landfall between the Bolivar Peninsula of Texas and Marsh Island, Louisiana.



Of the year's 30 named storms, 12 tropical cyclones made landfall over the continental United States, breaking the previous record of nine, which had stood since 1916.

Significant property damage and power line destruction were observed. The U.S. Department of Energy reported that the number of customers without power peaked at over 900,000 on August 27. This is comparable to the peak number of outages observed in the same areas during Hurricane Rita in 2005.

Hurricane Delta then struck the region previously wrought by Laura, as it made landfall as a Category 2 hurricane near Creole, Louisiana, late local time on October 9. RMS conducted virtual reconnaissance to establish the damage caused by these two events. We determined that more than half of the impacted postal codes from Delta were also impacted by Laura; these areas accounted for greater than 90 percent of estimated insured losses in this event.

Sally and Zeta Target the Southeastern U.S.

Before Hurricane Sally, the state of Alabama had not had a landfalling hurricane in 16 years, since Hurricane Ivan in 2004. While Sally's path through the Gulf of Mexico was both slow and erratic, thus hard to predict, it ultimately made landfall as a Category 2 hurricane with maximum sustained winds of 105 mph (170 km/hr) near Gulf Shores, Alabama, on September 16.

Damage from Sally was most severe in coastal cities, notably Pensacola, Florida, where parts of the city were inundated with several feet of water from a combination of storm surge and heavy rainfall. At its peak, Sally caused nearly 500,000 power outages.

Two weeks later, the same region saw Zeta make landfall as a strong Category 2 hurricane near Cocodrie, Louisiana, on October 28, with estimated one-minute sustained wind speeds of 110 mph (160 km/hr), just 1 mph short of Category 3 major hurricane status. Zeta's eye passed directly over the city of New Orleans, Louisiana – the strongest hurricane on record to do this – then crossed Lake Pontchartrain, making a second landfall near Eden Isle, Louisiana.

Zeta caused a peak of 2.2 million power outages and extensive structural damage to businesses and homes in southeastern Louisiana. Jefferson Parish, where some of the storm's strongest winds occurred, reported three breaches of Grand Isle's levee system.

But unlike Delta and Laura, the overlap in the worst-affected areas of Sally and Zeta was minimal – some structures were completely destroyed or severely damaged by Laura and thus could not, or did not,

Pier damaged by Hurricane Isaias in Ocean Isle Beach, North Carolina.

sustain further damage in Delta. Where overlap between Sally and Zeta did occur, structures that sustained some damage in Sally remained exposed in Zeta and experienced additional damage, albeit at lower wind speeds.

Isaias Sweeps Up the U.S. East Coast

The season wasn't entirely focused on the Gulf Coast. In early August, Hurricane Isaias impacted the U.S. East Coast from the Carolinas to Canada, reaching Category 1 strength just before landfall near Ocean Isle Beach, North Carolina, on August 4. Upon making landfall, Isaias quickly accelerated northward along the U.S. East Coast ahead of a deep and unusually strong trough in the jet stream, which was situated over the Midwest and Great Lakes region.

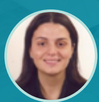
Damage from Isaias was primarily wind driven, though severe structural damage associated with the storm's wind field was minimal and localized. Most observed wind damage consisted of lost or damaged roofs as well as siding damage. Isaias did cause widespread treefall-driven damages and widespread power outages along the U.S. East Coast, especially in the mid-Atlantic and Northeast.

The U.S. Department of Energy reported that the number of customers without power in these regions peaked at over 3.6 million on the evening of August 4. This figure is the highest of any hurricane in 2020 and is comparable to the peak number of outages observed in the same areas during Hurricanes Sandy (2012) and Irene (2011).

The season was quite eventful. The 2021 North Atlantic hurricane season looms – and as early forecasts come through, RMS will publish our initial view of the season ahead on the RMS blog. For more information, visit www.rms.com, email sales@rms.com, or contact your RMS sales representative. ■

A New Normal? Accelerating Remote Event Reconnaissance During a Pandemic

Jessica Benjamin
Senior Modeler, RMS Event Response



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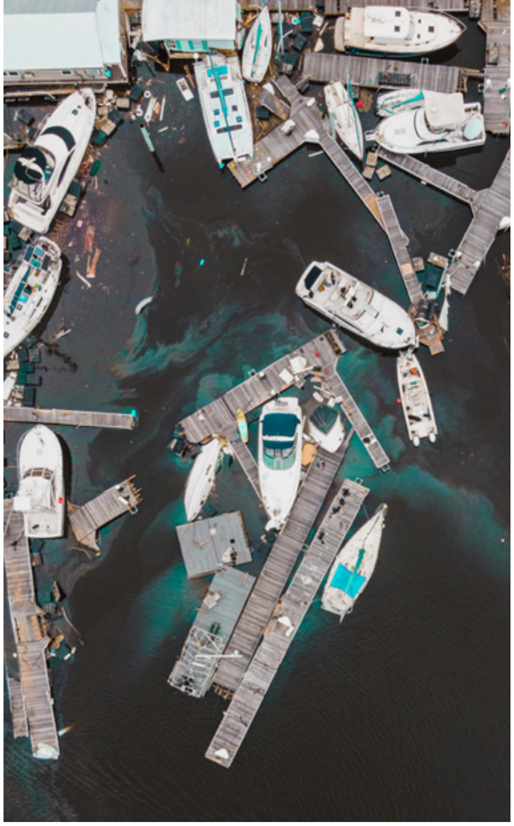
Like many businesses, RMS has had to innovate and rethink how we deliver services to our clients because of the COVID-19 pandemic. RMS Event Response services are relied on by our clients to gauge the impact of a catastrophic event. A potential positive to take from the “new normal” that we find ourselves in is that it has necessitated new thinking and accelerated the use of the latest technology. And, of course, all of this must currently be done while working from home.

When a catastrophe such as a hurricane strikes, RMS modelers, engineers, and vulnerability experts get on their boots and go on the ground as soon as it is safe to do so. Field reconnaissance in the immediate aftermath of an event serves several purposes. It provides an indication of the most prevalent type of damage as well as the general frequency and severity of different types of damage. Reconnaissance also helps us understand the full geographic extent of an event, including the relative contribution by sub-peril (for example, wind, surge, or inland flood).

This on-the-ground reconnaissance is a vital part of the post-event story. That being said, RMS also makes extensive use of remote sources of information – such as high-resolution satellite imagery combined with scouring credible media reports, social media posts, and updates from government and NGO/relief agencies.

During the 2020 Atlantic hurricane season, with many COVID-19 restrictions in place, we knew that we would be more reliant on these remote sources of information. For the (re)insurance industry in general, the pandemic saw a greater emphasis placed on “remote” adjusting. The question, then, was whether these remote techniques were both mature and scalable enough to largely take over from on-the-ground loss adjusters and, in our case, reconnaissance teams.



Reconnaissance helps us understand the full geographic extent of an event, including the relative contribution by sub-peril.

Cutting-Edge Research in Artificial Intelligence and Machine Learning

Our remote capabilities have expanded substantially over the years to take advantage of a growing range of visual and data sources. In 2018, RMS used satellite imagery from the National Oceanic and Atmospheric Administration (NOAA) to visually inspect and tag building damage after Hurricane Michael, with a dedicated team manually tagging 65,000 buildings over four days.

In combination with a robust and expandable RMS algorithm – based on cutting-edge research in artificial intelligence and machine learning – we used images from Hurricane Michael to more rapidly detect and classify damaged buildings across large areas. As described in the RMS report, the algorithm was then refined using data from three other large hurricanes. Using the algorithm, the speed and reliability of our damage tagging continued to improve.

The algorithm was ready for the start of the 2020 hurricane season, and a key test was Hurricane Laura, which made landfall in Louisiana in late August 2020. NOAA released over 3,000 aerial images covering 4 square miles (10.5 square kilometers) over a period of five days from August 27.

Following Laura's landfall, the RMS Geospatial Analysis team tagged more than three times the number of buildings we did for Michael – and in just seven hours – giving a breakdown by causes of building damage (wind, water, or both) and by line of business (residential or commercial). This approach paid dividends given the density of heavy industrial, oil, and gas facilities in the landfall area, and RMS modelers were able to assess high-value facilities quickly and accurately. Going forward, Laura will act as a benchmark event that provided key data and insights into industrial building performance in high winds.

Compared to our experience with Hurricane Michael, following Laura's landfall the RMS Geospatial Analysis team tagged over three times the number of buildings in just seven hours, giving a breakdown of whether the building damage was caused by wind, water, or both, and also by line of business (e.g. residential, commercial). This approach paid dividends given the density of heavy industrial, oil, and gas facilities in the landfall area, and RMS modelers were able to assess high-value facilities quickly and accurately. Going forward, Laura will act as a benchmark event that provides key data and insights into industrial building performance in high winds.

Aerial view of a house damaged by a fallen tree after Hurricane Laura made landfall in Lake Charles, Louisana.

Together with satellite imagery, our team scoured the web for news reports, images, and videos, all of which were cross-referenced with Google Street View to pinpoint the damage locations. We also used an internal web portal to automatically scrape geotagged images from social media feeds and map them alongside our wind and surge footprints as they were being developed.

All these insights were shared with clients immediately post-event in an in-depth report that RMS clients have come to expect following major catastrophic events. These efforts enabled us to maintain a sound, evidence-based approach to validating the RMS U.S. onshore industry loss estimate for Laura (US$9 billion to US$13 billion), even in the face of a global pandemic.

Hurricane Delta Tests Our New Approach

Another test for our new approach came just six weeks later as Hurricane Delta made landfall as a Category 2 hurricane just 15 miles (24 kilometers) east of where Hurricane Laura made landfall. These circumstances raised a unique set of challenges for quantifying the extent of damage and resulting financial loss, as Delta impacted many of the same regions that had already sustained wind and/or water damage from Laura.

We analyzed over 148,000 buildings captured in post-event NOAA imagery and found that around 1,600 of these were impacted by Delta only – the majority of which sustained water damage. Overall, however, we identified a larger influence from the reduced exposure value-at-risk in the overlapping region, suggesting losses attributed to Delta will be lower than had Laura never occurred. This work directly informed our industry loss estimate of US$2 billion to US$3.5 billion, which includes a 15 percent reduction in onshore U.S. losses due to the cumulative impacts of Hurricane Laura.

In-person field reconnaissance will always remain a hallmark of RMS Event Response. Combining on-the-ground reconnaissance, when it resumes, with our digital and aerial reconnaissance techniques will provide a wealth of information unrivaled by other catastrophe model vendors, including a deeper understanding of an event at both the local and regional scale. All of this continues to inform the collective knowledge of RMS Model Development teams as we improve, calibrate, and substantiate our building vulnerability functions and catastrophe models. For more information, visit www.rms.com, email sales@rms.com, or contact your RMS sales representative. ■

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