

The hail risk landscape is changing.

As climate and weather patterns shift, commercial losses due to hail have been increasing. In the past decade, record damages have been registered in Australia, North America and Europe among particularly exposed industries, including high value agriculture, solar plants, and outdoor vehicle storage.

In this paper we explore the evolution of the hail peril in the continental United States, including the underlying drivers of observed trends and impacts for the insurance marketplace.

Evolving trends for hail exposure & opportunities for insurance innovation



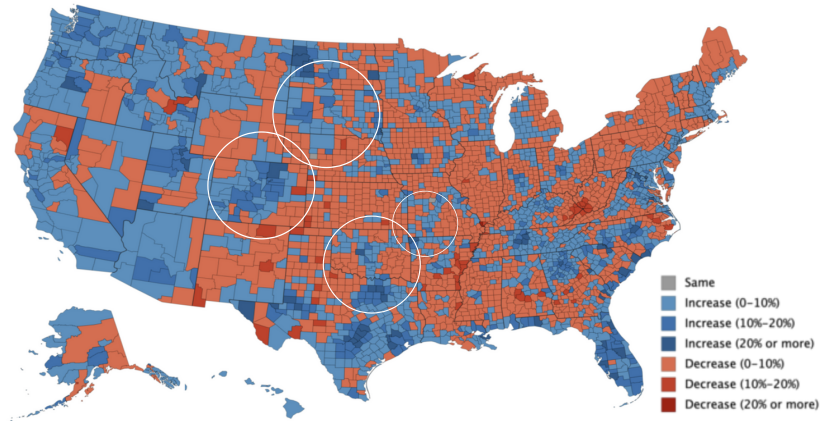
Descartes collaborates with brokers across the world to protect their corporate clients and governments against natural catastrophes, weather, and emerging risks, through a unique data-driven approach.

Population Growth & Industry Expansion, Major Drivers of Exposure Trends

POPULATION GROWTH

In states with a history of high hail prevalence, populations have grown substantially over the past decade. This includes Texas, whose population has grown by 16.4% or 4.2 million people since the last census in 2010. On a percentage basis, Texas' growth rate is second to Utah's 17.4%.

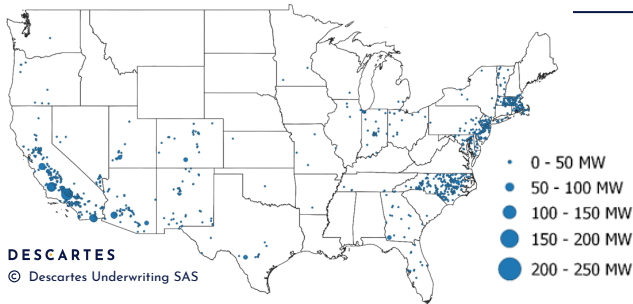
Drivers for population growth in these states include lower costs of living, friendly business environments, climate, and more. Technology has also played a role in shifting populations, allowing workers to be highly effective outside of traditional urban environments, such as NY, Chicago, Los Angeles - a trend accelerated by COVID-19.



Visualization of population change by county in the US
2010-2018

Data Source: US Census Bureau | Author: Jinkinson Smith

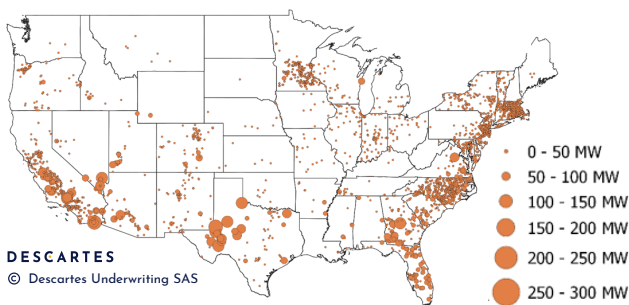
Operating Solar Plants [Dec 2015]



INDUSTRY EXPANSION - SOLAR

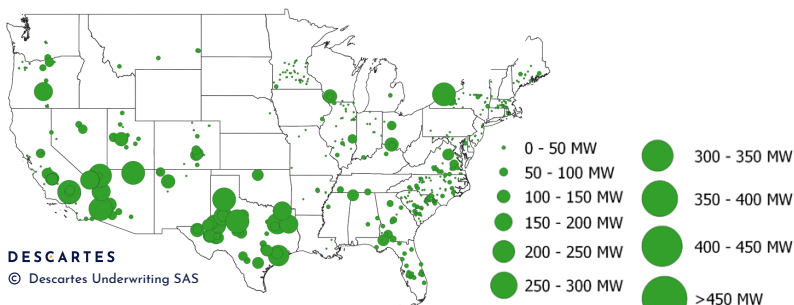
Expansion of industry & commerce in these areas has accompanied the growing populations, with a surge in services and utilities to meet the increased needs of new residents. For example, the renewable energy sector has seen significant growth in recent years, with many large solar farms built or under development in previously sparsely populated parts of the country.

Operating Solar Plants [Dec 2020]



With a larger concentration of assets in these hail prone regions, we see an increase in insured values and, therefore, an elevated level of total losses from a hail event. This also leads to consequential impacts for insurance, as historical ground reports of hail events in such locations were largely insufficient for traditional underwriting.

Planned Solar Plants [Dec 2020]

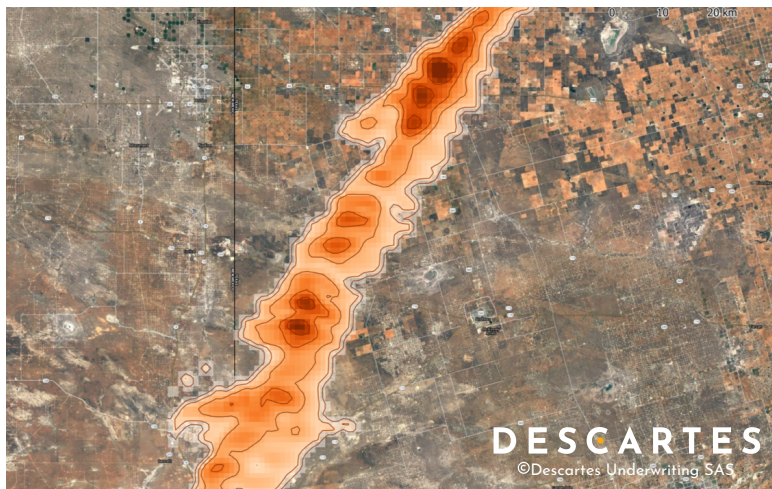


ADVANCING TECHNOLOGY

Fully remote, ultra-granular hail detection thanks to new technologies: a game changer for insurance

The continued advancement of technology related to the reporting and detection of weather events (e.g. doppler radar, satellite imagery, ground sensors, etc.) allows for significantly improved monitoring of severe convective storms. Similarly, hail event reporting has been improving dramatically, both in terms of quality and frequency.

These advances in technology have direct implications for the insurance marketplace, enabling underwriters to more accurately model the underlying phenomenon and reduce basis risk. Access to adequate data allows carriers to price their insurance products in correspondence to the insured's exposure. While the same technology also provides benefits to clients, who are now able to enact a cover which most closely represents their actual experience in future events.



Radar track of a hail event near the city of Andrews, NW Texas (at the border with New Mexico)

This image was obtained thanks to the computation of an algorithm using radar data over several hours. The darker coloring corresponds to larger hail stones.

Climate Change & Future Trends

In States east of the Rocky mountains, historical data and forecasting suggest a trend towards an increased number of days and events with large to very large hailstone size. Over the last two decades, Texas - where most solar farms in the region are located - has experienced a trend of 1-2 more days of large hailstone storms per year. Typically, the larger the hailstones of a given event, the increased likelihood of damage upon impact. Data from both current & future climate studies also indicates a shift in peak season from 'April-May' to 'March-April', leading to the occurrence of severe hail events earlier in the year.

For insureds & insurers, the increased significance of hail as a natural peril has not been rooted in climate change alone. Population growth, as well as the growth of industry & commerce in areas that previously lacked development, has also contributed significantly to the increase in losses from hail year over year.

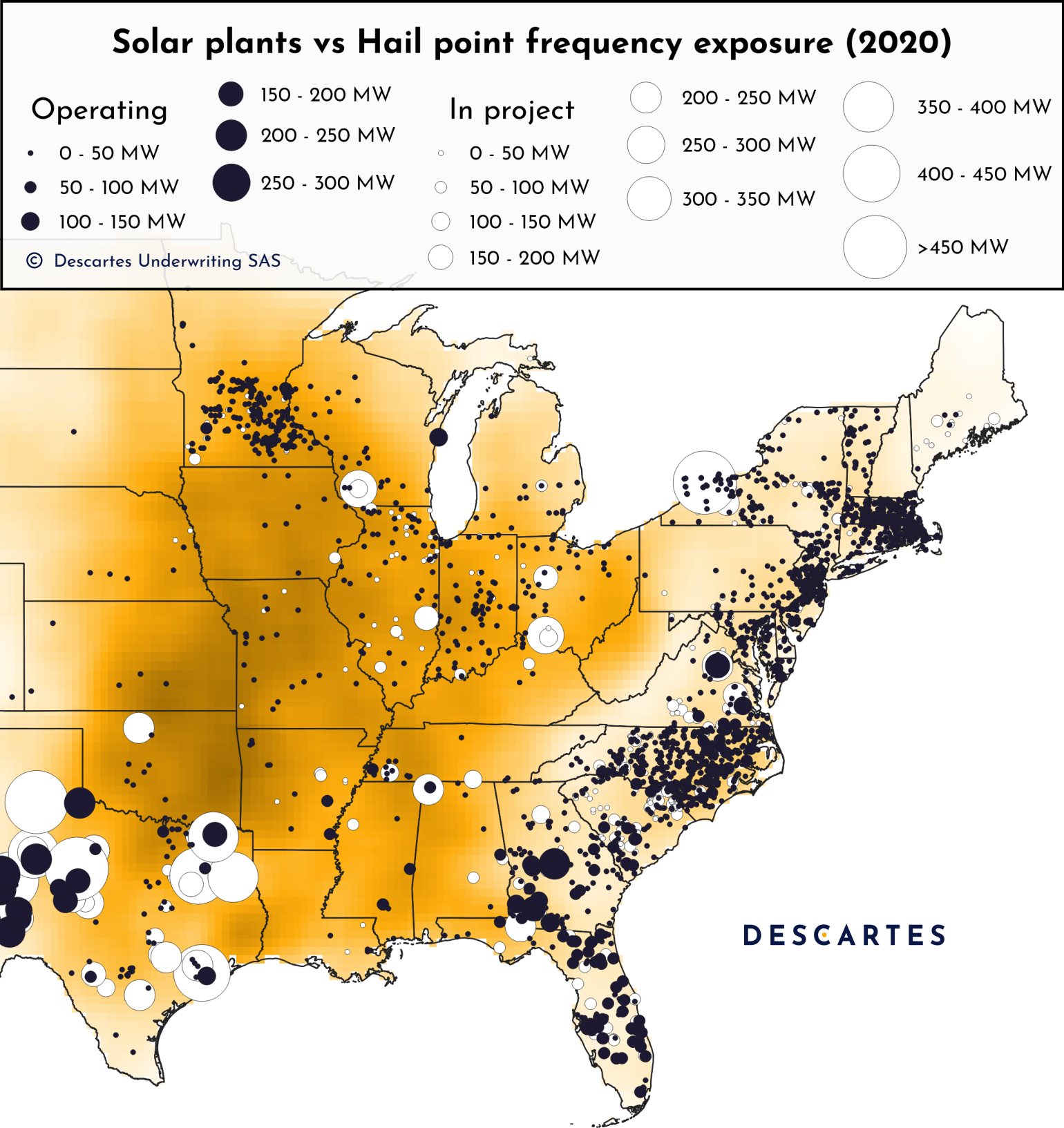
The advent of new technologies and the ability to better measure and track severe weather events is also providing a much clearer picture of the exposure landscape. More effective monitoring of hail events across the country, especially in previously underpopulated or undeveloped areas, and an increased understanding of climate change both suggest a higher risk exposure to hail in the future.



Damage to vineyard grapevines following hail event

PERIL & INDUSTRY EVOLUTION

The visualization below illustrates point hail frequency of hailstones > 0.75 inches in diameter. The point hail frequency is representative of the risk. Notably, the larger this parameter, the higher the frequency of events with hailstone sizes of at least 0.75 in. Thus, the dark colored regions on the map correspond to areas that are more at risk. The team at Descartes utilized 20 years of satellite data to compute this map.





Impacts on the Insurance Marketplace

The growth of industries such as agriculture and energy in places that used to be uninhabited combined with an increase in the severity of hail events carries implications for the insurance marketplace in terms of growing need and basis risk. However, with enhanced modeling and better technology, the insurance industry can rise to meet clients' developing needs.

As we continue to improve our ability to gather more accurate data, we also develop the ability to understand and monitor how hail events will behave at a particular location. Taken together, advancements in data gathering accuracy, modelling and monitoring, enable the expansion of a new generation of parametric insurance products, customized to each client's particular hail exposure needs and offering swift payment in the event of a triggering hailstorm at the client's location.

Here are just a few examples of where we're seeing the biggest impact of these advances within the insurance industry:

AGRICULTURE

In the agriculture sector, greenhouses (a key exclusion for many traditional insurers) and exposures throughout crop production can have dramatic financial impacts for producers. This is particularly the case when the volatility of the peril results in a late season hail storm that damages harvests. Take for example the July 21, 2014 hailstorm in South Michigan or June 27-29, 2017 hail storms at the South Dakota-Wisconsin border which brought large (4 cm hailstones) in conjunction with strong winds, stripping corn stalks bare and pummeling soybean leaves.

Whereas the main loss driver for industrial assets (vehicles, property, etc.) is most often determined by the size of hailstones, damages in agriculture are largely determined by the density of impacts and the vegetation phase. Across fruit varieties, we typically observe severe damages from hailstones above 2 cm, with irreversible damage by hailstones over 5cm for most other crops, vegetables and fruits. For smaller hailstone sizes, even if the fruit doesn't fall from its tree, its value can be diminished by the presence of small impacts on its skin, resulting in a financial loss for the client. The resulting implications for the clients' yield history can have long term effects on their insurance, liabilities, or caps. The evolution and volatility of hail also contributes to pricing volatility.



Anti-hail protective structures in Felonica, Italy

AGRICULTURE CONTINUED

Naturally as loss frequency increases, insurance rates also go up and can become cost prohibitive in certain areas with high peril frequency.

1-2 days

Climate trends indicate that Texas is likely to experience 1-2 more days of large hailstone storms per year

Hail events have trickle down effects on the agricultural supply chain and are not limited to producers alone. For farmers themselves, a large hail event during the growing cycle could result in a loss of crop market participation, leaving them unable to bring sufficient supply to market and potentially causing crop contract cancellations. Further down the supply chain, anyone dependent on the impacted crop also experiences indirect business losses from hail exposure, be it from inadequate supply to meet operational requirements for grain elevators to export contract obligations and more. Parametric programs allow farmers to hedge against their financial risk in a way they haven't been able to with traditional insurance products. Those in the agriculture space can look at their different exposures and really put protection in place for themselves and their crop production.



AUTO DEALERS & PROPERTY DAMAGE

Auto dealers who operate with large open lots find themselves at risk of a hail event. These lots can potentially have tens of millions of dollars of valuable inventory that is both easily exposed and damaged by hail. Impacts to vehicle assets can vary depending on hailstone size and the structural vulnerability of the vehicle part. RV roofs for instance are often made of sandwich panels which are more vulnerable to hail, while peak damages to vehicle bodies can withstand hailstones at 5 cm diameter and vehicle windows at 7 cm diameter.

Equally important in a hail event is roof damage or machine damage stored on roofs. Regions with growing populations such as North Texas and Eastern Colorado, have also seen an increase in commercial businesses and therefore an increase in assets that are exposed to hail.

SOLAR INDUSTRY

Large-scale solar production has dramatically increased in recent years, with solar farms and plants consistently being developed in previously empty parts of the country that happen to be hail prone areas. As discussed in the introduction, this has led to an increase in insured values and damages due to hail. We also generally see a linear correlation between the MW (MegaWatt) output of a given solar plant and that plant's development footprint. The larger the footprint of a solar farm, the larger the risk and ultimate financial impact faced by clients. For example, a solar farm in West Texas endured over \$80M USD of losses following a single hailstorm event in 2019.

\$80M USD

Losses endured by a solar farm in West Texas following a single hailstorm event in 2019

In the US and Europe most solar panels are tested to withstand hail grain sizes between 2.5 cm and 3.5 cm (approximately 1.5 in) during the manufacturing process. With standards such as the IEC 61215, IEC 61646, UL 1703, and UL 61703 commonplace, we've seen solar s

panel manufacturers begin to offer warranties for hailstones up to a certain size. This is particularly the case since solar operations located in hail prone area are less likely to be effective by other perils such as hurricanes or wind. Under the warranty, this trend offers the sector protection from smaller hail, around 1.5 inches or less in diameter, but larger hailstone storms still pose a significant and uncovered risk for plants.

Parametric insurance can provide protection from large hailstone events, e.g. over 1.5 inches in diameter, allowing for coverage outside of panel warranties. Parametrics can also cover microcracks caused by smaller hail events, a phenomenon that is overwhelmingly excluded from traditional covers. Demand is growing for these types of products as solar growth takes a larger share within the energy sector, driving the need for parametric coverage to meet the increased hail risk exposure.

As hail events exhibit larger hailstone size and the 'peak peril' season evolves, the increased damages and losses to all of these industries results in higher pricing, increased deductibles, and pressure on underwriters to better understand these risks. By anticipating where the hail threat is greatest and taking a forward-looking approach to properly underwrite for these risks, parametrics can overcome shortfalls faced by the traditional marketplace. The parametric insurance approach of modelling the underlying phenomenon directly and integration of multiple data sources also improves the accuracy of pricing and loss expectations for clients and carriers, ultimately reducing basis risk.

These industries are examples of where losses are not always adequately addressed by the traditional market and where parametric insurance can play a major role in helping solve problems for business interruption or potential financial loss due to hail.



Interested in learning more about
our parametric hail insurance?

Contact us!

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