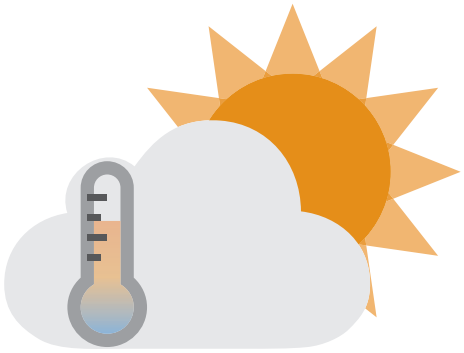
AIR's Climate Change Practice: Assess the Risk of Climate Change to Different Lines of Business

A recent report from the Intergovernmental Panel on Climate Change (IPCC) estimated that on a global basis economic loss would total USD 54 trillion by 2100 with 1.5°C of warming, USD 69 trillion with 2°C of warming, and USD 551 trillion with 3.7°C of warming. While only a portion of these estimates would be related to the property and casualty insurance market and there is enormous uncertainty associated with climate-related projections, the (re)insurance industry is at risk. As payouts increase, so will the price of protection.

AIR

AIR: A Global Leader in Modeling Climate Change Risk

As the leading provider of solutions that are helping organizations achieve resilience in the face of extreme events, AIR is uniquely positioned to assess the risk from climate change and to inform the creation of innovative products and forward-thinking incentives that will mitigate that risk.



Our atmospheric peril models can be used out of the box to assess risk under near-future climate conditions, including any rises in surface temperatures and sea levels that have already occurred.

But the models can also be conditioned for a different climate and thus can also be used for stress-testing intermediate and far-future climate scenarios. The same is true of our life and health, crop, liability, and supply chain models—all lines that will be impacted by climate change.

Perhaps best of all, as part of Verisk, AIR is ideally positioned to leverage the unique data assets of our parent company to develop truly innovative solutions to assess the globally interconnected risk posed by a warming climate to communities, businesses, and individuals.

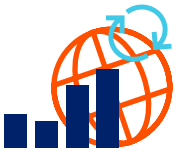
AIR's Climate Change Practice

Since our founding, AIR has been focused on providing defendable, science-based solutions for the most pressing issues facing the insurance industry.

For two decades, we've played an active role in a global community of scientists researching the impacts of climate change. We've collaborated with organizations such as Geoscience Australia (GA), The Met Office (UK), and the Association of British Insurers (ABI) to develop climate change scenarios and quantify the potential losses from them.

AIR has also engaged with insurance regulators to inform their own climate-related stress tests. We were co-authors on the Prudential Regulatory Authority's Practitioner's Aide for a Framework for Assessing Financial Impacts of Physical Climate Change, published in May 2019. Previously, we collaborated on the formulation of the core General Insurance Stress Tests 2019 that included climate change, and we subsequently issued guidance on how to respond to this document.

Our solutions leverage our existing suite of extreme event models, as well as customized solutions developed based on the unique requirements of our clients and partners.



AIR's Extreme Event Models for the Current and Near-Future Climate

AIR's existing natural catastrophe models—and in particular, our weather-related models—reflect the current and near-future climate, and account for any climate change that has already occurred. Many leverage the last 40 years of observational and reanalysis data. That's a period short enough to limit

biases from older data that may represent a climate that no longer exists, but long enough to capture a good representation of interannual variability.

But the models are not bound by the historical record. Because the historical record is short, they allow for the possibility of more extreme events than have been observed in the past and are thus forward-looking. When the models are updated, the most recent data is incorporated, and any statistically significant trends are addressed.

Most insurance and reinsurance contracts are of one-year duration. All AIR models appropriately capture the risk for the year—or multiple years—ahead. However, regulators and risk managers are increasingly concerned with how to plan for a somewhat more distant future. To address that need, AIR offers a wide array of customized solutions to assess and manage future climate change risk.

Custom Climate Solutions for the Intermediate Future and Beyond

The increase in significant weather disasters in the past few years—tropical cyclones, floods, wildfires, droughts—has raised concerns about the risk of climate change. Global climate models (GCMs) estimate that the frequency of a rainfall event like Hurricane Harvey, which inundated Houston in 2017, has increased from every 2,000 years at the end of the last century, to every 325 years today, to a projected every 100 years by the end of this century.

AIR's Climate Change Practice is working closely with other Verisk businesses to enhance our suite of risk assessment tools. We are working with Verisk Maplecroft to provide future climate projections of U.S. hurricane activity—including such metrics as maximum wind speeds by location—by leveraging AIR's climate change–conditioned catalogs. We would then extend this practice into other hurricane sub-perils for the U.S., and other regions impacted by tropical cyclone activities, as well as other weather perils that AIR models, such as inland flood and severe storm.

Besides our standard climate change solutions that are under development, AIR climate scientists and consultants can work with you to create the following customized solutions that capture your organization's climate change risk.

Custom Weather-Related Climate Change Catalogs. AIR scientists develop catalogs that represent future impacts on tropical cyclones, floods, and other extreme types of events for stress-testing based on output from GCMs, observation data, and recent scientific literature. Scenarios are available for our atmospheric peril, pandemic, crop, liability, and supply chain models. Our work for the Association of British Insurers (ABI) in 2017, for example, included assessing the financial impact of changes in storm track frequency and extratropical cyclone intensity across the UK from climate change.

Climate Change Scenarios. It is essential to consider how significant events, like Hurricane Andrew, that have occurred in the past, may manifest in the future because of climate change. Most events are complex, so that it is not known *a priori* how climate change will impact the different ingredients responsible for the event and the different sub-perils that contribute to the loss. AIR can provide limited events sets of an actual event that occurred in the past for today's climate, that is perturbed in various ways to reflect potential impacts from climate change, for clients to understand the sensitivity of which aspect contributes most/least to changes in loss, what scenarios will yield the most significant changes in loss, and what the probability of such an event occurring in a future climate is.

Custom Modifications to Model Parameters. AIR experts in the Global Resilience Practice are working with other climate change scientists and consulting firms to help governments and organizations adapt to and mitigate sea level rise. AIR assisted the City of Miami Beach with its stormwater management plan and developed an innovative algorithm to account for impacts of 1 foot of sea level rise on storm surge by 2050, which results in doubling of the average annual loss.

Exposure Accumulation in Climate-Conditioned Hazard Maps. AIR's Climate Change Practice can develop customized climate-change conditioned hazard maps to account for the future risk of different perils that can be run in Touchstone®. Touchstone's Geospatial Analytics Module enables you to calculate your accumulated exposure in any region to account for climate change impacts. Financial terms can be applied, and damage ratios can be assigned. AIR has developed flood hazard maps and can develop customized hazard maps that would correspond to an environment where climate change has occurred (for example, moving the coastline back by X feet to account for sea level rise).

Climate-Related Liability Footprints. As sea levels rise and more extreme weather events occur, more severe liability claims could emerge. Hurricanes Katrina, Harvey, and Florence all caused significant industrial accidents—oil spill, chemical plant explosion, and water contamination from hog waste and coal ash, respectively. Using climate change scenarios from Arium™ (AIR's casualty accumulation management platform), we calculate and combine the liability losses from each scenario to generate a liability footprint.

Climate Impacts on Life and Health. Climate change will have widespread impacts on human health, from heat- and air quality–related morbidity and mortality to disease spread. Deadly heat waves are forecast to become more frequent and more extreme. Gradual changes in temperature and humidity will continue to exacerbate conditions conducive to the expansion of vector-borne diseases. Most recently, COVID-19 has served to highlight the link between climate change and pandemic.

AIR's Climate Change Practice is leveraging the AIR Pandemic Model along with future temperature and precipitation information from the fifth phase of the Coupled Model Intercomparison Project (CMIP5) to simulate the impact of climate change on vector-borne disease risk.

Climate Impacts on Agriculture. Of all significant human endeavors, agriculture is perhaps the most sensitive to both short-term variations in weather and long-term change in the climate. Daily to monthly extremes in temperature, either too cold or too hot, and variation in rainfall, either too little or too much, each can significantly damage crops. Precipitation in the form of hail, even for periods of minutes, can be destructive. Longer-term climatic changes influence, for better or worse, the suitability of different crops for cultivation in different regions. Projected changes in frequencies and magnitudes of weather extremes would certainly affect future crop productivity.

AIR agricultural risk models use historical data and fundamental biological principles to quantify the effects of weather on crop yield. AIR's Climate Change Practice is using climatic change scenarios from the Coupled Model Intercomparison Project (CMIP) and elsewhere to understand likely impacts of ongoing and future climatic change and increasing atmospheric CO2 on insured-crop losses.

Climate Impacts on the Supply Chain. As part of business sustainability, organizations are looking to future-proof their businesses against climate change. Extreme weather events and sea level rise increase the risk to critical infrastructure that globally interconnected manufacturing and distribution networks rely on. To analyze the impact of climate change on interconnected systems, AIR has developed a supply chain risk modeling framework that can be used to analyze and characterize a range of possible disruption scenarios across the entire value chain. Output can be used to support critical risk mitigation decisions, such as whether to relocate or secure additional insurance placement.

Our Team

In early 2019, AIR appointed our first Director of Climate Change Research, Dr. Peter Sousounis. As the head of our Climate Change Practice, Dr. Sousounis works with a multi-disciplinary team of AIR scientists and consultants to develop AIR's climate change solutions.

Dr. Sousounis is also responsible for performing due diligence on the historical data, identifying statistically significant trends and, with the model development teams, determining how to incorporate them into the models.

AIR is collaborating with a network of scientists from around the world to develop a global atmospheric model that will provide a robust framework to model extreme weather events in a physically consistent manner. This will be a new paradigm in the state of practice for catastrophe modeling and is essential to address future changes to the climate in a scientific manner.

Dr. Peter Sousounis, Vice President and Director of Climate Change Research

Dr. Sousounis received graduate degrees in meteorology from MIT and Penn State and has authored more than 100 publications on weather, climate, climate change, and catastrophe modeling. He has overseen the development of AIR hurricane, extratropical cyclone, and severe thunderstorm models.

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