National Oceanic and Atmospheric Administration
U.S. Department of Commerce



Weather and Climate Data in Retail Asset Protection

Data-Driven Risk Assessment and Decision Making

Updated August 2026

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Executive Summary

Introduction and Background

Retail and other mercantiles (e.g., strip mall centers, enclosed shopping malls, retail food sales) constitute a significant portion of the U.S. commercial floorspace nationwide.[1] As of 2022, the U.S. had approximately 4.6 million retail establishments representing 11.1 percent of all U.S. business establishments.[2] Weather events such as hurricanes, floods, wildfires, tornadoes, and other climate-related hazards can cause massive disruption to the retail industry. These events can put employees, customers, physical assets, structures, and inventory at risk. This makes it essential for organizations to prepare effectively in order to minimize losses.

NOAA is partnering with three major industry sectors to improve the accessibility, usability, and functionality of NOAA data, products, and services. Through the Industry Partnerships program, NOAA is co-developing products based on the explicit needs that users share to improve risk assessment, guide smarter investments, and bolster economic resilience to weather and climate extremes. Through this initiative, NOAA is helping industries lower costs, increase profitability, and support safer, weather-resilient communities nationwide.

Key Findings

For this paper, NOAA's Industry Partnerships team engaged with seven organizations from the retail sector and conducted 13 one-on-one interviews. These interviews captured the environmental data solutions currently used within the sector, explored possible new uses for environmental data, and documented additional user needs. This paper provides an overview of climate and weather data, applications, and opportunities retailers and other sector stakeholders shared during targeted engagements, in the areas of asset protection and risk assessment functions within their operations.

The below table highlights key applications where NOAA's weather and climate data make a significant impact to retail asset protection users.

Stage	Decision	Example Application
Long-Term Strategic Planning	Real Estate Investments	A global payment network and technology supply company uses NOAA's long-term forecasting to evaluate

[1] U.S. Energy Information Administration, "Table B1. Summary Table: Totals and Means of Floorspace, Number of Workers, and Hours of Operation," 2018 Commercial Buildings Energy Consumption Survey (CBECS), December 2021, https://www.eia.gov/consumption/commercial/data/2018/.

[2] PricewaterhouseCoopers LLP (PwC), The Economic Contribution Of The U.S. Retail Industry (PwC, 2024), E-2, calculations based on data from the U.S. Bureau of Economic Analysis, U.S. Census Bureau, and Bureau of Labor Statistics.

		flood risk at potential real estate sites and other risks to assets, which informs investment decisions.
	Site Selection	A discount variety chain uses historical NOAA data on hurricanes, wildfires, and droughts to understand risk at potential store sites which informs decisions about site acquisition.
Before: Planning and Preparing For Weather Event Seasons	Weather Preparedness and Seasonal Planning	A home improvement retailer uses NOAA data for hurricanes, wildfires, winter, and spring to understand seasonal shifts that inform seasonal reorientation of inventory.
	Site-Specific Weather Alerts and Forecasts	A home improvement retailer uses a third party solution provider integrated with NOAA and other federal data to provide them with site-specific forecasts to make data informed asset protection decisions.
During: Real-Time Weather Event Response and Action	Real-Time Risk Assessment	A pet supply retailer uses a third party solution provider that pulls in NOAA data including hurricane, tornado, and other high risk events to assess and prioritize specific events that further inform their communication strategies, employee and pet safety measures, and manage asset protection.
	Real-Time Risk Management	A retail pharmacy utilizes NOAA data to assess smoke and fire hotspots that determine which of their stores need health and wellbeing products and to further communicate safety and asset protection actions being taken.
After: Post-Weather Event Recovery, Evaluation, & Adaptation	Response and Recovery	A retail pharmacy uses NOAA data to determine the locations of Red Cross relief and temporary pharmacies for communities to have access to the prescriptions and care they need during recovery.

Current Partnerships and Retail Environmental Data Needs

Interviewees expressed data needs and opportunities that could support many facets of their asset protection planning, including timely, spatially explicit, and decision-oriented environmental data throughout major weather events and rapid post-event impact analyses to assess damage severity following these events. These retailers and sector stakeholders recognize NOAA data as central to meeting these needs due to national coverage, scientific credibility, and integration with operational forecasting and monitoring systems.

The NOAA partnerships and collaboration reflected in this paper are crucial to understanding and developing sector-specific weather and climate data needs and priorities, and highlight how NOAA is addressing web accessibility, usability, and functionality of its data, products, and services.

Next Steps

Feedback from industry helps expand fundamental observations and foundational research models for NOAA to ensure the data from the science and research is accessible, and builds economic security. For the retail sector, next steps could include, but are not limited to:

- Engaging a broader cross-section of retail—including specialty shops, e-commerce, and small businesses—to understand their specific applications and ensure weather and climate data is accessible across users.
- Deepening sector relationships to further NOAA's commitment to engagement, support mutual risk-sharing, and share information that not only addresses risks but advances commercial innovation.
- Developing additional use cases and applied examples that demonstrate the value of NOAA data, opportunities for improvement, and identify more user needs.

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Introduction and Background

The National Oceanic and Atmospheric Administration (NOAA) is partnering with three major industry sectors to address the web accessibility, usability, and functionality of NOAA data, products, and services. NOAA is co-developing products based on the explicit needs that users share to improve risk assessment, guide smarter investments, and bolster economic resilience to weather and climate extremes. Through this initiative, NOAA is helping industries lower costs, increase profitability, and support safer, weather-resilient communities nationwide.[3]

Since 2021, NOAA has been working with the Retail Industry Leaders Association (RILA) and other sector stakeholders to identify the data, products, and services the industry relies on to make tactical and strategic decisions.[4] In addition to the engagement efforts that support delivering weather and climate data tools to decision-makers, this paper is NOAA's response to a request for resources to help leaders understand current environmental data usage within the retail sector.

In the course of these strategic engagements, the project team applied NOAA's Service Delivery Model (see Figure 1) during the focus on engagement with nationwide retailers and their stakeholders.



The Service Delivery Model emphasizes the criticality of continuous engagement with users, from product inception through delivery.[5]

For this paper, NOAA's Industry Partnerships team engaged with seven organizations from the retail sector and conducted 13 one-on-one interviews. These interviews aimed to capture the environmental data solutions currently used within the sector, while also exploring possible new uses for

[3] "Our Impact," National Centers for Environmental Information, accessed August 12, 2026, https://www.ncei.noaa.gov/about/our-impact.

[4] "Retail," National Centers for Environmental Information, accessed August 12, 2026, https://www.ncei.noaa.gov/about/our-impact/retail.

[5] National Oceanic and Atmospheric Administration, A Model of Service Delivery for the NOAA Water Initiative: A Proven Method for Integrating Decision Support and Service Delivery (Silver Spring, MD: National Oceanic and Atmospheric Administration, 2020), https://www.noaa.gov/sites/default/files/2022-02/A-Model-of-Service-Delivery-for-the-NOAA-Water-Initiative_FINAL.pdf.

environmental data, and documenting additional needs detailed by sector stakeholders. **This paper provides an overview of climate and weather data challenges and NOAA informed solutions that some retailers shared during these engagements, specific to asset protection functions of their operations. Some interviewees' responses were anonymized to protect company confidentiality.**

Retail Real Estate by the Numbers

The retail sector is a critical pillar of the U.S. economy and in 2025 accounted for approximately $2 trillion in direct Gross Domestic Product (GDP) contributions.[6] Retail operations encompass a significant concentration of U.S. physical assets, including real estate, and are highly dependent on storefronts, distribution centers, fulfillment facilities, and supporting infrastructure to support overall business success. Retail constitutes a significant portion of the U.S. commercial floorspace nationwide[7] and, as of 2022, the U.S. had approximately 4.6 million retail establishments representing 11.1 percent of all U.S. business establishments.[8]



U.S. retail by the numbers (2022)
Source: (National Retail Federation)

In 2022, retailers spent an average of 7.6 percent of their total operating expenses on building repairs and real estate lease and rental payments, making it the third largest operating cost category.[9] In addition, the Nationwide 2025 Commercial Lines Protection Survey found 73 percent of survey respondents who represent commercial property owners listed severe weather impacts to their property as a top concern, and 32 percent experienced damage from severe weather in the past five years.[10] The top five types of damage reported were broken windows, structural damage, damaged electrical systems, roof damage, and business interruption.[11] This highlights the retail sector's exposure to risks affecting both real estate and other assets within the retail properties.

Impact from Weather-Related Extreme Events

Weather is one of the pivotal factors shaping retail sector performance and events such as hurricanes,

[6] U.S. Bureau of Economic Analysis, "Value Added by Industry," Interactive Data Tables, accessed September 23, 2026, https://apps.bea.gov/iTable/.

[7] U.S. EIA, 2018 CBECS.

[8] PwC, The Economic Contribution Of The U.S. Retail Industry, page number.

[9] U.S. Census Bureau, "Estimated Detailed Operating Expenses of U.S. Retail Firms by Kind of Business: 2017" and "Estimated Detailed Operating Expenses of U.S. Retail Firms by Kind of Business: 2022," Annual Retail Trade Survey (ARTS), https://www.census.gov/programs-surveys/arts/data/tables.html.

[10] The paper authors acknowledge that this is an area in need of further research; while the Nationwide survey is used to illustrate the challenges commercial property owners face, the methodology limits the universality and generalizability of results. According to the survey methodology, approximately 100 respondents represented commercial property owners. Despite these limitations, this study is regularly used across the industry and is generally accepted as a starting point for additional research.

[11] Nationwide. “May 2025 Nationwide Agency Forward Commercial Lines Protection Survey.” May 2025.https://news.nationwide.com/download/ea5b4633-5946-416e-923d-1b865caa5b0a/2025clprotectionreport-newsroom.pdf?utm_source=NWNewsroom&utm_medium=Newsroom&utm_campaign=NWNewsroom

floods, wildfires, tornadoes, and other climate-related hazards can cause massive disruption to the retail industry. With physical assets, structures, inventory, employees, customers and sales at risk, retailers can leverage weather and climate data to support positive business outcomes.

NOAA's conversations with retail stakeholders spotlight how leaders are increasingly recognizing the growing risks associated with extreme weather impacts on their assets. These retailers also recognize that the resilience of their business and decisions before, during, and after extreme weather events can and does cause a ripple effect on the resilience of their personnel and the broader communities they serve. Across these discussions, the team found that there is a complex balance between workplace safety, personnel preparedness, and business continuity planning, which requires responsive risk management and asset protection strategies by sector stakeholders. Retail risk management allows leaders to identify, assess, and mitigate potential threats– including real estate risk– that could influence financial performance, operations, or brand reputation.

> "Retailers' ability to prepare for and respond quickly to extreme weather events … is critical for the broader communities that they're operating in."
>
> Jessica Dankert, Vice President, Supply Chain, Retail Industry Leaders Association (RILA)

Using Data for Risk Assessment and Asset Protection

Asset protection "is a function of organizational management, and as such security professionals are often expected to provide technical expertise in efficient and effective security risk management activities. The quality of the overall protection effort will depend on the organizational environment, assets, threats, vulnerabilities, and the organizational leadership commitment to managing those risks."[12] By leveraging risk assessment and strategic analysis, data empowers retail decision-makers and their stakeholders to make confident decisions—from annual planning to the critical windows before, during, and after weather events. The following sections highlight use cases on how risk management experts leverage trusted historical, real-time, and forecasted weather and climate data to make agile, informed decisions.

Long-Term Strategic Planning

Interviewed retailers use NOAA's historical climatological data to develop internal climate risk dashboards, which inform their investment decisions, risk management, and asset protection strategies. Retailers often contract third-party design and engineering firms to build these dashboards, which overlay environmental data—such as historical data about flooding, extreme temperatures, and precipitation—with store and distribution center locations to translate hazard information into site-specific exposure assessments. Some retailers' dashboards go beyond the company's current assets, allowing retail real estate and portfolio teams to utilize historical hazard data to evaluate the suitability of prospective sites and assess long-term exposure.

[12] Jim Ellis, Christopher A. Hertig, and Robert Metscher, "Concepts and Evolution of Asset Protection and Security," in The Professional Protection Officer, ed. International Foundation for Protection Officers (Elsevier, 2020), 1–21.

Use Case: Real Estate Investments

A global payment network and technology supply company uses NOAA data including Climate Normals and Global Historical Climatology Network daily within their climate risk program for long-term forecasting to assist with processes such as evaluating flood risk at potential real estate sites and other physical risk to assets. They shared that this data helps them develop, internally analyze, and propose solutions for their sites–such as investing in an HVAC that has better ratings against extreme temperatures or windows that reflect sunlight more efficiently–enabling resilience in the face of extreme weather conditions. The company utilizes NOAA data along with Arcadis, a third-party data provider, and on-site weather stations to generate easily interpreted data and risk scores, as well as understanding what real-world events might look like when impacting certain locations.

Similarly, this company uses NOAA extreme temperature data such as National Weather Service (NWS) HeatRisk to support asset safety and resilient infrastructure readiness. To do this, they monitor temperature anomalies, especially considering heat waves, to ensure adequate cooling, test HVAC systems, and provide water and other protective resources for employees. Integrating NOAA environmental data such as Global Historical Climatology Network daily (GHCNd), U.S. Historical Climatology Network (USHCN), NOAAGlobalTemp, Local Climatological Data (LCD), and Storm Events Database (SED) with modeling and operational thresholds also assists with informing decisions related to ventilation adjustments, occupancy limits, and temporary closures. These data-driven actions reduce health and safety risks, minimize asset degradation, and support compliance with environmental and labor regulations, underscoring the central role of NOAA data in resilience and hazard response.



Shopping mall impacted by flooding;

Source: TerryKelly, via GettyImages

One challenge the retail sector faces when making real estate investment decisions is integrating environmental risk information with complex, cross-functional business interests. Select retail leaders

noted that decisions regarding site selection or reinvestment into resilient infrastructure designs in existing facilities are typically informed by a combination of revenue potential, historical performance, customer demographics, and exposure to environmental hazards; emphasizing that NOAA data plays an important part in optimizing site selection.

Use Case: Site Selection

A discount variety chain utilized NOAA data to inform the decision-making process during site acquisition. The company worked with consultants to develop a company-specific climate risk dashboard, pulling historical NOAA data from across multiple weather events and natural disasters such as hurricanes, wildfires, and droughts to generate a risk assessment for stores and potential sites across the country. The company portfolio and facilities teams then use this data for making decisions about site acquisition, facility planning, and enhancing the resilience of flood-prone buildings against the effects of future natural disasters. The company takes many factors into consideration, including repair costs, property viability and equipment upgrades, which vary by climate zone.

Before: Planning and Preparing For Weather Event Seasons

Prior to severe weather events, business decision-makers prepare for potential property loss, damage, or both. Preparing for extreme weather events supports business continuity when disaster strikes.

Use Case: Seasonal Planning

A home improvement retailer looks at the year as a whole with four distinct planning seasons, including hurricane, wildfire, winter, and spring when planning for weather events. They integrate weather and climate data into their seasonal planning by utilizing NOAA tools from the NOAA NWS Storm Prediction Center (SPC), the National Hurricane Center (NHC), and the Climate Prediction Center (CPC). For them, season-specific forecasts such as those from CPC are critical not only for monitoring hazards, but also for seasonal reorientation of inventory. A representative said, “I can’t tell you how often I have people reaching out asking when spring is going to hit. When are we going to see signs?” In this context, for many retailers, “being able to forecast good weather is almost as critical as forecasting bad.” This seasonal planning helps them not only protect their employees, customers, and their over 2,000 store and corporate locations nationwide, but additionally allows them to stage products, materials, and communicate plans throughout their network of merchants and vendors.[13]

Once logistics and operations leaders have their annual seasonal plans in place, a significant component of effective preparedness is ensuring they have effective training, alert, and communication channels in place.

[13] Lowe’s Newsroom. 2022. "How Lowe’s Command Center Prepares and Responds to Natural Disasters." September 30, 2022. https://corporate.lowes.com/newsroom/stories/inside-lowes/how-lowes-command-center-prepares-and-responds-natural-disasters

Use Case: Site-Specific Weather Alerts and Forecasts

A home improvement retailer monitors weather across 131 location data points for each of their 2,000 asset locations with forecasts provided every hour by Accuweather for Business. This alert system, integrated with NOAA and other federal data, provides site-specific forecasting for weather events, along with departures from normal for all locations. Once the retailer's team has identified a hazard as a potential impact to their assets, they monitor NOAA for forecast changes and updates. From there, they can prepare to initiate their premeditated action plans upon imminent impact.

This retailer attributes its pre-event success to annual strategic planning that prioritizes four distinct seasons—hurricane, wildfire, winter, and spring—and includes an end-of-year survey for leaders to discuss company wins and potential areas of opportunity. These planning steps allow the retailer to stand by for forecasts closer to event impact (typically 3-8 days pre-impact) when forecast certainty increases. These annual planning measures strengthen the retailer's preparation for potential events and the development of operational strategies, while the more accurate forecasts—days ahead of the event—allow the company to take precise, site-specific action. This retailer further noted that, "If we are having to scramble 14 days in advance around the storm…we have failed in our strategy."

During: Real-Time Weather Event Response and Action

During weather events, retail stakeholders shift from strategic planning to real-time monitoring and response, using updated data tools to manage weather risks impacting employee and customer safety and physical assets. During such events, these leaders shared that they assume roles in their companies' emergency operations structures.

During large-scale weather events, these leaders rely on NOAA's real-time data such as NWS NHC, National Weather Maps, and Geostationary Operational Environmental Satellite (GOES) Satellite Image Viewer, to guide time-sensitive decisions related to risk assessment, employee safety, and continuity of essential services. Asset protection decision-makers overlay watches, warnings, and forecast cones with store locations in geospatial platforms to determine when to advise customers to acquire things like prescriptions or other essential needs, when to modify operating hours, and when to close facilities to protect staff. To assist with real-time data, NOAA data products fill numerous gaps.

These kinds of integrated decisions support tools assist in translating environmental data into actionable, facility-level guidance. Retail stakeholders use hazard dashboards that incorporate NOAA forecasts, storm tracks, wind fields, and hurricane models to assess potential impacts across store networks and to inform protective actions. These tools further support decisions such as evacuating or safeguarding in-store assets, repositioning inventory, and implementing flood or wind mitigation measures. Automated alert systems including text-based notifications for tornado touchdowns enable rapid identification of site-specific risks and activation of predefined crisis management playbooks.

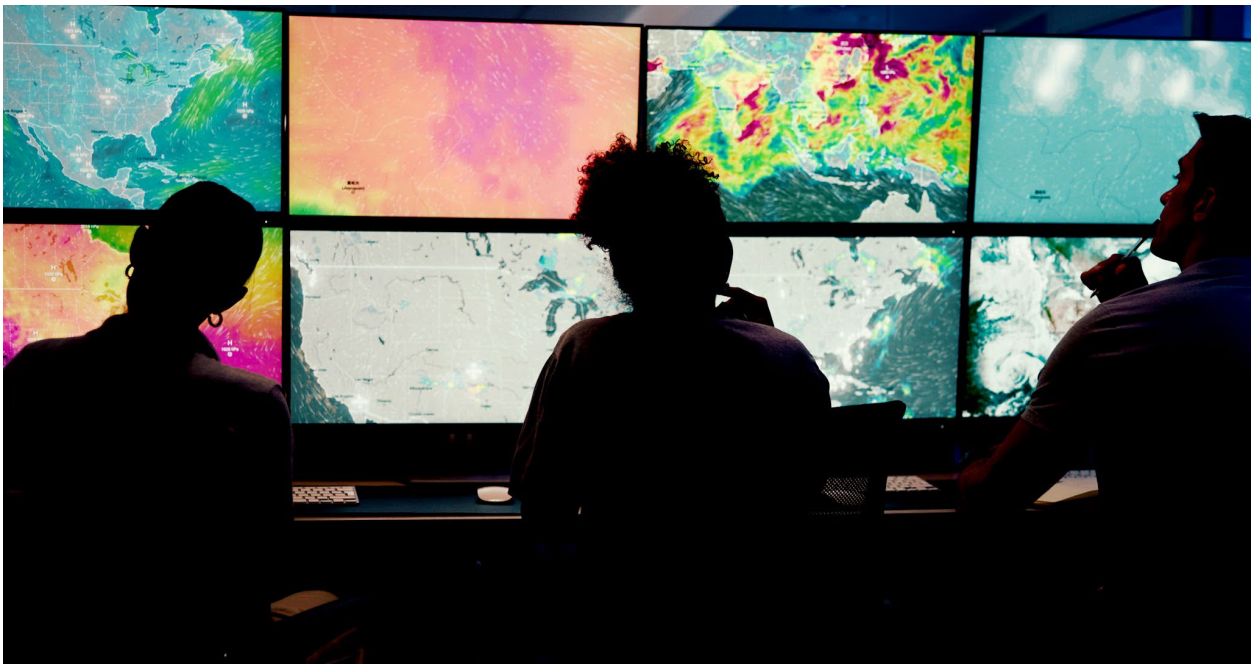
Using Data Dashboards for Compounding Hazards

Asset protection leaders integrate environmental data into centralized asset protection platforms that display all store and facility locations alongside indicators of weather-related disruptions. These platforms allow users to identify impacted assets, visualize patterns of exposure, and quickly assess the scope of potential damage or mitigation needs.

Use Cases: Real-Time Risk Assessment

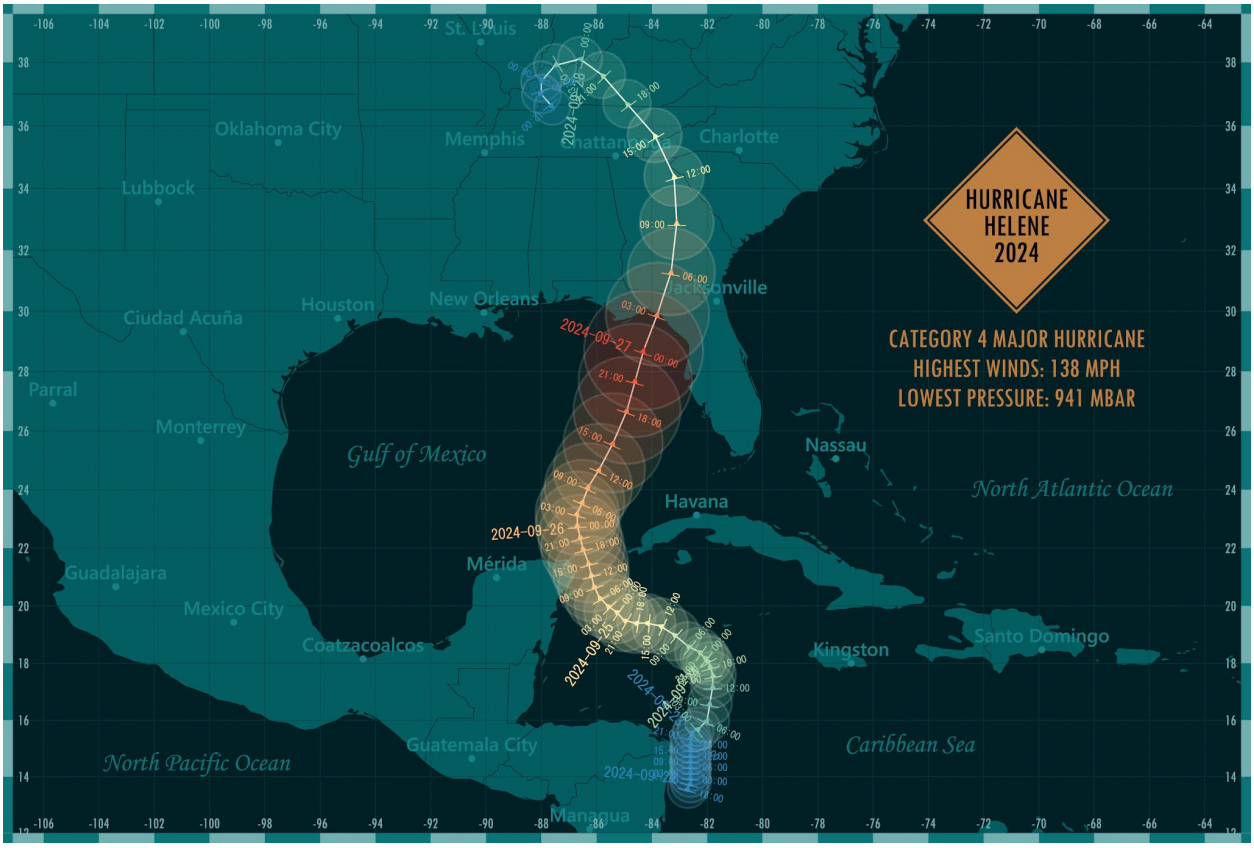
A pet supply retailer uses Early Alert to stay on top of real-time decisions. Early Alert provides them a dashboard that pulls in NOAA NHC hurricane data, tornado data, and other high risk events near their stores. This interactive dashboard helps them assess and prioritize what events they are monitoring and supports communication strategies, including taking precautions for pets housed in-store or total evacuation. This retailer's operations, logistics, and distribution centers all receive copies of specific Early Alert reports so that they can understand things like road closures, obstructed mountain passes, and snow levels. For hurricanes, this retailer tracks wind speed, event forecast timing, and expected event duration and overlays the report map over actual assets to assess their risks.

During Hurricane Helene, a retail pharmacy incorporated NHC track and cone data, hurricane watches and warnings, and flood mapping into their own geographic information system (GIS), to understand how and where their store locations might be impacted by the impending event. As the storm progressed, they constantly monitored the storm and activated their corporate emergency protocol, which included hosting company calls to share forecasts and make critical communications decisions. Corporate decision makers worked with stores in impacted regions to communicate to the public how soon they should prioritize picking up time-sensitive prescription medications and when to close stores and send employees home for their safety.



A team of people monitor a bank of screens showing weather and satellite images.

Source: Jacob Wackerhausen via Adobe Images



Hurricane Helene 2024 Track North Atlantic Ocean Infographic, from NOAA's International Best Track Archive for Climate Stewardship (IBTrACS) data. Source: FrankRamspott via Adobe Images

Tracking and Responding to Secondary Hazards

Companies also use environmental data to manage secondary and cascading hazards, such as extreme heat and degraded air quality from wildfire smoke. Interviewees shared that they often access data for wind speed, wind direction, and even smoke forecasts through NOAA geospatial products. They use this to forecast secondary or cascading hazard impacts—such as wildfire smoke, ground-level ozone, flash floods, and mudslides—several days in advance. This allows them to identify target communities and facilities likely to experience these impacts, as well as pre-position health-related supplies or other essential community resources.

Use Case: Real-Time Risk Management

During the 2025 California Palisades fires, a retail pharmacy utilized the NOAA Satellite Analysis Branch's daily analysis of smoke locations and the Hazard Mapping System Fire and Smoke Product across North America to assess smoke and fire hotspots from satellites in order to determine where the fires were spreading and additionally shows darker colors on the map where fire is expanding. This retailer uses Esri map layers that utilize color coding depending on how dense the fire and smoke are, which ultimately minimizes extra steps in their risk assessment process. By using NOAA fire, smoke, and wind data, alongside the Environmental Protection Agency's (EPA) Air Now, this retailer was able to alert its stores to check inventory on items like eye drops and other medicines—staying several days ahead of the Palisades fire community needs. This foresight allowed them to communicate effectively with stores regarding safety and asset protection, while providing the surrounding communities with access to essential health and wellbeing products.



Wildfire in Pacific Palisades, Los Angeles, January 8, 2025, images from Koreatown towards Getty Center and Brentwood.

Source: Erick Ley via Adobe Images

Many retailers interviewed noted that NOAA data is foundational to their weather and climate risk dashboards, which either pull data directly from NOAA or from third-party providers like Esri, Early Alert, and Accuweather for Business, whose models rely on NOAA and NWS data products. In other cases, environmental data for risk assessment is sourced from climate modeling, performed by companies like

Jupiter Intelligence. For example, several retailers partner with Esri and have NOAA data as an input to monitor their store and truck locations embedded onto a map. This allows them to see hazards in real-time and make decisions based on the location and strength of an event.

After: Post-Weather Event Recovery, Evaluation, & Adaptation

During discussions, some retailers also noted NOAA data in their post-disaster needs. After weather events, they shift focus to impact assessment and recovery, using data to evaluate the damage and response actions, and further guide future risk mitigation strategies. The growing operational reliance on environmental intelligence has also advanced the development of in-house geospatial analysis capabilities, particularly following major disaster events that revealed planning gaps in existing asset protection and response coordination.

When physical property is damaged, destroyed, or temporarily inoperable, or when infrastructure systems fail, companies must implement contingency plans to help restore operations, repair equipment, and protect existing inventory. By examining their successes and opportunities for improvement, companies can incorporate key lessons learned into long-term planning.

Use Case: Response and Recovery

In the aftermath of Hurricane Helene, a retail pharmacy relied on NOAA NWS GIS layers within Esri federal government GIS sets, along with EPA, Department of Energy (DOE), and even school data, to determine where they could put Red Cross relief locations and temporary pharmacies for people to have access to their prescriptions. They also used United States Geological Survey's (USGS) flood inundation mapping, which provides a green (normal conditions) to purple (extreme flooding) scale in relation to their stores. Access to this data allowed them to monitor road closures and determine safe routes for addressing fleet protection, store, and community needs.

While retail stakeholders often step into different roles and responsibilities within each of these planning and operations stages, NOAA recognizes the cyclical and iterative flow of these responsibilities. Every year presents new opportunities to strengthen risk management strategies based on the lessons learned from extreme weather events. After each year, retailers can reflect on their lessons learned and often identify new needs and priorities. Data providers like NOAA can work closely with users to improve data accessibility and tools to better meet these needs.



U.S. Soldiers assigned to Headquarters Battery, 678th Air Defense Artillery Brigade, South Carolina Army National Guard, distribute food and water supplies to locals in support of the aftermath of Hurricane Helene on Oct. 1, 2024 in Whitmire, South Carolina.

Source: SC National Guard



USDA Forest Service employees assist in the unloading of storm relief supplies in Marshall, North Carolina, Oct. 8, 2024; Source: Forest Service, USDA

Current Partnerships and Retail Environmental Data Needs

Through NOAA's current industry partnerships, we learned several weather and climate data needs related to environmental risk visualization, specifically for individualized information that effectively communicates risk to internal decision-makers. Additionally, they highlighted opportunities to strengthen NOAA or third-party solution providers' climate and weather data, including:

- Forward-looking data for air quality and smoke forecasts—around 3 to 7 days—to more accurately assess risk to improve inventory planning and store-level safety. Current forecasts typically extend 1 to 3 days out.
- Enhanced visualization of flood risk with clear depiction of proximity to rivers, delineating 100-year floodplains, and understanding how these boundaries may change over time.
- Availability and accessibility of consistent and comparable data to more rapidly inform corporate leadership of the need to consider climate and weather hazards in their real estate investment and development projects.
- More accessible geospatial data options and standardized visualization tools that integrate NOAA data with asset-level information, which would enable clearer justification of risk ratings and more confident decision-making.
- Rapid post-event impact analyses to assess damage severity following events such as hailstorms, which would allow decision-makers to quickly identify affected building components and align inventory, vendors, and contractors to support repairs and meet customer demand.

A list of existing NOAA data referenced during these targeted discussions and a list of co-developed NOAA data products are available for review (see Appendix D and E).

Conclusion and Next Steps

Conclusion

This paper highlighted key applications where NOAA's weather and climate data make a significant impact within retail asset protection. By integrating NOAA's data and insights into annual and event specific loss-prevention strategies before, during, and after extreme weather events, retailers can optimize a proactive approach to risk management.

NOAA recognizes the cruciality of industry engagement, "in which NOAA can share government facilities, intellectual property, and expertise in collaborative interactions to help create useful, marketable products for public benefit."[14]

Next Steps

NOAA is committed to addressing user needs from the retail sector and other industries by enhancing existing products, designing new products, and ensuring decision-makers have the resources they need to understand and apply weather and climate data into their systems.

To better support the retail sector, NOAA would benefit from engagement with a broader cross-section of retail—including but not limited to specialty shops, e-commerce, and small businesses—in addition to an in-depth, structured engagement approach to better understand application and ensure weather and

[14] NOAA Science Advisory Board, Public-Private Partnerships, presented to the NOAA Science Advisory Board by the SAB Subcommittee for Public-Private Partnerships (Washington, DC: National Oceanic and Atmospheric Administration, March 19, 2024), 6, https://sab.noaa.gov/wp-content/uploads/SAB_Report_March2024_Final-Public-Private-Partnerships-Report_508Complete.pdf.

climate data is accessible to the full scope of the retail landscape.[15] We invite retailers and other solution providers to continue discussions and engagement with NOAA to advance observation networks, science, and product development.

To express interest in the NOAA industry partnerships future development, contact industryproving.grounds@noaa.gov. NOAA welcomes ongoing use cases and applied examples on how NOAA data is useful, where there are opportunities for improvement, and what additional needs users have.

[15] NOAA Science Advisory Board, Public-Private Partnerships.

Appendix A. Interview Contributors

Retail

- A discount variety chain store, Conducted September-December 2026
- A home improvement retailer, Conducted September-December 2026
- A pharmacy store chain, Conducted September-December 2026
- A pet supply retailer, Conducted September-December 2026

Financial Institutions

- A global payment network and technology supply company, Conducted September-December 2026

Organizations

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Appendix C. NOAA Tools Mentioned By Retail Stakeholders

The table below highlights existing NOAA data products and tools that retailers, solution providers, and real estate and asset protection leaders noted during industry engagement discussions, which they use to support operational decision-making, including risk assessment and asset protection across all phases of extreme weather events.

NOAA Tool	Description	Retail Use Case Example
Hazard Mapping System Fire and Smoke Product	This product uses data from the GOES-R/ABI Fire Detection and Characterization (FDC) and JPSS/VIIRS Enterprise Fire products to monitor vegetation fires and smoke activity across North America. Fire and smoke information is updated multiple times a day in near real-time.	Monitor fire and smoke activities to protect assets and know when to activate emergency response plans
International Best Track Archive for Climate Stewardship	A comprehensive collection of tropical cyclone (hurricane) tracks created by combining recent and historical global tropical cyclone data.	Improve planning for and emergency response to hurricanes by visualizing regional trends and assessing how risks are evolving over space and time
National Hurricane Center	The homepage for the National Hurricane Center. The main product featured is the 2-day and 7-day tropical outlook, including forecasted paths of active storms.	Track potential hurricane and tropical storm pathways as they relate to their assets
National Integrated Heat Health Information System (NIHHIS)	This homepage serves as a hub for federal data products related to extreme heat, such as the Centers for Disease Control and Prevention's (CDC) HeatRisk Dashboard, an Extreme Heat Vulnerability Mapping Tool, and a national Heat & Health Tracker.	Plan for the impacts of extreme heat, including employee and customer safety measures, changes in energy demand, and changes in sales and inventory planning
National Weather Service (NWS) GIS Portal	Contains the National GIS Map Viewer, a web-based GIS tool that supports all NWS product suites that are frequently displayed on maps, so users can choose to layer the group of products necessary for their mission needs. Many of the NWS data sets are available in downloadable formats that are able to be imported directly into GIS or custom map viewers or web pages.	Obtain easily customizable queries into a wide range of NWS products, with tools for easy geovisualization, or download NWS datasets for integration

NOAA Tool	Description	Retail Use Case Example
		into internal or proprietary risk assessment tools
National Weather Service (NWS) Radar Viewer	Provides a real-time view of national radar or individual NEXRAD station products featuring a broad suite of data, including reflectivity, velocity, hydrometeor classification, wind speed and direction data, as well as storm-based alerts.	Track storm systems and quickly visualize ongoing extreme weather alerts, watches, and warnings, helping the sector protect assets at risk
Sea Level Rise Viewer	This product shows the future impacts of sea level rise visually, allowing users to use the viewer, download data specific to a region, and share maps.	Identify areas of concern for sea level rise among current or potential future real estate sites
Storm Prediction Center (SPC)	This webpage contains an easily-accessible homebase of all convective outlooks, current watches and warnings, active fire weather, and severe weather climatology.	Monitor current extreme weather watches and warnings
U.S. Wind Climatology	Provides a spatially and temporally continuous wind climatology for the contiguous U.S. on a monthly basis from January 1979 to present.	Understand trends in regional wind patterns when assessing smoke and air quality hazard risks at their locations
xmACIS2	A web-based interface that provides interactive access to climatological summary products. The products are based on data from the Regional Climate Centers' constantly-updated climate database, Applied Climate Information System (ACIS). Contains historical (dating as far back as 1872, depending on the weather station) and contemporary data on a wide variety of climate summary products such as the start and end date of specific temperature thresholds, number of consecutive days of a temperature or precipitation extreme, and climate normals.	Create customized queries and access data in graphical or tabular form to understand historical climate trends in a specific location

Appendix D. NOAA Industry Partnerships' Data Products

The below table features a list of new and updated NOAA products and tools that retailers co-developed with NOAA through industry engagements.

NOAA Data Product/Tool	Description	Use Case Example
Advanced Dvorak Technique - Hurricane Satellite (ADT-HURSAT)	A record of climate quality tropical cyclone intensity estimates from 1979 through 2024.	Strengthen supply chain management strategies and potentially minimize future impacts to communities
Billion Dollar Disasters (BDD)	A record of climate events in the U.S. and globally from 1980-2024 that shows the impact of extreme weather and climate events on the economy in inflation adjusted dollars.	Assess asset level vulnerabilities to inform risk management
Climate Atlas	An updated and modernized web application that provides access to a collection of pre-generated temperature and precipitation maps.	Support seasonal stock planning and inventory management
Event Footprint Catalog (EFC)	A new product providing spatial footprints and GIS-compatible downloads for severe storms.	Assess potential impacts of extreme weather on specific regions and disruptions to supply chains and further direct recovery efforts and materials needed to impacted stores or communities
U.S. Precipitation Time Series Explorer (PTE)	A new product with near real-time analysis of localized flooding events to better understand exceedance potential, frequency, and risk of extreme rainfall events.	Support re-routing and the protection of assets
Storm Events Database (SED)	Improvements to the existing database include an updated user interface, new search functions, and features for customizing and downloading data.	Categorize trends, improve strategic planning by anticipating impacts of extreme weather on specific regions and disruptions to supply chains
Typical Meteorological	A new product with a point-and-click interface and dataset with one year's worth of climatological data	Inform decisions around building new facilities and

NOAA Data Product/Tool	Description	Use Case Example
Year (TMY)	that are considered “typical” from a record of many years of data for current conditions and future climate projections.	site selections

Appendix E. Acronyms

ACIS	Applied Climate Information System
ADT-HURSAT	Advanced Dvorak Technique - Hurricane Satellite
CDC	Centers for Disease Control and Prevention
DOE	Department of Energy
EFC	Event Footprint Catalog
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GOES	Geostationary Operational Environmental Satellite
GHCNd	Global Historical Climatology Network daily
GIS	Geographic Information System
LCD	Local Climatological Data
LOCA	Localized Constructed Analogs
NCEI	National Centers for Environmental Information
NHC	National Hurricane Center
NOAA	National Oceanic & Atmospheric Administration
NWS	National Weather Service
PTE	U.S. Precipitation Time Series Explorer
SCAN	Soil Climate Analysis Network
SED	Storm Events Database
SPC	Storm Prediction Center
USGS	U.S. Geological Survey
USHCN	U.S. Historical Climatology Network

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Working Together to Improve Resilience

NOAA collaborates with industry leaders to update and develop new data and observation products, including maps, interactive tools, and other datasets. By improving access to environmental data, NOAA connects decision makers with accurate, timely, and future-facing data products and services to support improved risk assessments and economic, community, and environmental resilience.

Together, we can empower safe, resilient, and cost-efficient decisions for short and long-term planning, which safeguards communities and the U.S. economy.



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