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AI Resilience Report:

Summer 2024 Recap and Fall / Winter Preview for Consumers and Businesses
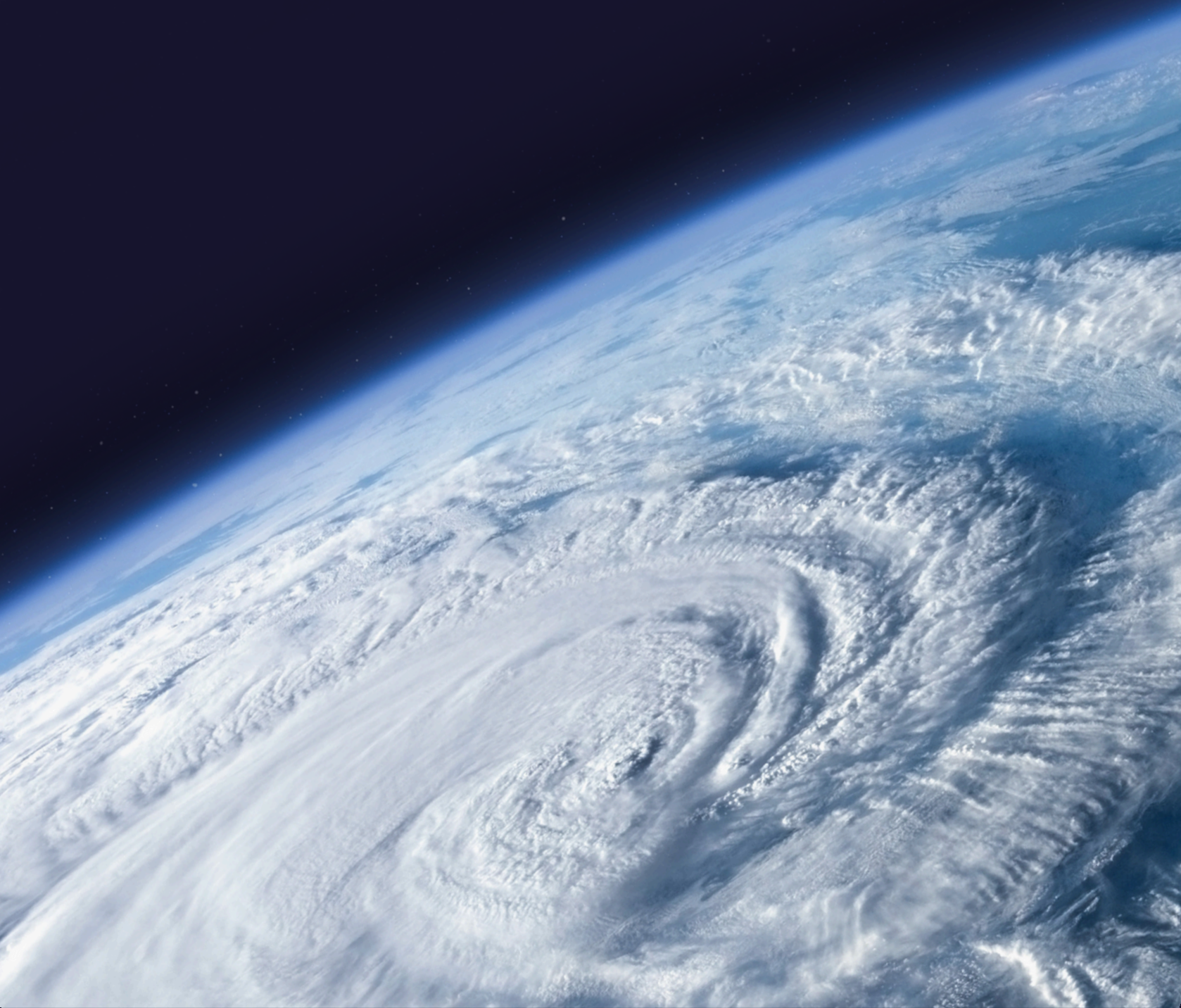
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2024 has been marked by an alarming rise in extreme weather. As of July 2024, the United States alone had experienced 19 separate weather and climate disaster events with losses exceeding $1 billion each. From devastating storms to relentless heat waves, this volatility has affected every aspect of life—leaving no sector untouched. Consumers face new risks in their daily routines, while businesses grapple with operational disruptions, supply chain vulnerabilities, and rising costs.

That's why Tomorrow.io has teamed up with 1Weather, a leading consumer weather app trusted by millions, to take a closer look at the intersection of weather's impact on both consumers and businesses. By combining Tomorrow.io's advanced weather data from our Resilience Platform™ with 1Weather's extensive consumer insights, we set out to understand the full spectrum of weather's influence. Drawing on survey data and analysis of real-world conditions, our collaboration paint a clearer picture of how both individuals and organizations are navigating this increasingly unpredictable world—helping you to better prepare, adapt, and thrive amidst the challenges ahead.

Summer 2024: A Season of Unprecedented Weather Challenges

The summer of 2024 brought a series of extreme weather events that left a lasting mark on businesses and communities worldwide. From unprecedented heat waves and powerful hurricanes to sudden flooding and intense storms, the season posed considerable challenges. To uncover the extent of these impacts on business operations, we reviewed data from Tomorrow.io's Resilience Platform™ spanning June 1 to August 31, 2024. Our analysis covered nearly 500,000 alerts across a range of industries and weather conditions. Here are the key insights from our findings:

1**. Flood Risks and Water Management Challenges:** Precipitation intensity accounted for 10.38% of all alerts, highlighting the complexity of weather patterns even during a summer dominated by heat. Businesses had to manage increased risks of flash floods, water damage, and disruptions to outdoor operations and supply chains.

2. Scheduling and Energy Management Pressures: Timing-related parameters such as sunset and sunrise times each accounted for about 10% of alerts. This high frequency likely reflects businesses' increasing reliance on precise scheduling to optimize operations, manage energy consumption, and ensure worker safety during extended daylight hours and heat.

3. Wind-Related Hazards and Disruptions: Wind-related alerts, particularly around wind gusts, accounted for 11.43%, of all alerts. High winds, often associated with summer storms, posed risks to infrastructure, outdoor operations, and transportation, emphasizing the need for robust wind mitigation strategies across industries.

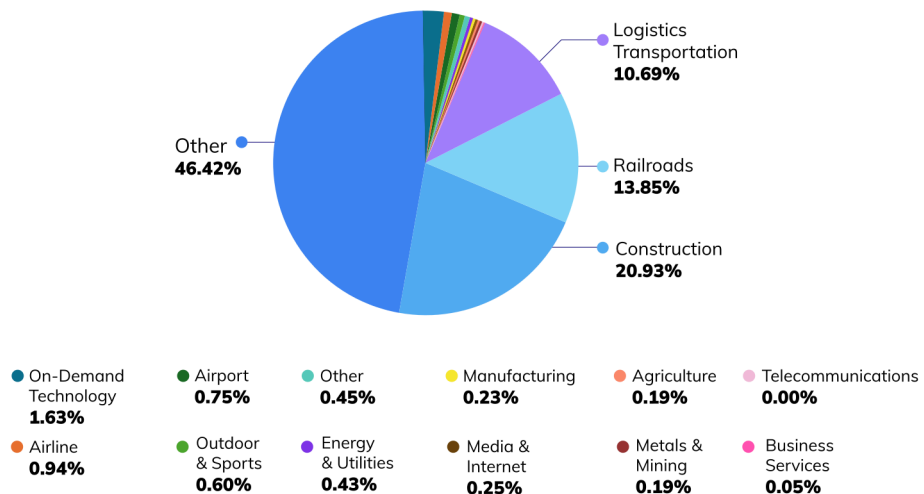**Industry Impact:** The construction industry was the most affected sector, accounting for 20.93% of all weather-related alerts. This vulnerability stems from the industry's direct exposure to the elements and the critical nature of weather conditions for on-site safety and project timelines. Railroads followed at 13.85%, underscoring the ripple effect of extreme weather on transportation infrastructure and potential supply chain disruptions.

Most Impacted Days: June 4, June 18, and June 14 stood out as particularly challenging days. These dates likely saw a convergence of multiple adverse weather conditions, including intense heat and severe storms, leading to widespread operational disruptions across sectors.

By Parameter

Volume By Industry

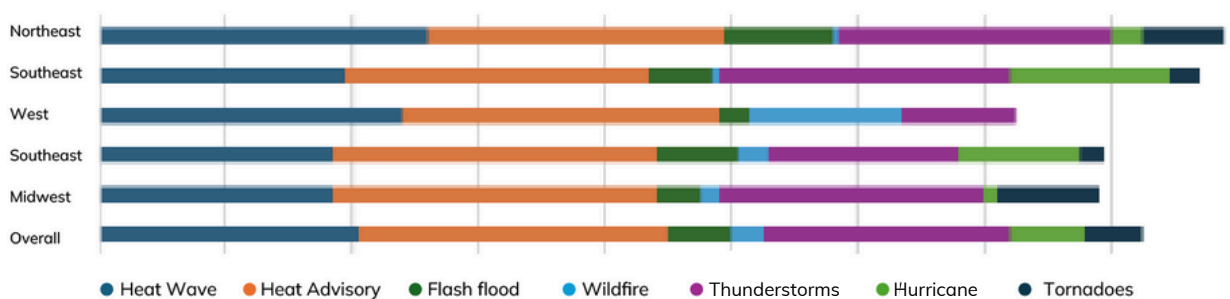| On-Demand Technology 1.63% | Airport 0.75% | Other 0.45% | Manufacturing 0.23% | Agriculture 0.19% | Telecommunications 0.00% |
| Airline 0.94% | Outdoor & Sports 0.60% | Energy & Utilities 0.43% | Media & Internet 0.25% | Metals & Mining 0.19% | Business Services 0.05% |
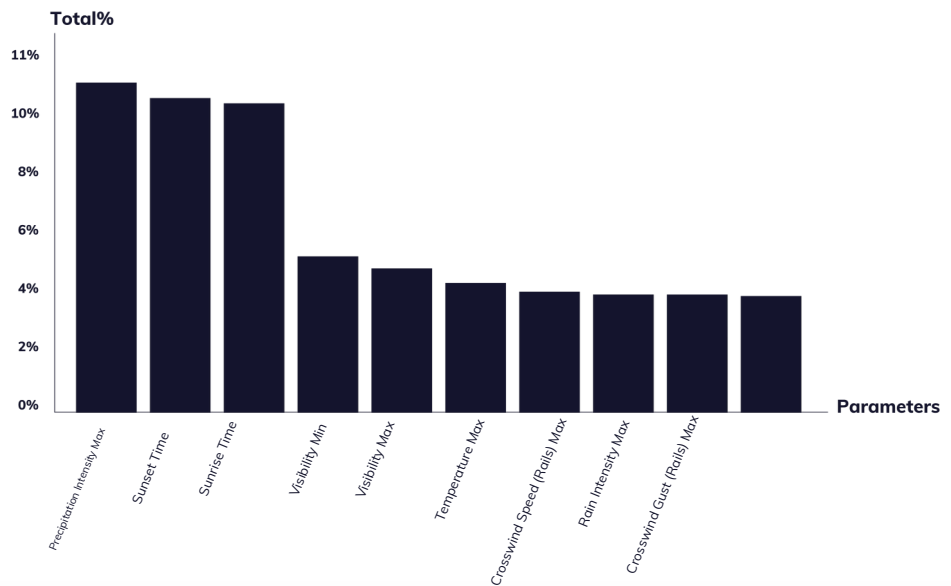
Consumer Impact

The summer of 2024 brought extreme weather conditions that compelled Americans to reconsider how they prepared for and managed severe events. From surging utility costs and higher grocery bills to an increased reliance on weather apps for live updates, the intense heat drove individuals and families to adjust their budgets, travel arrangements, and safety strategies.

Key Takeaways: 80% of the people faced one or more disruptive weather this summer, right from heat waves to hurricanes to flash floods and thunderstorms. Weather apps became essential tools for navigating extreme weather besides local TV news. People rely on real-time radar and severe weather alerts to inform them during this time.
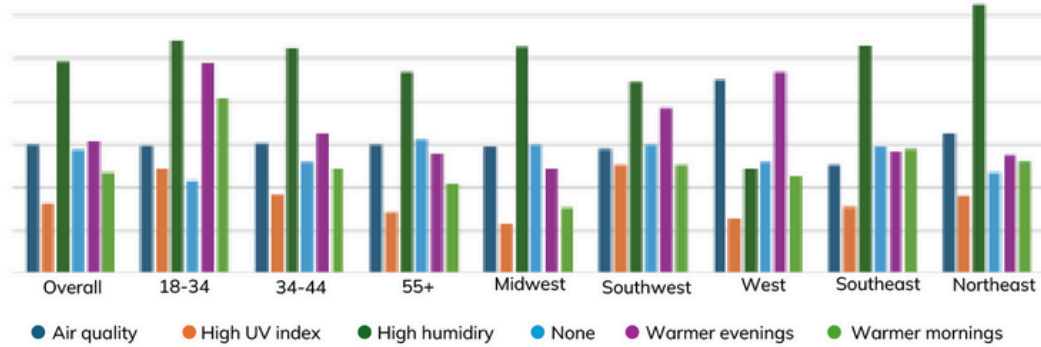
- Half of all consumers reported being affected by heat waves and advisories, while thunderstorms exceeded expectations for 39% of respondents.
- In the Southeast, 39% of consumers expressed heightened concern about hurricanes, with 25% experiencing them directly, underscoring the region's susceptibility to severe weather.

Severe Weather Experiences By Region

(Legend: Heat Wave, Heat Advisory, Flash flood, Wildfire, Thunderstorms, Hurricane, Tornadoes — by region: Northeast, Southeast, West, Southeast, Midwest, Overall)

85% of respondents also reported additional challenges such as rising electricity bills, allergies, and power outages. Humidity and poor air quality were significant concerns, even in regions like the Northeast, which are not typically affected. Families also experienced increased spending on groceries and leisure activities, driven by the need to accommodate children being home during the summer, adding to the financial pressures of an already difficult season.

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Weather Concerns In Summer

Legend: ● Air quality ● High UV index ● High humidiry ● None ● Warmer evenings ● Warmer mornings

Categories: Overall, 18-34, 34-44, 55+, Midwest, Southwest, West, Southeast, Northeast

Other Concerns In Summer

Categories: Northeast, Southeast, West, Southeast, Midwest, 55+, 35-54, 18-24, Overall

Legend: ● Allergies ● Dehydrathion ● High electricity bills ● Internet Outages ● Mosquitoes ● None ● Power outages
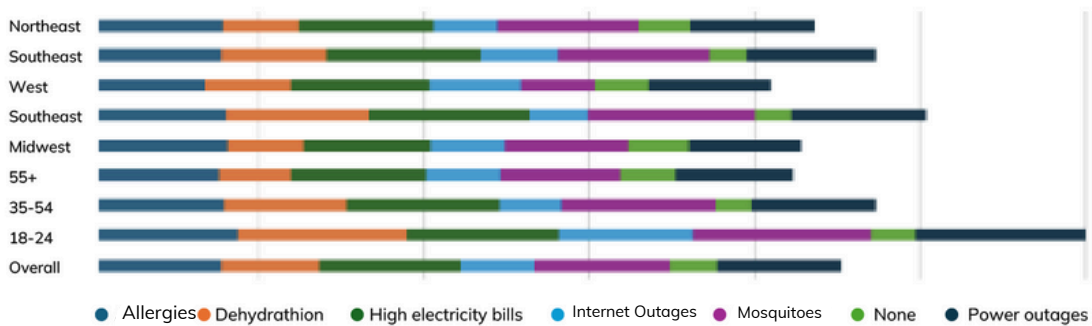
48-year-old male from Texas shared:

"The electricity bills are through the roof in the summer. It normally increases about 100 to 150%. During the winter, I'll pay about $120, but during the summer, it's close to $250 to $300."

"I spend way more money during the summer, especially on groceries. We spend more on activities for the kids. You know, we go to the movies a lot more during the summer because the kids are home, and we've got to keep them entertained."

71-year-old female from Georgia shared:

"Yeah, because we get a lot of power failures when it rains here. That's an unfortunate thing. I have batteries and I make sure all my candles are positioned with what you call the matches handles and matches or I have, you know, the lamps that have the batteries. I make sure I've got mini batteries, a lot of them. When the rain gets intense, then it goes off. I'd say at least once a week."

• Air conditioning servicing (27%) was the most common summer preparation, particularly in the 18 -34 age group (50%). Younger men and women equally shopped for summer apparel and stocked up on sunscreen. Only 11% users reported prepping for emergency kit or evacuation, while almost half didn't prepare specifically for summer.

Activities for Summer Preparation
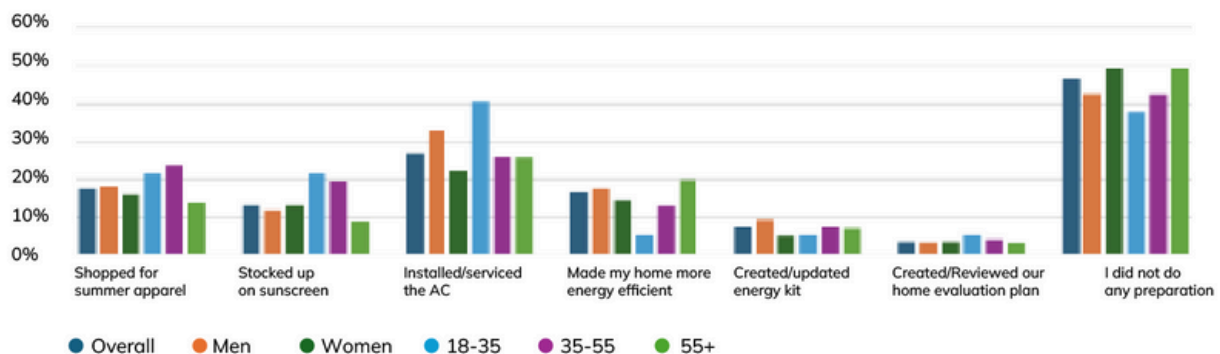
• Between May and July, app usage surged as nearly two-thirds of users—especially in the Southwest—checked their weather apps multiple times daily. Radar emerged as the most frequently used feature in the Northeast and Southeast, while humidity checks were particularly popular in the Midwest and Southwest, driven by persistently high humidity levels.

App Opens By Month
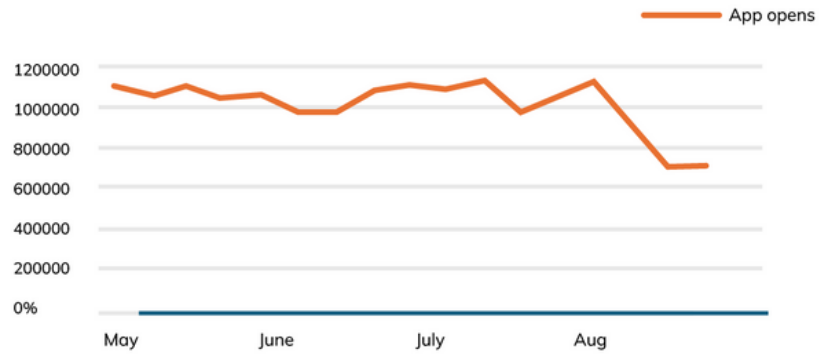
Features Used During Summer
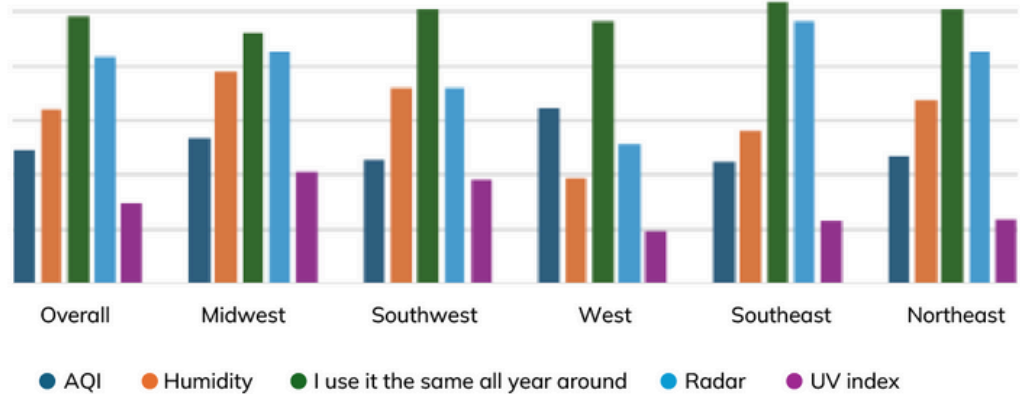
A 44-year-old male from Texas shared:
 "So, what I use is mostly like the Today feature where you will simply get the details with the precipitation, the humidity and, that you will see the weather changing like hourly....I'd like to be able to see like the amount of precipitation that is expected during the days. Because if you plan to go out, like as an example, I was going out to see an animal exhibit this past Saturday. So, I checked the app just to figure out if it was going to rain or not."

Heat Wave Spotlight: How Record Temperatures Disrupted Key Sectors

While weather was volatile as a whole this summer, heat took center stage thanks to record-breaking temperatures. With over 2 billion people globally experiencing 30+ days of "risky" heat, the impact on businesses was equally staggering. We took a deep dive into heat impact based on nearly 50,000, heat-related alerts from June 1 to August 31, 2024, and found revealing patterns about how extreme temperatures affected different sectors.

Key findings from our analysis include:

1. Rail Infrastructure Stress and Safety Concerns: Railroads emerged as the most affected sector by far, accounting for 21.23% of all heat-related alerts. This high percentage reflects the critical impact of extreme temperatures on rail infrastructure, potentially causing track deformations and equipment malfunctions. These issues could lead to significant operational disruptions and safety concerns, necessitating increased monitoring and maintenance.

2. Aviation Challenges and Performance Issues: The airline industry represented 2.88% of heat alerts. Rising temperatures posed notable challenges for aviation, affecting air density, aircraft performance, and ground operations. This suggests a need for adjusted flight schedules, payload considerations, and enhanced ground cooling systems to maintain safe and efficient operations.

3. Supply Chain and Outdoor Work Disruptions: Logistics and transportation (2.27%) and construction (2.13%) sectors also saw considerable impacts. These disruptions underscore how severe weather can impact supply chains and outdoor work, resulting in delays in deliveries, heightened worker safety concerns, and extended project timelines.

4. Most Impacted Days: The most intense impacts were felt on three days—July 14, July 15, and August 2. These were not isolated events but were part of an extended heat wave that disrupted multiple industries simultaneously. This pattern underscores a stark reality—a coordinated, cross-sector approach is essential to prepare for and respond to future heat crises effectively.

Top Industries Disrupted by Heat

Industry	Percentage
Railroads	21.23%
Airline	2.88%
Logistics / Transportation	2.27%
Construction	2.13%
Outdoor & Sports	1.18%
Energy + Utilities	0.54%
Media & Internet	0.51%
Metals & Mining	0.22%
On-Demand Technology	0.22%
Business Services	0.18%
Federal Government	0.04%
Other	0.04%
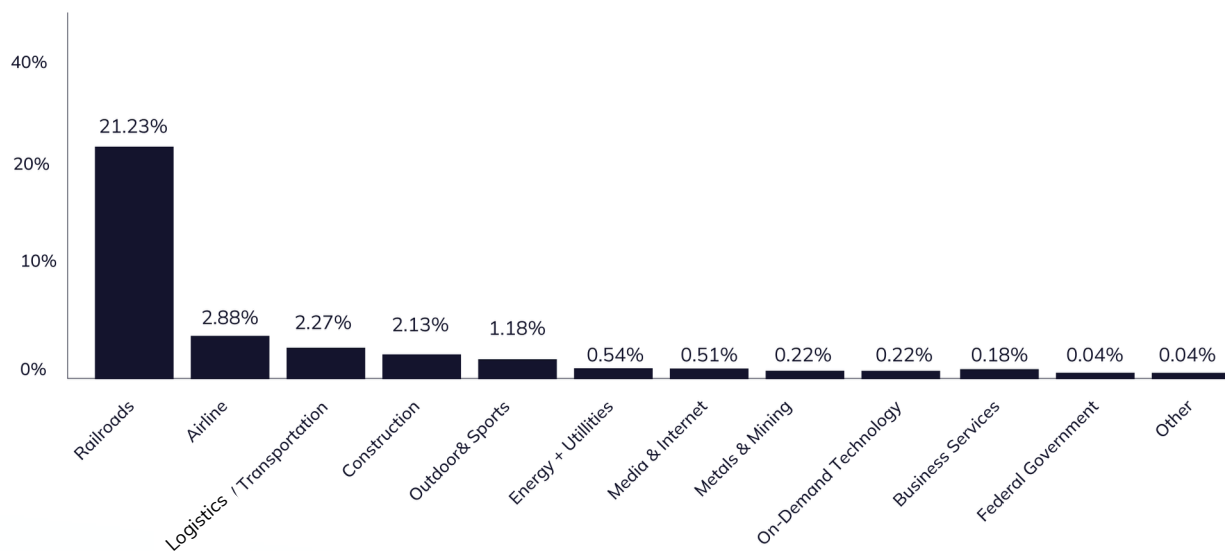
Consumer Impact:

Most respondents encountered temperatures ranging from 85°F to 100°F, though extreme heat above 100°F was more frequent in the Southwest and among younger users, with about 1 in 5 reporting such conditions. In contrast, the Midwest and Northeast generally experienced milder temperatures. While many began making adjustments at around 90°F, those affected by heat relied more heavily on weather alerts than on physical safety measures to cope with the conditions.

Temperature Experienced In Summer
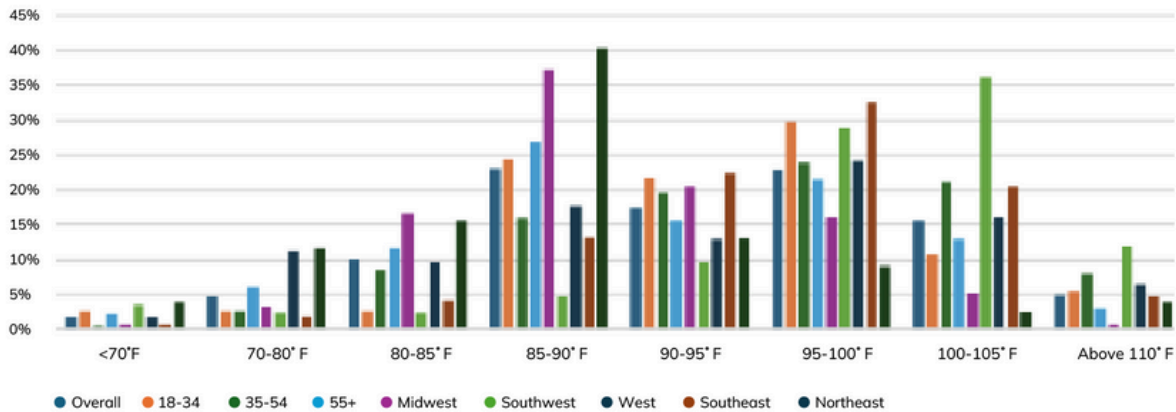
Change In Routine Due To Heat
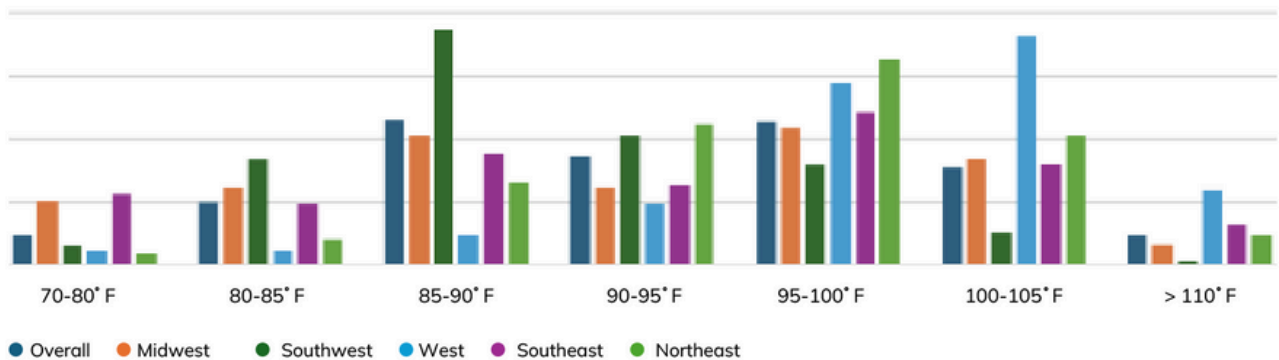
A 44-year-old man from Texas shared:

"The only thing I haven't done this summer is to go out to play tennis because it's just uncomfortable going out to play in the middle of the day where the sun is still out.You cannot really play late at night. So, I would just start playing again once the weather starts coming down at the end of this month"

Heat-affected respondents show a less immediate response compared to those facing flash floods or hurricanes. However, they are more reliant on weather alerts and real-time forecasts, reflecting the complex nature of heatwaves. Overall, the preparedness actions for heat primarily focus on monitoring the weather, charging electronics, and ensuring supplies like food and water, rather than physical evacuations or home safety measures typical in flash floods or hurricanes.

Heat Preparedness			Overall (n= 444)	Heat (n= 347)
Information sources		Local emergency alerts	27%	29%
		Followed local meteorologists on social media	29%	29%
		Severe weather alerts	65%	69%
Weather information		Radar	57%	60%
		Hourly forecasts	48%	52%
Precautions taken		Charging gadgets	42%	45%
		Flashlights and extra batteries	54%	56%
		Stocking up on food and water	40%	42%
Actions after severe weather		Did not take any precautions	34%	35%
		Started paying more attention to weather apps	30%	31%

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Hurricane Spotlight: Breakthrough Insights into a Record-Breaking Season

The 2024 Atlantic hurricane season was predicted to be one of the most intense in recent history, and it has already delivered a series of powerful storms. As we continue to navigate this challenging season, which runs from June 1 to November 30, Tomorrow.io's cutting-edge technology is providing unprecedented insights into these significant weather systems.

Our unique approach to hurricane forecasting combines advanced modeling with groundbreaking satellite technology, backed by Tomorrow.io's constellation of Pathfinder and microwave sounder satellites, which allow us to capture detailed scans of hurricanes, offering multiple layers of atmospheric data that were previously unavailable. This revolutionary capability enhances our understanding of storm structure, intensity, and potential path, ultimately improving forecast accuracy and giving communities and businesses more time to prepare. Throughout the 2024 season, we've gathered remarkable data on several major hurricanes.

Here, we showcase scans from three significant storms:

Hurricane Debby: Our
Pathfinders also captured
Hurricane Debby's development,
offering insights into its rapid
intensification process and
potential for storm surge.
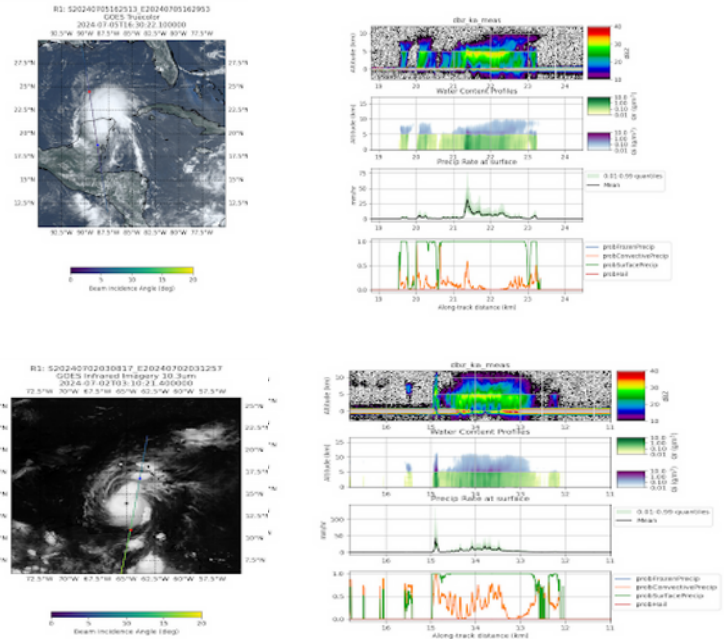
Hurricane Helene: This composite
image of Helene, taken just after it
made landfall as a Category 4
hurricane, showcases various
atmospheric data layers, providing
detailed insights into the storm's
structure, intensity, and
surrounding weather patterns.

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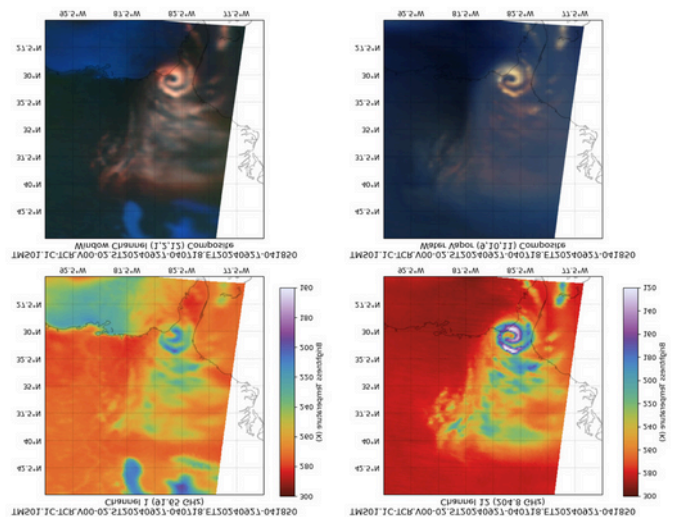
Our satellites offer a level of precision and detail never before seen in hurricane tracking. During the 2024 season, especially with storms like Hurricanes Beryl and Helene, we were able to provide high-resolution scans that captured real-time changes in storm intensity, path, and rainfall. This level of insight is critical in an era where hurricanes are intensifying more rapidly and increasing their rainfall potential, leading to devastating floods like we saw in western North Carolina with Helene.

Dr. Joe Munchak
 former NASA Research Meteorologist and
Tomorrow.io Principal Atmospheric Data Scientist


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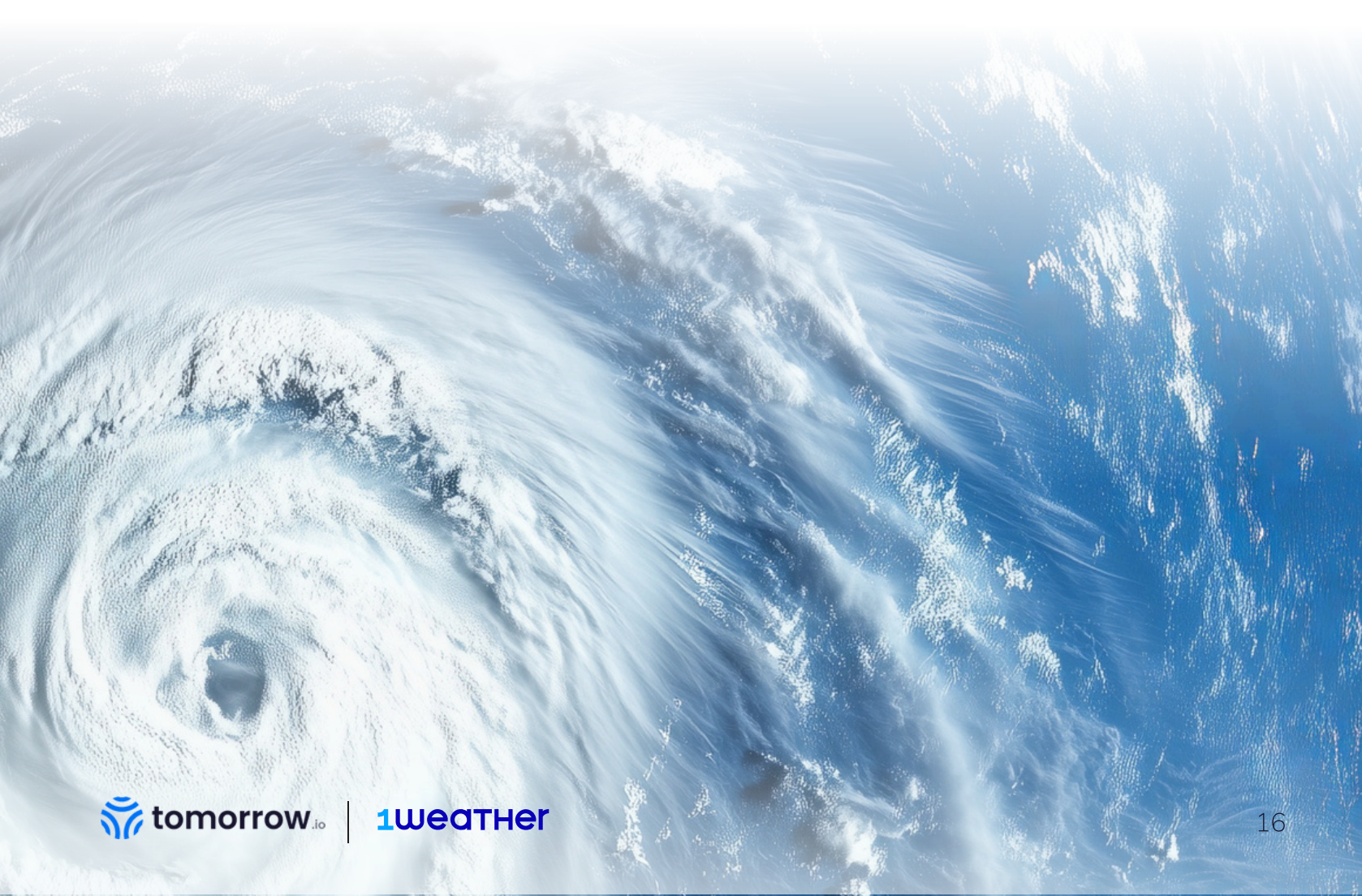
Consumer Impact:

This year's hurricane season was especially devastating, with powerful storms like Beryl and Debby leaving widespread impacts across multiple states. These intense weather events drove significant spikes in weather app usage as people scrambled to stay informed and safe. On July 8th, Beryl's landfall in Texas saw the highest engagement, with Texans tracking the storm in real-time. Florida and North Carolina residents similarly kept a close watch during Debby's arrival in early August.

Hurricane Beryl: July 8th appears to be the most active day across most metrics, with Beryl making landfall in Texas. July 4th shows increased radar views, likely reflecting users live tracking the progress. There's been a general decline in activity from July 11th, once it dissipated in Ontario.

- **Notification Clicks:** Peaks were observed on July 1 and 6, aligning with major storm updates.
- **App Opens:** Spiked significantly on July 8 and 9, corresponding to Beryl's landfall and post-storm updates.
- **Radar Views:** The highest spike occurred on July 8, showcasing the app's importance during critical storm moments.
- **Regional Engagement:** Texas had the highest notification and radar activity on July 8, with Louisiana and Arkansas also showing significant app opens and radar usage during Beryl's peak.

App Behavior During Beryl
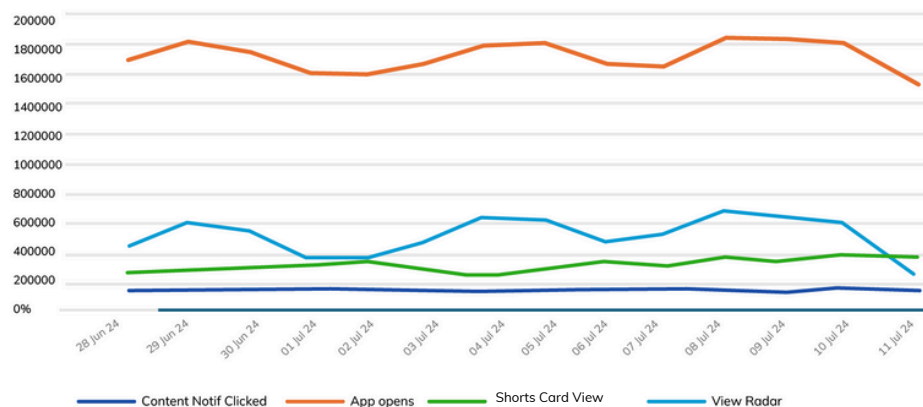
**App Open
By States**
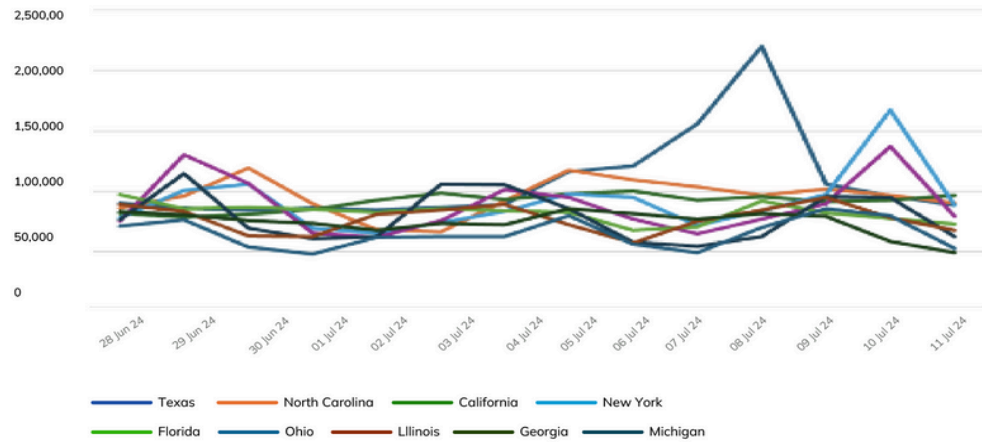
Hurricane Debby: There is a clear spike in weather app usage around August 3-7, with North Carolina, Florida, and New York leading in app opens, tracking of Debby in real-time on radar and consuming news around its progress and intensity.

- **Notifications and App Opens**: Peaked on August 6, immediately after Debby made landfall as a Category 1 hurricane.
- **Weather News (Shorts**): Reached its highest engagement on August 5, reflecting strong user interest in hurricane-related content.
- **Radar View**s: Spiked on August 7, as users tracked Debby's progress post-landfall.
- **Regional Engagement**: Florida and North Carolina saw the highest app open spikes during Debby's initial landfall on August 5 and offshore movement on August 6.
- **Post-Tropical Activity**: New York and Pennsylvania experienced notable increases in app opens from August 8 to 9, driven by flood watches and wind advisories during Debby's post-tropical cyclone phase.

**App Behavior
During Debby**
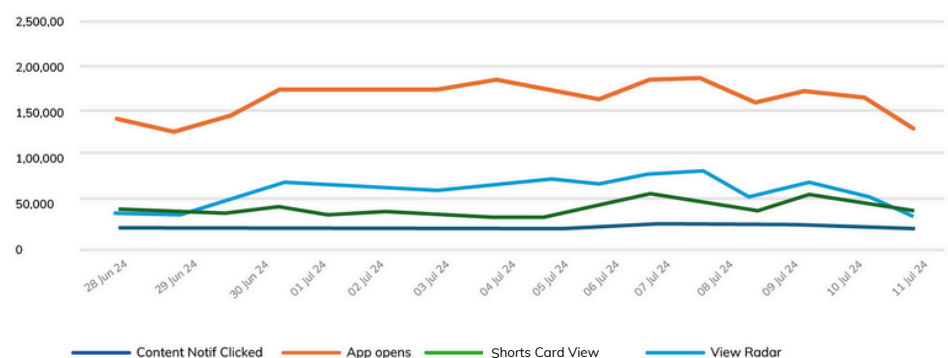
**App Behavior
During Beryl**
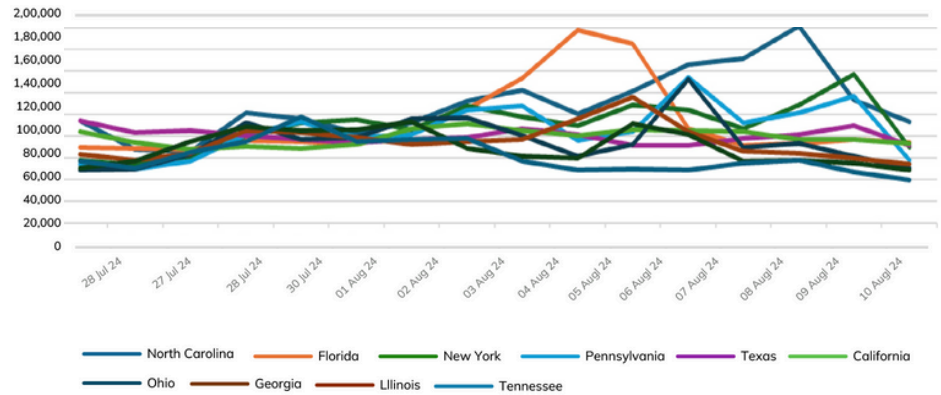
Flash flood or hurricane respondents take more immediate, proactive actions compared to the overall group, showing higher levels of preparedness for evacuation and urgent response. They are likely to sign up for local emergency alerts and use a weather radio They rely more on real-time information and are more likely to secure supplies and charge electronics, reflecting the heightened urgency and danger associated with flash floods. While 23% claimed not having an emergency kit, rest mostly include batteries, first-aid and, food and water supplies in their kit. These people are three times more likely to have evacuated than overall.

Hurricane Preparedness

		Overall (n= 444)	Flood or Hurricane (n= 108)
Information sources	Local emergency alerts	27%	31%
	Weather radio	10%	16%
Weather information	Radar	57%	58%
	Hourly forecasts	47%	56%
Precautions taken	Charging gadgets	42%	56%
	Flashlights and extra batteries	54%	56%
	Stocking up on food and water	40%	49%
	Evacuation, if needed	17%	33%
Actions after severe weather	Improved home or property safety measures	15%	19%
	Evacuated or relocated temporarily	5%	15%

Emergency Kit For Consumers

Category	Percentage
I did not have an Emergency kit	~22%
Pet supplies	~31%
Power bank	~39%
Medicines	~45%
Cash	~36%
Important Documents in a Waterproof Container	~25%
Battery-powered or hand-crank radio	~24%
Non-Perishable Food and Water	~52%
First aid supplies	~49%
Flashlights and Extra Batteries	~54%
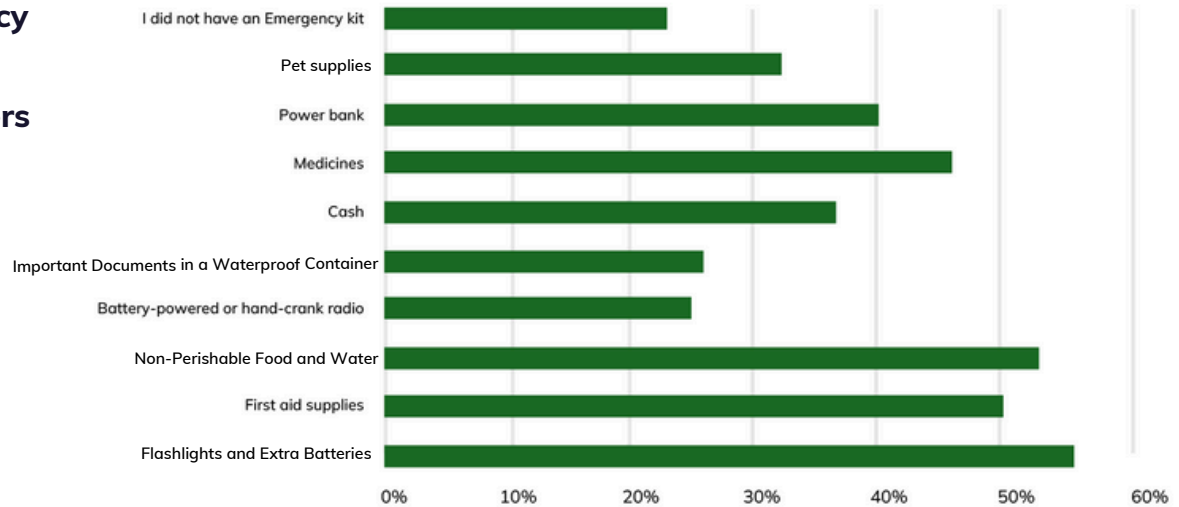
A 34-year-old woman from Maryland shared:

"It was more like passing through and it was just going to be the remnant of it. We just like always just made sure that our small stockpile of food is still good, that we can use it, make sure that things are charged...Sometimes, I use an app called Next Door and then like sometimes I'll look at Facebook and Twitter."

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Travel & Transportation Industry Spotlight: Navigating Summer's Weather Challenges

Despite summer 2024's volatile weather, including record-breaking heat waves and an intense hurricane season, travel and commerce persevered. However, the weather's impact on transportation operations was significant and multifaceted.

An analysis of over 50,000 alerts from June 1 to August 31, 2024 reveals three key business impacts that posed the greatest challenges to the transportation industry:

1. Blowovers and Derailments: Accounting for 11.43% of all alerts, wind gusts were the most significant weather factor affecting transportation. High winds pose a serious risk of vehicle blowovers on roads and bridges, particularly for high-profile vehicles like trucks and buses. In rail transportation, strong gusts can lead to cargo shifts or, in extreme cases, derailments, especially on exposed routes. These wind-related risks not only threaten safety but also lead to substantial delays and potential cargo losses.

2. Reduced Traction and Hydroplaning: At 10.53% of alerts, rainfall intensity was a close second in impact. Heavy rain significantly reduces traction on roads, increasing the risk of accidents and necessitating slower speeds. This leads to longer travel times and potential missed deliveries. For railways, intense rain can cause track flooding and ballast washout, resulting in speed restrictions or line closures. In severe cases, hydroplaning risks on runways can lead to flight delays or diversions, disrupting air freight schedules.

3. Operational Slowdowns and Groundings: Comprising 4.64% of alerts, reduced visibility rounds out the top three impacts. Poor visibility necessitates reduced speeds across all modes of transport, leading to significant operational slowdowns. On roads, this means longer transit times and increased fuel consumption. In aviation, low visibility can result in delayed or canceled flights, disrupting both passenger travel and air freight operations. For maritime transport, poor visibility in ports can slow or halt loading and unloading operations, causing costly delays in supply chains.

The concentration of most impacted days in July (10th and 16th) suggests that midsummer brought particularly challenging conditions, possibly combining high temperatures with severe weather events that affected multiple transportation parameters simultaneously, leading to compounded operational challenges.

This analysis underscores the importance of advanced technology like Tomorrow.io, which provides transportation organizations with hyper-local, real-time weather intelligence. From optimizing delivery routes during severe storms to protecting driver safety in extreme conditions, the platform empowers transportation companies to stay ahead of challenges and maintain reliability even in adverse weather scenarios.

> JetBlue strives first and foremost to be the innovation leader when it comes to safety and efficiency. With Tomorrow.io, we have found the right partner for us for both day-to-day operations, as well as sustainability goals related to climate resiliency and our overall ESG strategy.

Steve Olson
VP, JetBlue's System Operations Center

Top Disruptions by Parameter

Parameter	Value
Wind Gust Max	11.43
Rain Intensity Avg	10.53%
Wind Gust Metar TsfMax	9.45%
Wind Gust Min	8.30%
Wind Gust Metar TsfMin	8.30%
Temperature ApparentAvg	5.65%
Wind Speed Avg	5.65%
Visibility Min	4.64%
Visibility Meter TafMIN	4.14%
Cloud Ceiling Min	3.32%
Lighting Flash Rate Densit	2.88%
Temperature Avg	2.56%
Rain Intensity Max	2.53%
Visibility Meter TafMIN	2.21%
Precipitation Type	2.20%
Precipitation Intensity	1.85%
Wind Speed Avg	0.84%

Consumer Impact:

There is a clear preference for vacations in summer, particularly among younger individuals and in certain regions like the Southwest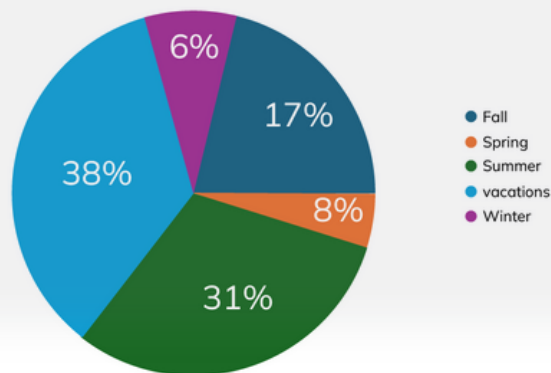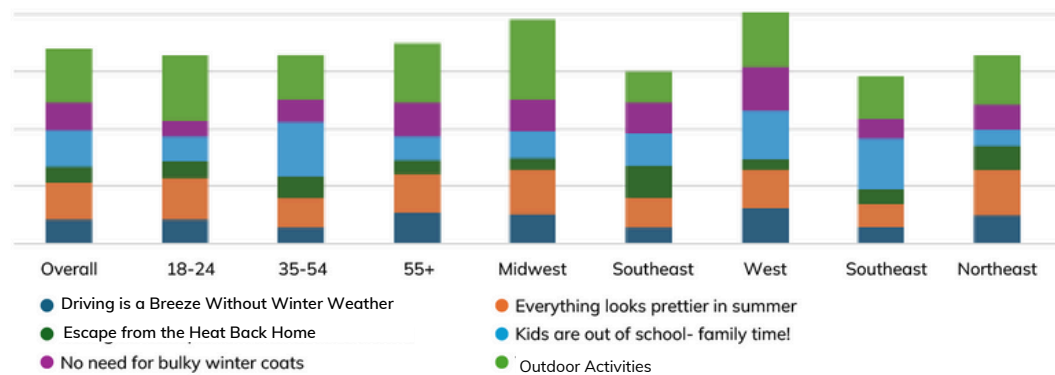. Almost 50% claim its due to the right weather for outdoor fun. However, the high percentage of non-vacationers could indicate changes in weather that are affecting travel behaviors.

Season For Travel

- Fall
- Spring
- Summer
- vacations
- Winter

6%
17%
8%
31%
38%

Reasons For Travel

Overall · 18-24 · 35-54 · 55+ · Midwest · Southeast · West · Southeast · Northeast

- Driving is a Breeze Without Winter Weather
- Escape from the Heat Back Home
- No need for bulky winter coats
- Everything looks prettier in summer
- Kids are out of school- family time!
- Outdoor Activities

A 48-year-old male from Texas shared:

"We were going to go back to Hurricane Harbor, but there was a 75% chance of thunderstorms. Can't go to a water park in thunder and lightning because they'll shut the park down. I didn't want to waste the trip, so I canceled it for that day and ended up going the following day."

A 71-year-old female from Georgia shared:

"I went to New York in the end of July and beginning of August, and I checked the weather every day because it was hot, and I wanted to see what I should wear or not wear. Once I got there, it was hotter than I expected, so I relied on basically three pieces of clothing."in weather that are affecting travel behaviors.

Fall 2024: Navigating Seasonal Transitions and Operational Challenges

As we shift our focus from the intense heat and storms of summer, fall brings its own set of weather-related challenges for businesses. To better prepare for the upcoming season, we conducted a historical analysis of nearly 600,000 alerts from September 1 to November 30, 2023, providing valuable insights across various industries and weather parameters.

Key findings from our analysis include:

Delays and Safety Concerns: Alerts for reduced visibility accounted for 10.17% of all notifications, making it the most common issue reported. This highlights the critical challenges posed by factors like dense fog and early darkness, which can disrupt transportation schedules, elevate accident risks, and hinder outdoor operations.

Operational Disruptions Due to Wet Conditions: Precipitation-related alerts made up 7.70% of all notifications, emphasizing the continued impact of rainfall on fall operations. Heavy precipitation increases the risk of water damage, creates slippery conditions that jeopardize worker safety, and raises the potential for flooding, which can disrupt supply chains and halt on-site activities.

S**cheduling and Energy Management Challenges:** Notifications related to sunset and sunrise times accounted for approximately 7.2% of all alerts, highlighting the operational impact of shorter daylight hours. These shifts create challenges for businesses in managing work schedules, adjusting lighting systems, and maintaining energy efficiency as days grow shorter.

Industry Impact:

Construction was once again the most affected sector, with 14.69% of all alerts, experiencing compounded challenges from visibility issues, wet conditions, and daylight changes. Logistics and Transportation followed at 10.81%, reflecting ongoing struggles to ensure efficient and safe movement of goods and people during unpredictable fall weather.

Most Impacted Days:

September 23, September 25, and November 27 emerged as particularly challenging days. These dates likely experienced early snowfalls, severe autumn storms, or a combination of both, resulting in widespread operational disruptions across various industries.

This fall weather analysis emphasizes the importance of strategic planning as businesses transition from summer to winter operations. With shorter days, heavier rainfall, and the onset of early winter storms, fall presents unique challenges that require proactive solutions. Tomorrow.io's Resilience Platform equips companies with the tools to anticipate and adapt to these seasonal changes. By preparing in advance, businesses can prioritize worker safety, minimize unexpected delays, and sustain smooth operations despite evolving weather conditions.

"

Tomorrow.io allows Walbridge job sites to mitigate and minimize weather impact, which helps us maintain our cost and schedule.

Eric Twigg
Walbridge Senior Vice President

Walbridge

Consumer Impact:

For many people, fall brings a mix of both challenges and pleasant seasonal transitions. In Texas, a 41 year old male app user recalled disruptive weather patterns from previous falls, such as sudden temperature drops of up to 70°F within days. The unpredictability of the weather in this region makes fall a season of stark contrasts.

Another app user from Maryland anticipated the slippery conditions caused by fallen leaves, adding a layer of difficulty to everyday tasks. In Texas, fall is closely associated with nature, as residents notice cooler mornings, vibrant autumn colors, and the falling leaves. This seasonal transition signals the start of activities such as deer hunting, where weather conditions play a pivotal role—clear, sunny days often being the most favorable.

Overall, fall 2024 is expected to bring dramatic weather changes, but it also presents opportunities for outdoor activities when conditions are favorable.

Winter 2023-2024:
Navigating Cold-Weather Challenges

As businesses prepare for the upcoming winter, insights from the previous season offer valuable guidance. By analyzing nearly 800,000 weather alerts from November 1, 2023, to February 28, 2023, Tomorrow.io provides key insights to help businesses adapt their strategies and address the operational challenges posed by winter weather.
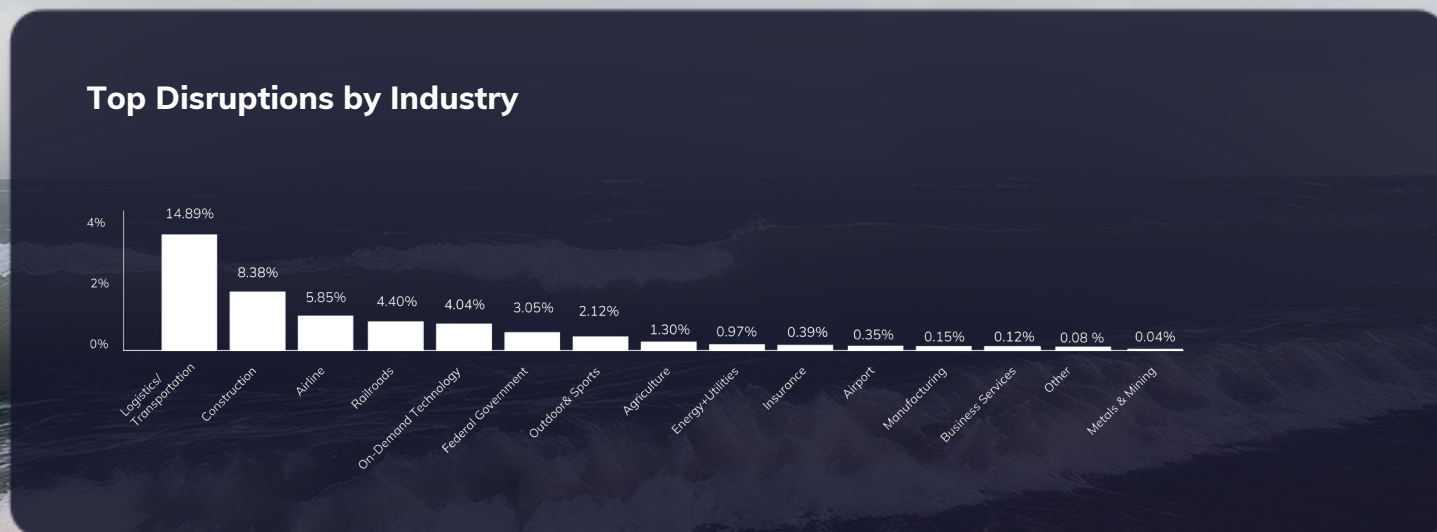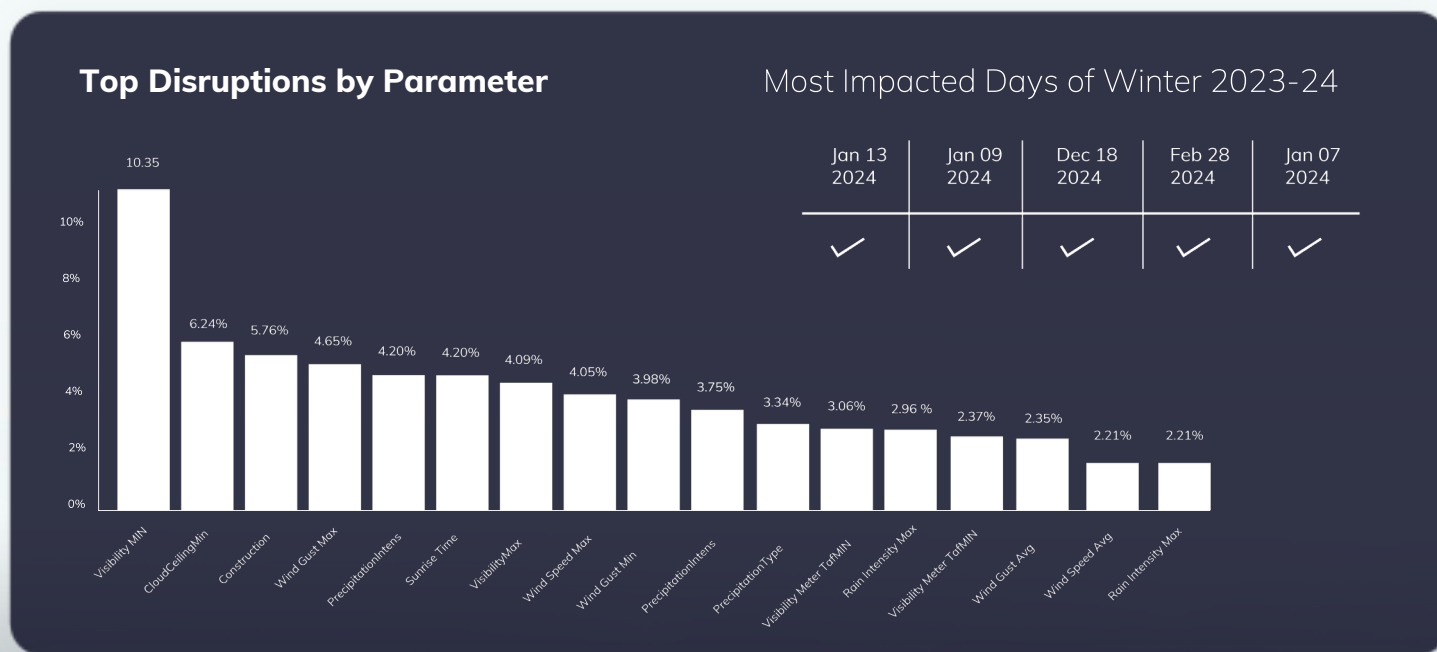
Key findings from our analysis include:

1. Visibility-Related Operational Slowdowns: Alerts related to reduced visibility topped the list at 10.35% of all notifications. This high percentage underscores winter's significant impact on operations due to fog, snow, and early darkness. Businesses faced increased risks of transportation delays, workplace accidents, and reduced efficiency in outdoor operations.

2. Overhead Hazards and Structural Stress: Alerts related to cloud cover made up 6.24% of all notifications, highlighting potential risks from low-hanging clouds and precipitation. These conditions increase the likelihood of icing on structures, present overhead hazards for construction and outdoor work, and create significant challenges for aviation, such as reduced visibility and flight delays.

3. Wind-Related Risks and Disruptions: Alerts for wind gusts accounted for 5.76% of all notifications, underscoring the significant risks posed by strong winter winds. These conditions can cause infrastructure damage, widespread power outages, and hazardous situations for transportation and outdoor operations.

Industry Impact: Logistics and transportation experienced the greatest impact from winter weather, generating 14.89% of all alerts. This highlights the ongoing struggle to move goods and people safely and efficiently during the challenging winter months. The construction industry followed closely, with 8.38% of alerts, reflecting the compounded difficulties posed by reduced visibility, high winds, and cold weather, which can affect materials, workflows, and worker safety.

Most Impacted Days: January 13, January 9, and December 18 emerged as particularly challenging days, marked by a combination of adverse winter weather conditions. These dates likely experienced severe storms, extreme cold snaps, or both, resulting in significant operational disruptions across multiple industries.

Top Disruptions by Parameter

Bar chart values (left to right):
- Visibility MIN: 10.35
- CloudCeilingMin: 6.24%
- Construction: 5.76%
- Wind Gust Max: 4.65%
- PrecipitationIntens: 4.20%
- Sunrise Time: 4.20%
- VisibilityMax: 4.09%
- Wind Speed Max: 4.05%
- Wind Gust Min: 3.98%
- PrecipitationIntens: 3.75%
- PrecipitationType: 3.34%
- Visibility Meter TofMIN: 3.06%
- Rain Intensity Max: 2.96 %
- Visibility Meter TofMIN: 2.37%
- Wind Gust Avg: 2.35%
- Wind Speed Avg: 2.21%
- Rain Intensity Max: 2.21%

Most Impacted Days of Winter 2023-24

Jan 13 2024	Jan 09 2024	Dec 18 2024	Feb 28 2024	Jan 07 2024
✓	✓	✓	✓	✓

Top Disruptions by Industry

Bar chart values (left to right):
- Logistics/Transportation: 14.89%
- Construction: 8.38%
- Airline: 5.85%
- Railroads: 4.40%
- On-Demand Technology: 4.04%
- Federal Government: 3.05%
- Outdoor & Sports: 2.12%
- Agriculture: 1.30%
- Energy+Utilities: 0.97%
- Insurance: 0.39%
- Airport: 0.35%
- Manufacturing: 0.15%
- Business Services: 0.12%
- Other: 0.08 %
- Metals & Mining: 0.04%

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Consumer Impact:

In the United States, those most significantly impacted by winter weather primarily reside in the northeastern states. For the majority of the population, peak winter months are January and February, characterized by colder temperatures and increased snowfall. Driving and shoveling snow emerge as the top winter concerns, with many relying heavily on weather apps to assess road safety. Most individuals report feeling uncomfortable driving in more than 2-3 inches of snow. Unlike summer, winter prompts more proactive preparation, including activities such as:

- Bolster insulation in the house like install door sweeps beneath doors , insulating old windows etc.
- Safeguard against potential pipe bursts by cutting off the supply to exterior pipes and draining water
- Switch ceiling fan to rotate in the opposite direction
- Switch from all-season tires to snow tires and keep snow scraper in the car

A 44-year-old male from Texas shared:

"If they(hailstones) fall while you're driving then your car that could cost you 2000 to $4000 to repair. Just to give you an idea of how bad of the problem that is, I bought a car last year...when I was coming back from visiting my parents. I got hail and that cost me $1000 to repair. I had about 25 to 30 different dents on my car." "Winters are normally around 40 Fahrenheit usually, but it can go as low as 25 on some counted days of the year. This presents a challenge because the state is usually very hot, so it is not usually prepared for, you know, insulation of the pipes. So they usually tell you that you need to like leave the cabinet doors open and try to put like insulation on the outside hoses or anything like that. It's a common problem here that your pipes might burst because they freeze. The ice inside the pipes expands and then that causes a massive issue because the pipes break, and you get flooding in your home."

A 58-year-old male from Ohio shared: *"I don't like snow. I don't like driving in it. I don't like shoveling it... if it snows a lot, he [dog] can't go outside... so I've got to shovel little tunnels in the snow on the deck for him. When it snows heavily, I keep my eyes on that. Winter weather I'm always more concerned about than the summer weather..... I really don't like driving on ice... I've been in accidents before where it didn't matter how good my equipment was... you are not controlling the car on ice....In winter, I keep my salt spreader and snow blower in my garage because I know I'm going to use it. I also park my car out on the driveway sometimes and take the snow on the car. "*

As we approach the critical holiday shopping period, understanding how weather influences retail operations is crucial. To provide valuable insights for the season ahead, we analyzed over 60,000 alerts from November 1 to December 31, 2023 specific to the retail sector.

Key findings from our analysis include:

Visibility Challenges Affecting Foot Traffic: Visibility-related alerts accounted for 11.79% of all notifications, making them the most common issue. Poor visibility, often caused by fog or early winter storms, can greatly influence consumer behavior by reducing foot traffic to physical stores. This also raises safety concerns for both customers and employees, emphasizing the need for businesses to prepare for these conditions and adjust operations accordingly.

Wind-Related Risks to Transportation and Supply Chains: Alerts for high wind gusts comprised 11.15% of notifications, underscoring the dangers posed by strong winds to the movement of goods. High winds can create significant hazards, such as the risk of trucks being blown over during transit from distribution centers to stores. These conditions highlight the critical need to secure supply chains during windy periods and suggest a strategic pivot toward boosting online promotions when ground transportation is disrupted by adverse weather.

Temperature Fluctuations Impacting Inventory and Energy Costs: Alerts for significant temperature drops made up 8.88% of all notifications, highlighting their impact on operations. Sudden decreases in temperature can pose challenges for inventory management, particularly for temperature-sensitive goods, and lead to increased heating costs for stores. These fluctuations also influence consumer behavior, often driving heightened demand for cold-weather products, making it essential for businesses to anticipate and adapt to changing conditions effectively.

Most Impacted Days: December 18, December 11, and December 3 stood out as particularly challenging days. These dates, falling in the heart of the holiday shopping season, likely saw a convergence of adverse weather conditions that could have significantly impacted both in-store and online retail operations.

The wide range of impactful factors—including visibility, wind, and temperature fluctuations—illustrates the complex challenges retailers must navigate to ensure smooth operations and meet consumer demand during this critical time. With Tomorrow.io's Resilience Platform, retailers can leverage hyper-local, real-time weather insights to anticipate disruptions, optimize supply chains, and adjust inventory and staffing strategies proactively, ensuring they stay ahead of weather-related challenges.

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We leverage Tomorrow.io to understand the limitations of our operation on any given day, at any given hour, in any given city.

Hanna Buehler
Director of Operations, Shipt

Shipt 🛍

About tomorrow.io

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Whether it's planning for the week or staying prepared for severe weather, 1Weather brings accurate, hyperlocal forecasts directly to your fingertips. Available in over 50 languages and across multiple platforms, 1Weather ensures you're always ready to own the day for whatever the weather brings. 1Weather was acquired by InMobi in 2016, which is headquartered in Singapore. For more information, visit www.1weatherapp.com