Just add weather – chemicals, petroleum and industrial products

How weather insights can grow your bottom line

IBM Institute for Business Value

Executive Report

Chemicals, petroleum, industrial products

In this report

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Turn rain into sunshine

What is it about the weather that keeps chemicals, petroleum and industrial products executives up at night? Perhaps it's the negative impact weather often has on business – from unused asset time to crop losses to misaligned gasoline demand and supply. Yet according to our recent research, that's not true for all organizations. Some chemicals, petroleum and industrial products companies are reaping benefits from weather data by leveraging insights to reduce costs and increase revenues. In this report, we draw on input from 150 chemicals, petroleum and industrial products executives worldwide to explore how organizations can learn from those that view weather data as a competitive advantage.

Executive summary

Almost every weather-related headline in the media or corporate annual reports focuses on the associated negative impacts for organizations. And there's a lot to report: in 2017 alone, 330 catastrophic weather events occurred, 31 of which resulted in damages of more than USD 1 billion.[1]

Hurricane Harvey hit the Houston, Texas, area in 2017 and had a tremendous impact on the US economy. That's not surprising, since Houston is among the top three hubs for oil refineries and the largest US center for chemical production.[2] At one point in Harvey's aftermath, almost one-quarter of US refining capacity was shut down, including Motiva Enterprises LLC's Port Arthur refinery, the nation's largest.[3]

Even "normal weather" impacts the chemicals, petroleum and industrial products industries on a daily basis, whether through operations needs, critical infrastructure requirements or dangers for field workers. Weather-related damage can cause costly manufacturing equipment failures. Seasonal weather, including severe storms and hurricanes, can exert tremendous influence on natural gas demands. Weather-related perils cause hundreds of fatalities in the US alone, and over 100,000 worldwide each year.[4] Monitoring these perils manually can reduce productivity and put workers at risk of injury.

100%

of chemicals, petroleum and industrial products' executives surveyed report that improved weather insights can positively impact annual revenue growth

87%

of executives surveyed that view weather data as a competitive advantage have staff dedicated to analyzing it

76%

of executives surveyed that see weather data as a competitive advantage expect that weather insights as a service would be more valuable than raw data

To better understand how weather impacts organizations globally and across industries, the IBM Institute for Business Value (IBV), in cooperation with Oxford Economics, surveyed 1,000 global C-level executives representing 13 industries and 15 countries (see "Study approach and methodology" on page 18). Of these participants, 150 were from the chemicals, petroleum and industrial products industries.

Our research indicates that weather has both negative and positive impacts on organizations that can translate directly to income statements. And an overwhelming majority of executives say better weather-related insights can reduce costs and increase revenues.

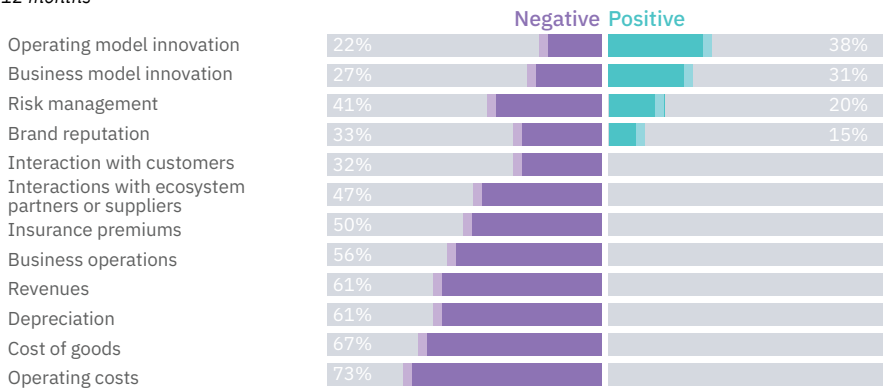
So what's holding them back? The executives surveyed identified six key business and technical challenges that inhibit their organizations from deriving more insights from weather data. Fortunately, these challenges are relatively easy to address. This report identifies lessons learned from the chemicals, petroleum and industrial products companies that view weather data as a competitive advantage.

Weather matters

Weather is indisputably important to organizations. Chemicals, petroleum and industrial products executives reported that weather has impacted their companies in a variety of ways over the past 12 months (see Figure 1).

Figure 1

How weather has impacted chemicals, petroleum and industrial products organizations in the past 12 months



Source: IBM Institute for Business Value 2018 Global Weather Study.

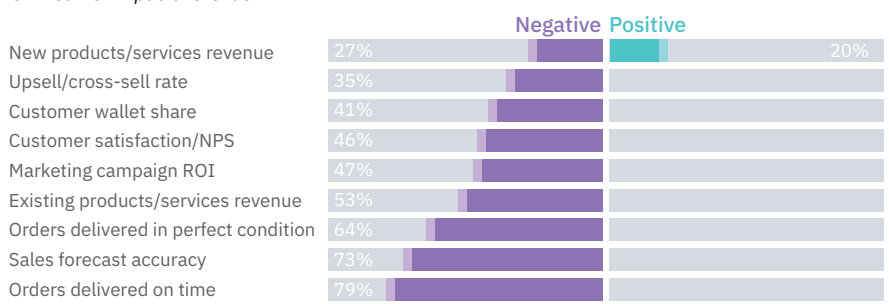
Increasing mine site efficiency[5]

A mining equipment manufacturer is impacted by weather through mining disruption delays: 7 percent of the company's asset time is unused due to weather delays. One way to address this issue is to position trucks scheduled for repair at a maintenance bay in advance of a weather event. Another way is to pre-position pumps, graders and bulldozers in advance of a weather event to shorten mine closure duration. The combination of these opportunities can conservatively yield a 15 percent reduction in weather delays. Assuming five sites, this could translate into more than 3,500 hours of productive truck hours by redirecting trucks that are subject to long weather delays to maintenance.

While executives cited both negative and positive impacts, the balance tipped greatly toward the negative. Seventy-three percent of chemicals, petroleum and industrial products executives identified negative impacts to operating costs – a much higher proportion than the 53 percent of cross-industry respondents. Many of these executives also cited negative impacts to cost of goods, depreciation, revenues, business operations and insurance premiums, in that order. By contrast, executives cited operating and business model innovation, risk management and brand reputation as factors more positively impacted by weather.

More than half of the executives indicate that at least four revenue metrics are negatively impacted by weather in their organizations, with on-time sales order delivery and forecast accuracy cited as the most negatively impacted (see Figure 2). Only one revenue metric was cited as being impacted positively: revenue from new products or services.

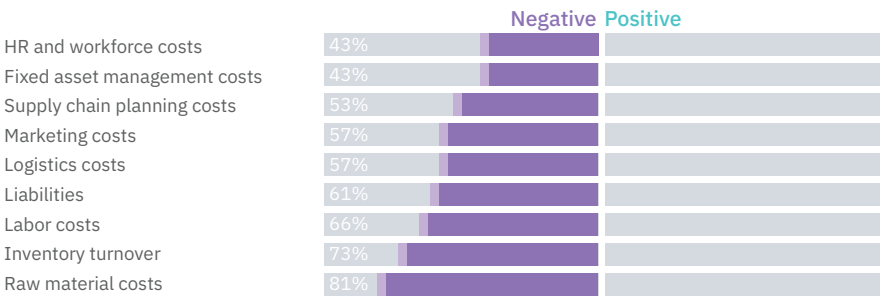
Figure 2
How weather impacts revenue



Source: IBM Institute for Business Value 2018 Global Weather Study.

From a cost perspective, no respondents report a positive impact of weather on cost metrics. More than other metrics, executives cited raw material costs, inventory turnover and labor costs as being negatively impacted by weather (see Figure 3).

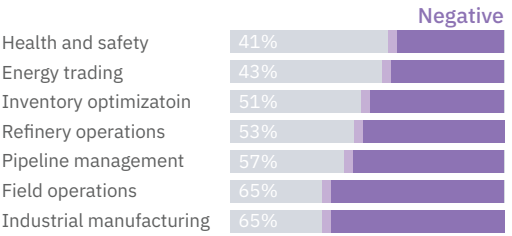
Figure 3
How weather impacts cost metrics



Source: IBM Institute for Business Value 2018 Global Weather Study.

Specific to the chemicals and petroleum area, respondents report that weather has a negative impact on operations. They cited manufacturing, field operations and pipeline management as the most negatively impacted areas (see Figure 4).

Figure 4
How weather impacts chemicals and petroleum operations over the past 12 months



Source: IBM Institute for Business Value 2018 Global Weather Study.

The value of insight

An astonishing 100 percent of respondents say an improved use of weather data could enable their organizations to realize revenue growth, reduce annual legal, insurance and risk mitigation costs, and facilitate lower operating costs.

When we asked executives to scope the potential value of better weather-related insights, over one in five scoped the potential annual revenue growth opportunity to be between 2 and 5 percent. This opportunity translates to additional revenue growth of up to USD 50 million per USD 1 billion of annual revenue. An additional two-thirds of executives say the revenue growth potential could be up to USD 20 million per USD 1 billion of annual revenue.

Executives saw even greater potential for cost reduction. Twenty-nine percent of respondents said the opportunity to reduce operating costs could be between 2 and 5 percent. And a majority (60 percent) expect that better weather insights could provide the same cost reduction potential for annual legal, insurance and risk mitigation costs.

The value forecast
Because weather impacts business performance metrics, organizations can use performance benchmarking to envisage the potential for improvement and define the associated monetary value of improved performance levels.

The examples that follow show current industry peer group performance for metrics influenced by weather, using data from the IBM Institute for Business Value Benchmarking database.[6]

Example 1: Industrial products improvement of inventory turns
Weather impacts all types of inventory, including raw materials, work in progress and finished goods. An industrial products organization can gain a competitive advantage by using insights from data – including many types of weather data – to reduce the need to store inventory to service sales. Not only can this help release working capital, it can also provide cost savings on warehousing and storage space.

IBM benchmarking data shows that industrial products organization report average inventory turns of 1.5 per USD 1 billion in cost of goods sold for bottom quartile performers.[7] Performance levels rise to 3.9 for median performers and 6.5 and higher for top quartile performers.[8] In this scenario, an industrial products organization that improves its inventory turns from 1.5 to 3.9 could potentially release USD 410 million in working capital for every USD 1 billion of costs of goods sold.[9]

Example 2: Chemicals and petroleum supply chain cost reduction
Weather impacts the movement of raw materials, goods and products. Storms, flooding and severe winds can create transportation and delivery nightmares. Chemicals and petroleum companies are likely to need to adjust routing, lead times and capacity. This can have a dramatic impact on supply chain efficiency.

Benchmarking data shows that the bottom quartile chemicals and petroleum performers report supply chain costs as 10 percent of revenues.[10] Median performers are at 5.33 percent.[11] A chemicals and petroleum organization that reduces its supply chain costs from the bottom quartile to the median could potentially reduce its costs by USD 46 million for every USD 1 billion of revenues.[12]

Optimizing crop yields in agriculture[13]

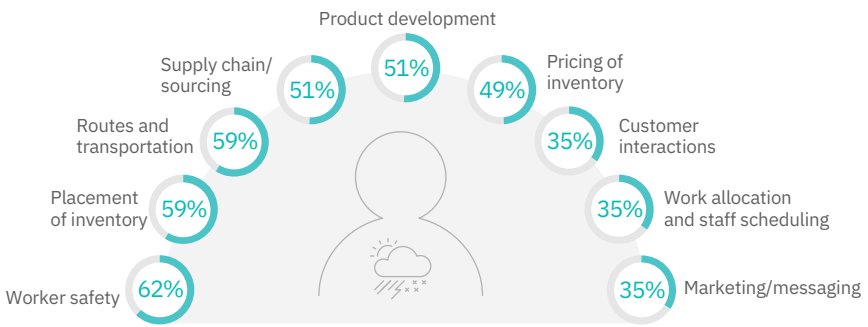
Ninety percent of crop losses are due to weather. Internet of Things (IoT) data can be collected from sensors installed in everything from seed drills, sprayers and spreaders, to drones, satellite imagery and soil. This sensor information can then be analyzed with farm weather, historical yield and weather station data to identify where the greatest potential for improvement lies. With these insights, growers can focus their efforts and resources on areas that have the highest potential for growth. Crop yield forecast data can also be shared with lenders, insurers, government agencies, commodities traders and other agribusiness suppliers to better inform decisions across the entire industry ecosystem.

Weathering the weather

The value of better weather insights can extend beyond cost reduction and revenue growth opportunities. Most executives say weather has a significant impact on business decision making within their organizations (see Figure 5). Sixty-two percent told us that weather either influences all human decisions or triggers automated decisions related to worker safety. And many respondents declare that weather plays a significant role in decisions, ranging from placement of inventory, routes and transportation, and supply chain management and sourcing, to product development. Improved weather insights can enable organizations to improve decision making and performance in these critical areas.

Figure 5

Where weather influences all human decisions or triggers automated actions

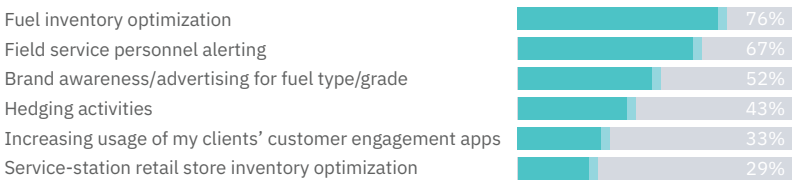


Source: IBM Institute for Business Value 2018 Global Weather Study.

All of the executives surveyed also said they incorporate weather data into their organizations' operational plans. Over one-quarter indicate they integrate weather data into operational plans months out, while more than half say it is integrated into plans weeks before they go into effect.

Chemicals and petroleum respondents view weather insights as helping fuel inventory optimization and field service personnel alerting (see Figure 6).

Figure 6
Areas that would benefit most from weather data-derived insights



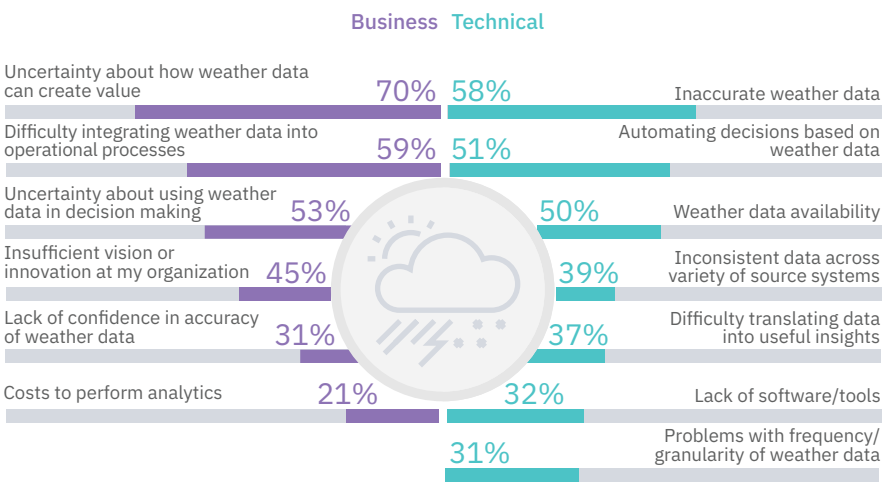
Source: IBM Institute for Business Value 2018 Global Weather Study.

What's hindering growth?

Many leaders struggle to put weather insights to work. We asked chemicals, petroleum and industrial products executives what's inhibiting their organizations from deriving more insights from weather data. They identified multiple business and technical challenges (see Figure 7).

Figure 7

What's inhibiting executives from gaining better insights from weather data



Source: IBM Institute for Business Value 2018 Global Weather Study.

Uncertainty about how weather data creates value topped the list of business challenges, followed by difficulty integrating weather data into operational processes and uncertainty about using weather data in decision making. Costs related to analytics were a lesser concern.

The accuracy of data, automation of data-based decisions and availability of data topped the list of technical challenges encountered by organizations integrating weather data into day-to-day business practices. The management of weather data is exacerbated by the fact that nearly three-quarters of organizations use weather data from a variety of sources. Less than a third of respondents identify a lack of software and tools, and problems with frequency, completeness or granularity of weather data as barriers.

Improving gasoline demand forecasting and supply decisions[14]

The Weather Company, an IBM Business, analyzed local weather data at ten gasoline distribution centers over an 18-month period and overlaid gasoline demand to understand patterns. Time-series and regression-based models were developed to analyze the usefulness of weather information. In nine out of ten distribution centers, weather impacted gasoline demand. During extreme heat, demand increased 31 percent, but supply only increased 10 percent, resulting in a demand/supply mismatch. By adding weather information to enable more efficient decisions, companies can increase supply before extreme heat and decrease supply when temperatures are normal.

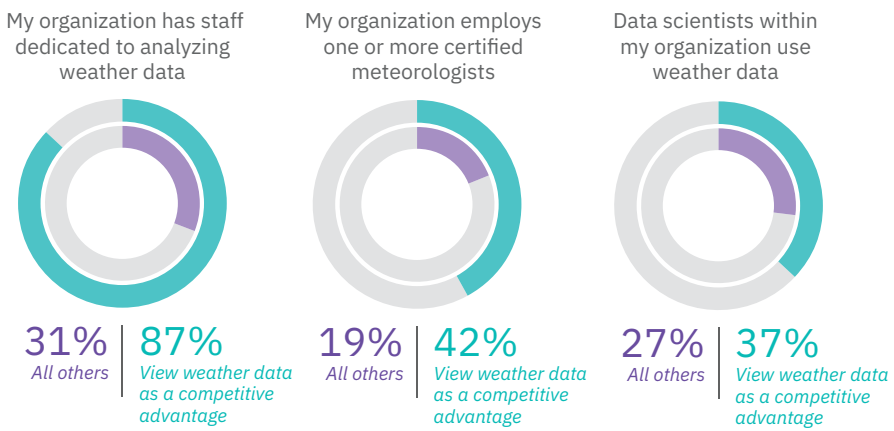
Growing tips for your bottom line

So why are the weather fortunes of organizations so different? To better understand this dynamic, we identified a group that has an alternate perspective: the 41 percent of our respondents who view weather data as a competitive advantage. Almost two-thirds of the members of this group are acting on their instincts when using weather data, compared to just 47 percent of their peers.

These organizations see both actual real-time (82 percent) and historical (44 percent) weather data as important to their objectives. They perceive less difficulty in capturing and analyzing weather data efficiently, and performance at scale. And they are less worried about the cost of using weather data and integrating it into their organizations' systems. Over three-quarters say weather insights as a service would be more valuable than raw data alone.

Organizations that view weather data as a competitive advantage stand out in dedicating staff to the effort (see Figure 8). Eighty-seven percent state that their organizations have staff dedicated to analyzing weather data. They have two times the number of certified meteorologists than their peers.

Figure 8
Resources focused on weather



Source: IBM Institute for Business Value 2018 Global Weather Study.

So how can organizations clear these business and technical obstacles and begin to capitalize on weather insights? Many pioneering organizations have successfully overcome these challenges. Organizations can adopt these leading practices to address their most pressing business and technical challenges.

World Fuel Services integrates weather data into operational processes[15]

World Fuel Services (WFS) provides energy procurement advisory services, supply fulfillment, and transaction and payment management solutions to commercial and industrial customers, principally in the aviation, marine and land transportation industries.

WFS deployed the myWorld app, which is designed specifically for business aviation and gives users a single platform to efficiently access fuel, weather, complex flight planning, airport, handler, country and regulatory data, in addition to a services engine.

The app provides users with complex information and calculations embedded directly into the flight plan process and incorporates advanced features and functionality to support pilots from fuel to flight – both on the ground and in the air. WFS successfully incorporated weather data into the app to provide key features such as integrated weather graphics and vector content overlaid on interactive maps.

Business challenge	Leading practice
Uncertainty about how weather data usage can create value	You can't control the weather, but you can control *for* the weather. Aim to have a clear strategy and understanding of how weather impacts functions across the organization. Start with a Design Thinking workshop and include senior leaders from business units across the organization. Uncover the quick hits — projects that deliver high value and are feasible to implement — and build out a longer-term plan to use weather data insights.
Difficulty integrating weather data into operational processes	Weather insights should further enable data-driven decision making and automation for operational processes, not add additional complexity. Aim to couple weather data with their existing modeling tool sets. Learn from historical data and become more predictive by tying in factors such as current on-demand weather data and future forecast data along with real-time alerts to help build a comprehensive picture of the business impact of weather.
Uncertainty about using weather data in decision making	Don't focus on data, focus on decision support fueled by data. Most organizations are looking for creative ways to identify and confirm rapid, scalable and cost-effective ways to design, test and deploy transformational changes, including weather-based decision making. Seek experienced, collaborative partners that can co-create and experiment with you on agile, rapid prototypes to build strong business cases and trust.

Technical challenge	Leading practice
Inaccurate weather data	Conduct due diligence when seeking a weather data provider and select an organization with high quality and reliability. Also seek out a third party to verify weather data provider accuracy claims. Raw data often does not lead to value directly—deriving value requires transforming the data into insight with the use of skilled meteorologists and data scientists.
Automating decisions based on weather data	Use data science to identify trigger levels when weather affects your business and apply automation to take business action when those trigger levels are likely to be exceeded. Modernizing and automating decisions based on new data can enable faster time-to-value, reduced risk and increased customer satisfaction. Analytics on relevant data, including weather, should drive toward creating insights and then taking valuable actions.
Weather data availability	Picking a weather data supplier is critical. Select a weather data provider that has a global scale, solutions and up-time to meet requirements. Weather data is not "one size fits all." Different use cases require different types of data, even industry-specific variables, at different temporal and geospatial granularities.

Monsanto connects weather data with IoT data[16]

Monsanto Company, a creator of seeds, has developed FieldDrive, a cloud-based data collection platform. It allows the company to pull yield and positioning data dynamically off combines and tractors via sensors and put it in the cloud with weather forecasts and other data. This combination yields reliable information about the quality of products and where they are at the time of harvest.

Connecting the data collected on the ground with sales and research data provides insights to better support customers and development of products that work in a wider array of growing conditions.

Head in the clouds or in a fog?

In what ways is your organization capitalizing on weather insights to reduce costs and increase revenues? How could you benefit from greater weather-related insights?

To what degree are weather-related insights influencing decision making about your critical processes? Where is there room for improvement?

How is your organization integrating weather insights into operational planning? How could you improve planning with better weather insights?

What is your plan to consider using weather insights as a service? How will you access the necessary capabilities to realize the potential of weather-related insights?

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Related reports

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Study approach and methodology

In cooperation with Oxford Economics, the IBM Institute for Business Value surveyed 1,000 C-level executives representing 13 industries and 15 countries, including 250 from North America, 50 from Latin America, 200 from Western Europe, 150 from the Nordics, 100 from Australia and New Zealand, 100 each from Japan and India, and 50 from China. Of these, 150 chemicals, petroleum and industrial products executives participated in the study. Respondents were asked a series of questions about how weather impacts their organizations, the potential they say exists by improving weather-related insights and challenges they encounter in gaining those insights.

For more information

To learn more about this IBM Institute for Business Value (IBV) study, please contact us at iibv@us.ibm.com. Follow @IBMIBV on Twitter, and for a full catalog of our research or to subscribe to our newsletter, visit: **ibm.com**/iibv.

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6 The IBM Institute for Business Value (IBV) Benchmarking database encompasses over 1,000 business and process performance metrics and data from more than 27,000 business entities from more than 76 countries. For more information, visit: https://www-935.ibm.com/services/us/gbs/thoughtleadership/benchmarking/

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