ISSUE BRIEF: Q1 2020

IOWA COMPANIES EXPLAIN CLIMATE CHANGE AND SEVERE WEATHER RISK
EXECUTIVE SUMMARY

This report examines how severe weather is disrupting supply chains, distorting commodity prices, damaging plants and equipment, and hurting consumer demand for Iowa businesses. It is meant to serve as a resource for local, state, and Congressional officials and media interested in energy and climate change policy. Specifically, the points made here should help media and officials answer a simple question about climate change: Can we fix climate change without wrecking our economy?

Iowa’s top entrepreneurs, executives, investors, and small business owners are changing how they build, where they locate, and how they insure their assets. They are creating new business lines and models to mitigate the effects of climate change. And they are issuing warnings to their investors about climate change that skeptics in Des Moines and Washington, D.C. should not ignore.

Severe weather affects Iowa’s greatest competitive advantages, including fast-moving global supply chains, model climate for corn and soybeans, and access to key waterways like the Mississippi and Missouri Rivers. Severe weather is affecting key industries, from farms and orchards to aerospace, auto suppliers, railroads, restaurants, and shipping.

Business Forward has worked with more than 990 entrepreneurs, executives, and small business owners across Iowa. These leaders have helped brief Congress, the White House, and state legislatures on a range of issues, including tax reform, trade agreements, infrastructure investment, and immigration reform. More than 260 of them have participated in our climate change and clean energy program, where they have learned about renewable energy options and shared their experience managing severe weather costs.

BOTH OF IOWA’S FORTUNE 500 COMPANIES HAVE ISSUED WARNINGS TO THEIR INVESTORS, AS WELL AS INDUSTRY LEADERS IN ENERGY, MANUFACTURING, FOOD PROCESSING, AND MORE.
### Key Themes from Fortune 500 Warnings about Climate Change

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<th>“Just in Time” Inventory and Global Supply Chains Raise Risk</th>
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<td>To boost profits, U.S. companies source from across the globe, encourage suppliers to specialize, and reduce overhead costs by operating with as little as two to four hours of parts inventory on site. As our supply chains grow more global, more specialized, and faster, severe weather events become more expensive.</td>
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<th>Extreme Temperatures Threaten Comparative Advantages Across Supply Chains</th>
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<td>Iowa farmers in 2019 were unable to plant a record 463,339 acres of crops like corn and soybeans due to flooding, heavy rains, and cold temperatures. Fluctuating water levels on the Mississippi and Missouri rivers pose a threat to Iowa’s shipping industry.</td>
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<th>Damage to the Developing World Hurts U.S. Companies</th>
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<td>Developing markets face greater climate risk: their populations live in hotter climates and are concentrated in coastal areas with poor infrastructure. This hurts Fortune 500 companies, because those developing markets are expected to drive their future growth.</td>
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<th>Weather Can Be the Difference Between a Good Year and Going Out of Business</th>
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<td>For retailers, restaurants, and the entertainment industry, weather can make or break their year. Good weather allows golf courses to sell more afternoon rounds and restaurants and sports teams to fill outdoor seating. For low-margin businesses, marginal sales are critical to survival.</td>
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<th>Small Businesses Are Less Likely to Survive Severe Weather Losses</th>
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<td>They have smaller cash reserves, are more likely to operate out of a single location, less likely to have backup systems, and have a harder time relocating. Small businesses are more likely to shut down due to severe weather events, and their failures are bad news for the big companies they supply.</td>
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Iowa’s infrastructure is particularly vulnerable to severe weather events. According to the American Society of Civil Engineers (ASCE), Iowa has the highest percentage of structurally deficient bridges in the nation, with nearly 20 percent of 24,000 total bridges rated as structurally deficient in 2018. Roadways in Iowa are aging and the projected budgeting shortfall for Iowa’s roads is $32.5 billion over the next 20 years. Dams are one of Iowa’s most pressing areas of need, as less than 30 percent of high hazard potential dams have emergency action plans compared to 70 percent nationwide. The state of Iowa spends less than $50 per dam on maintenance each year, far lower than the national average of $700 per dam. There is also a $664 million shortfall in recreation and public parks infrastructure spending.

The Federal Government has been underfunding infrastructure for years, resulting in a system that fails: the ASCE gave the United States a D+ on infrastructure in 2017. According to the Des Moines Register, Iowa has the third worst infrastructure in the United States. Without a strong federal partner, local and state governments are left to plan and fund infrastructure investments on their own. A high number of governmental units makes coordinating policy and collaborating more difficult. Iowa has 1,947 total governmental units, ranking 17th highest in the country.

Because of these factors, Iowa companies are warning investors that climate change threatens to reduce productivity and profits.
A SNAPSHOT OF IOWA’S ECONOMY

PRIVATE SECTOR GDP
$168 BILLION
30TH IN U.S.

STATE POPULATION
3,156,145
31ST IN U.S.

UNEMPLOYMENT RATE
2.5%

PEOPLE EMPLOYED
1,690,000

NET ENERGY: IMPORTER
-724 TRILLION BTU

GROSS DOMESTIC PRODUCT BY INDUSTRY
(2018)

27% - FINANCIAL OPERATIONS & HOUSING
20% - MANUFACTURING
9% - PROFESSIONAL & BUSINESS SERVICES
7% - EDUCATION & SOCIAL ASSISTANCE
7% - TRANSPORTATION & WAREHOUSING
6% - AGRICULTURE
5% - CONSTRUCTION
5% - WHOLESALE TRADE
4% - RETAIL TRADE
3% - TRANSPORTATION & WAREHOUSING
3% - INFORMATION & ENTERTAINMENT
2% - UTILITIES
2% - MINING & EXTRACTION
<1% - OTHER

EMPLOYMENT BY INDUSTRY
(2018)

20% - OFFICE MANAGEMENT & SUPPORT
14% - FINANCIAL OPERATIONS & SALES
12% - CONSTRUCTION & MAINTENANCE
10% - MANUFACTURING
9% - FOOD SERVICES & AGRICULTURE
8% - HEALTH CARE
8% - TRANSPORTATION & SHIPPING
7% - EDUCATION
7% - PERSONAL & PROTECTIVE SERVICES
4% - SKILL INTENSIVE
1% - ENTERTAINMENT

SOURCE: GDP DATA IS FROM THE BUREAU OF ECONOMIC ANALYSIS. EMPLOYMENT DATA IS FROM THE BUREAU OF LABOR. POPULATION FROM THE CENSUS BUREAU. ENERGY DATA FROM EIA.
HOW SEVERE WEATHER AFFECTS KEY IOWA INDUSTRIES, AS EXPLAINED BY IOWA EXECUTIVES

AEROSPACE

Iowa State University is a leader in aerospace research and engineering programs. The university has close ties with Collins Aerospace, a leader in the global aerospace industry. The company employs more than 1,200 Iowa State alumni in its American and global offices.6

Collins Aerospace (under the parent company United Technologies and formerly under Rockwell Collins) has three key engine component locations in Iowa.7 Rockwell Collins stated that its aerospace business may “not always have alternate sources of supply readily available for certain goods or services, such as liquid crystal displays. A shortage of raw materials or components, the loss of a significant supplier or subcontractor or their inability to meet performance, quality or delivery requirements due to natural disaster... or other causes could have a material adverse effect on our business, financial condition, results of operations and cash flows.”8

AIRPORTS

Aviation is a critical part of Iowa’s economy. Twelve percent of Iowa’s economy is linked to aviation and the industry has an economic impact of $18.4 billion, supporting 47,000 jobs around the state.9 There are two major airports in Iowa: Eastern Iowa Airport and Des Moines International Airport, where Delta Airlines, United Airlines, and American Airlines are the most popular airlines.10

Delta reports, “Our results of operations are impacted by severe weather, natural disasters and seasonality. Severe weather conditions and natural disasters can significantly disrupt service and create air traffic control problems. These events decrease revenue and can also increase costs. In addition, increases in the frequency, severity or duration of thunderstorms, hurricanes, typhoons or other severe weather events, including from changes in the global climate, could result in increases in delays and cancellations, turbulence-related injuries and fuel consumption to avoid such weather, any of which could result in loss of revenue and higher costs.”11
**United Airlines** states that the airline “may incur substantial costs as a result of changes in weather patterns due to climate change. Increases in the frequency, severity or duration of severe weather events such as thunderstorms, hurricanes, flooding, typhoons, tornadoes and other severe weather events could result in increases in delays and cancellations, turbulence-related injuries and fuel consumption to avoid such weather, any of which could result in significant loss of revenue and higher costs.”

**American Airlines** is the largest airline in the world and is also the most popular airline at Des Moines International Airport. The airline warns, “Our business has been and will continue to be affected by many changing economic and other conditions beyond our control, including global events that affect travel behavior, and our results of operations could be volatile and fluctuate due to seasonality...including, among others: weather and natural disasters, including increases in such disasters and related costs caused by more severe weather due to climate change.”

**CROPS & AGRICULTURE**

Iowa produces nearly 10 percent of the nation's food supply. Iowa's top four crops are corn, soybeans, hay, and oats; together the four crops represent more than $14 billion in economic output and the bulk of Iowa's field crops. For every degree Celsius that the Earth warms, corn yields are projected to decrease 7.4 percent and soybean yields by 3.1 percent.

Severe weather events disproportionately hurt states like Iowa that rely heavily on agriculture for revenue. In 2019, multiple instances of unprecedented flooding paralyzed farmers and wiped out fields of crops that could not be saved and were not insured. The estimated value of crops lost in a record flood in March was more than $2 billion along the Missouri River basin. The floods also weakened or destroyed existing levees, making the area more susceptible to future flooding. Soils became so saturated that they were unable to be used, and hundreds were displaced from their homes, yet to return.

One of the hubs of agriculture processing in the United States is Cedar Rapids. The second largest city by population in Iowa, Cedar Rapids is the largest corn processing city in the nation. Fortune 500 companies like General Mills and Archer Daniels Midland have manufacturing plants or operations centers in Cedar Rapids.

**HOW SEVERE WEATHER AFFECTS CASH CROPS (AND FOOD PRICES)**

1. Consistently warmer temperatures stress plants and livestock, reducing crop yields and livestock health.

2. Rising surface temperatures are disrupting weather patterns, affecting rainfall, and even the timing and duration of growing seasons.

3. More severe storms are damaging crops and livestock.
General Mills warns investors, “Our ability to make, move, and sell products is critical to our success. Damage or disruption to raw material supplies or our manufacturing or distribution capabilities due to weather, including any potential effects of climate change, natural disaster...could impair our ability to manufacture or sell our products. Many of our product lines are manufactured at a single location...Failure to take adequate steps to mitigate the likelihood or potential impact of such events, or to effectively manage such events if they occur, particularly when a product is sourced from a single supplier or location, could adversely affect our business and results of operations.”

Archer Daniels Midland is a global food processing corporation that recently invested $200 million to update an existing grain processing plant in Iowa. Its most recent annual report states, “The Company’s operations rely on dependable and efficient transportation services, the disruption of which could result in difficulties supplying materials to the Company’s facilities and impair the Company’s ability to deliver products to its customers in a timely manner. The Company relies on access to navigable rivers and waterways in order to fulfill its transportation obligations more effectively...Certain factors which may impact the availability of non-agricultural commodity raw materials are out of the Company’s control including, but not limited to, disruptions resulting from weather, economic conditions, manufacturing delays or disruptions at suppliers...”

― RAY GAESSER
Corn and soybean farmer, Corning

― ANDY AND MELISSA DUNHAM
Owners, Grinnell Heritage Farm

[Most farmers are already] managing for extreme weather events. It’s top of most guys’ minds. We live with mother Nature every day and we’re trying to adapt. We’re geared up to plant and harvest earlier and more quickly.

If you can name a conservation practice, we’re probably doing it... If we can’t make a go of it, on some of the best soil in the world, with a pretty competent farmer, the lights are going to go out for a lot of people.
ENERGY

Iowa is a leader in wind energy and biofuel production. More than one-third of the state’s electricity was produced from wind in 2018, the second highest share of any state. While coal is still the primary source of net electricity production, its share of the energy market has significantly decreased over the last decade; in 2008, three-quarters of Iowa’s electricity was produced from coal, and today coal produces only 45 percent of the state’s electricity.27

Iowa is also the nation’s largest ethanol producer, with more than a quarter of the country’s production capacity at over four billion gallons per year. After a series of floods in March 2019 in Iowa, Nebraska, and South Dakota, about 13 percent of the nation’s ethanol production was impacted. Biorefineries were forced to shut down or slow production, and supply chain disruption caused by railroad damage led to higher prices in affected markets.28

MidAmerican Energy Company provided its Iowa customers with more than half of their electricity from renewable sources in 2017.29 MidAmerican Energy is a subsidiary of Berkshire Hathaway. The official statement from Berkshire Hathaway Energy warns, “The impact of events or conditions caused by climate change, whether from natural processes or human activities, are uncertain and could vary widely, from highly localized to worldwide, and the extent to which a utility’s operations may be affected is uncertain. Climate change may cause physical and financial risk through, among other things, sea level rise, changes in precipitation and extreme weather events… Availability of resources to generate electricity, such as water for hydroelectric production and cooling purposes may also be impacted by climate change and could influence the Registrants’ existing and future electricity generating portfolio. These issues may have a direct impact on the costs of electricity production and increase the price customers pay or their demand for electricity.”30

Renewable Energy Group is a Fortune 1000 biofuel company.31 Headquartered in Ames, Renewable Energy Group is the largest producer of biodiesel in North America by volume, and has a total of seven operations sites in Iowa.32 It warns, “If any transportation providers fail to deliver raw materials to us in a timely manner, we may be unable to manufacture products on a timely basis. Shipments of products and raw materials may be delayed due to weather conditions… Any failure of a third-party transportation provider to deliver raw materials or products in a timely manner could harm our reputation, negatively affect our customer relationships and have a material adverse effect on our business, financial condition and results of operations.”33

Climate change may cause physical and financial risk through, among other things, sea level rise, changes in precipitation and extreme weather events.

- MIDAMERICAN ENERGY COMPANY

Any failure of a third-party transportation provider to deliver raw materials or products in a timely manner could harm our reputation, negatively affect our customer relationships and have a material adverse effect on our business, financial condition and results of operations.

- RENEWABLE ENERGY GROUP
HEALTH CARE & PHARMACEUTICALS
Iowa has an aging population that requires more medical attention, making its health care industry particularly important. Overall, health care has an $18 billion annual economic impact and provides more than one-fifth of Iowa’s non-farm jobs.

Iowa relies heavily on smaller, independently-owned pharmacies, particularly in rural areas. These pharmacies often serve as suppliers for medication and patient care facilities. For rural communities that lack health care facilities nearby, pharmacists offer the only opportunity to directly discuss patient care. But these pharmacies are more vulnerable to severe weather because they lack the cash reserves to offset financial losses. More than 16 percent of independently-owned pharmacies closed from 2003 to 2018.

Major pharmacies are impacted by extreme weather as well. CVS has 38 Iowa locations and warns that severe weather is among the factors that could disrupt their operations, negatively impact consumer shopping patterns, and adversely affect their supply chain.

HOTELS
The lodging industry in Iowa generated more than $1 billion in traveler spending for 2018, representing a 12 percent increase from the previous year. Severe weather events can limit travel within and to the state, resulting in volatility in the industry.

Hilton operates 51 hotels in Iowa. The hotel chain’s annual report warns, “Macroeconomic and other factors beyond our control can reduce demand for hospitality products and services, including demand for rooms at our hotels. These factors include but are not limited to: climate change or availability of natural resources; natural or man-made disasters and extreme weather conditions, including earthquakes, tsunamis, tornadoes, hurricanes, typhoons, floods, wildfires, volcanic eruptions, oil spills and nuclear incidents.”

Starwood Hotels, which was recently acquired by Marriott, operates 47 hotels in the state of Iowa. Starwood’s last annual report warned, “[we] are subject to risks from natural disasters such as earthquakes and severe weather, which may result in damage to our properties. Natural disasters and severe weather such as earthquakes, tornadoes, hurricanes or floods may result in significant damage to our properties.

EFFICIENCY & CLIMATE RISK
For decades, Iowa companies have built increasingly large, complex, and fast-moving supply chains. To reach the lowest-cost producers, Iowa companies depend more on Asian, South American, and African markets.

To maximize each individual supplier plant’s efficiency, Iowa companies have encouraged their suppliers to specialize. And, to reduce overhead costs, more Iowa companies are following just-in-time inventory practices, which require their global supply chains to operate with greater speed.

As their supply chains become more global, Iowa factories, stores, and plants grow more vulnerable to severe weather in other countries.
The extent of our casualty losses and loss in operating income in connection with such events is a function of the severity of the event and the total amount of exposure in the affected area. When we have geographic concentration of exposures, a single catastrophe or destructive weather event affecting a region may have significant negative effect on our financial condition and results of operations. We may be materially and adversely affected by our exposure to losses arising from natural disasters or severe weather.\textsuperscript{43}

**INFORMATION & COMMUNICATIONS TECHNOLOGY**

Rural areas in Iowa attract IT companies to start, relocate, and expand. The state has worked hard to develop relationships with technology companies to foster sustainable growth in the sector and help create jobs. Companies like IBM, Google, Facebook and Microsoft have all recently invested in Iowa to build data centers. In total, the technology industry employs more than 76,000 people and accounts for $10.7 billion of the state’s economic output.\textsuperscript{44}

IBM reports, “Weather exerts a tremendous influence on the economy. It affects productivity, sales and energy consumption, and it can disrupt supply chains and transportation systems. Severe weather can upend lives and businesses for hours, weeks, years or even forever...severe weather is the leading cause of power disruptions in many countries. Global economic losses resulting from weather disasters totaled $215 billion last year.”\textsuperscript{45}

Alphabet, Google’s parent company, informs its investors that “we may experience supply shortages and price increases driven by raw material availability, manufacturing capacity, labor shortages, industry allocations, natural disasters, the effects of climate change (such as sea level rise, drought, flooding, wildfires, and increased storm severity)....In addition, some of the components we use in our technical infrastructure and products are available only from a single source or limited sources, and we may not be able to find replacement vendors on favorable terms or at all in the event of a supply chain disruption.”\textsuperscript{46}

*Severe weather can upend lives and businesses for hours, weeks, years or even forever.*

- IBM

*We may experience supply shortages and price increases driven by raw material availability, manufacturing capacity, labor shortages, industry allocations, natural disasters, the effects of climate change (such as sea level rise, drought, flooding, wildfires, and increased storm severity).*

- ALPHABET
INSURANCE & FINANCIAL SERVICES
The Greater Des Moines area has the highest concentration of insurance employment of any metropolitan area in the United States.\textsuperscript{47} The insurance industry accounts for about 16 percent of the region’s jobs, and the area has been called a “global hub of the insurance industry” by the Chamber of Commerce.\textsuperscript{48}

Allied Insurance states that “natural disasters and severe weather such as floods, blizzards and rising temperatures may result in damage to the properties. The extent of Allied’s casualty losses and loss in operating income in connection with such events is a function of the severity of the event and the total amount of exposure in the affected area...In addition, climate change, to the extent it causes changes in weather patterns, could have effects on Allied’s business by increasing the cost of property insurance, and/or energy at the properties. As a result, the consequences of natural disasters, severe weather and climate change could increase Allied’s costs and reduce Allied’s cash flow.”\textsuperscript{49}

Progressive Corporation reports that its 2018 “profit results were vastly affected by weather and natural catastrophes. Our catastrophe reinsurance program limited our retained losses and loss adjustment expenses from Hurricane Michael to $60 million. Unfortunately, our retained catastrophe losses and loss adjustment expenses from hurricanes, hail, winter storms, and the California Wildfires totaled $295 million.”\textsuperscript{50}

Travelers Companies, Inc. warns that “severe weather events over the last two decades have underscored the unpredictability of future climate trends, and potentially changing climate conditions could add to the frequency and severity of natural disasters and create additional uncertainty as to future trends and exposures. During that time period, the insurance industry experienced increased catastrophe losses due to a number of potential causal factors, including, in addition to weather/climate variability...For example, hurricane activity has impacted areas further inland than previously experienced by us, and demographic changes have resulted in larger populations in coastal areas which historically have been subject to severe storms and related storm surge, thus expanding our potential for losses from hurricanes. Additionally, both the frequency and severity of tornado and hail storms in the United States have been more volatile during the last decade. The frequency and severity of wildfire losses have been elevated in more recent years.”\textsuperscript{51}
Principal Financial is a Fortune 500 financial services company with headquarters in Des Moines. Principal employs approximately 6,500 workers in Des Moines, making it the third-largest employer in the region. Its annual report to investors warns that climate change has intensified severe weather events and natural disasters, which represent significant liabilities to its financial stability: “Atmospheric concentrations of carbon dioxide and other greenhouse gases have increased dramatically since the industrial revolution, resulting in a gradual increase in the frequency and severity of natural disasters...Potential impacts may include the following: climate change may impact asset prices, as well as general economic conditions. For example, rising sea levels may lead to decreases in real estate values in coastal areas. Changes in asset prices may impact the value of our fixed income, real estate and commercial mortgage investments.”

MANUFACTURING

Advanced manufacturing is among Iowa’s largest industries, contributing $31.2 billion to the state’s economy. There are more than 6,000 manufacturing establishments that employ more than 213,000 Iowans, nearly 13 percent of the workforce.

HNI Corporation, a furniture manufacturer based in Muscatine, has five locations in the state. HNI warns that “natural disasters, acts of God, force majeure events, or other catastrophic events, including severe weather, military action, terrorist attacks, power interruptions, and fires, could disrupt operations and likewise, the ability to produce or deliver products. Several of the Corporation’s production facilities, members, and key management are located within a small geographic area in eastern Iowa and a natural disaster or catastrophe in the area could have a significant adverse effect on the results of operations and business conditions. Further, several of our production facilities are single-site manufacturers of certain products, and an adverse event affecting any of those facilities could significantly delay production of certain products and adversely affect the operations and business conditions.”

John Deere, producer of farm equipment and other heavy machinery, employs more than 3,000 workers in Iowa. John Deere warns, “Certain components and parts used in John Deere’s products are available from a single supplier and cannot be alternatively sourced quickly. Supply chain disruptions due to supplier financial distress, capacity constraints, labor shortages, business continuity, quality, delivery or disruptions due to weather-related or natural disaster events could affect John Deere’s operations and profitability...
The potential physical impacts of climate change on John Deere's facilities, suppliers and customers and therefore on John Deere’s operations are highly uncertain and will be particular to the circumstances developing in various geographical regions. These may include long-term changes in temperatures levels and water availability. These potential physical effects may adversely impact the demand for John Deere products and the cost, production, sales and financial performance of John Deere's operations.\textsuperscript{59}

\textbf{Winnebago Industries} is an RV manufacturing company with more than $2 billion in revenue in 2018.\textsuperscript{60} Based in Forest City, the company warns of severe weather’s impact on its manufacturing operations: “We currently manufacture most of our products in northern Iowa and northern Indiana. These facilities may be affected by natural or man-made disasters and other external events. In the event that one of our manufacturing facilities was affected by a disaster or other event, we could be forced to shift production to one of our other manufacturing facilities or to cease operations. Any disruption in our manufacturing capacity could have an adverse impact on our ability to produce sufficient inventory of our products or may require us to incur additional expenses in order to produce sufficient inventory, and therefore, may adversely affect our net sales and operating results. Any disruption or delay at our manufacturing facilities could impair our ability to meet the demands of our customers, and our customers may cancel orders or purchase products from our competitors, which could adversely affect our business and operating results.”\textsuperscript{61}

\textbf{TPI Composites} is the largest U.S.-based independent manufacturer of composite wind turbines.\textsuperscript{62} The company has a transportation manufacturing facility and a wind blade manufacturing facility in Newton, representing its only two manufacturing facilities in the United States.\textsuperscript{63} TPI Composites warns that severe weather impacts the installation, distribution, and operation of wind turbines, and negatively affects the company’s reputation.\textsuperscript{64}
MILITARY

Iowa has more than 11,000 active duty military members and reserve force members employed throughout the state.65 There are three Army bases in Iowa: Camp Dodge Army Base in Johnston, Fort Des Moines Army Base in Des Moines, and Iowa Army Ammunition Base in Middletown.66

Assistant Secretary of the Army for Civil Works R.D. James said, “As an engineer and after years as a member of the Mississippi River Commission, working with multiple Civil Works water resource projects designed to perform under extreme climatic conditions, I believe it is critical that we look at hydrologic data, analyze hydrologic trends, and understand what is happening on the ground at Army Civil Works projects. That kind of understanding is crucial to assuring those projects continue to perform as designed and that they are sufficiently resilient to face whatever future climatic events may occur...Because most Army Civil Works projects are specifically designed to safely perform and reduce risk under the extremes of the hydrologic cycle, from extreme floods to prolonged drought and everywhere in between, I believe we owe it to the communities, industries and economic sectors that depend on Civil Works systems to assure those systems are sufficiently resilient in order to dependably perform regardless of what future climatic conditions are presented.”67

PORTS & SHIPPING

Iowa is the only state in the nation bordered by two navigable rivers, the Mississippi and Missouri.68 In 2018, waterways and ports contributed $4.3 billion to the state’s economy.69 Water transport is the most cost-effective method of shipping grain and bulk commodities;70 one standard barge has the carrying capacity of 16 rail cars or 70 large tractor trailers, but remains far less energy intensive.71

But poor infrastructure and the increased risk of flooding threaten the efficiency of water transport. All 11 locks on the Mississippi River that border Iowa are potential bottlenecks that, if damaged or delayed, can cause massive traffic jams along the waterway and limit the flow of goods out of the state.72 Additionally, the Missouri River’s unpredictable water levels and dam system, which is 60 percent older than initially intended, leave Iowa susceptible to weather events that could cost the state hundreds of millions of dollars.73

SEVERE WEATHER TREND

Higher Temperatures

Temperatures across the U.S. are 1.8 degrees warmer, on average, than they were at the beginning of last century, and most of this increase has occurred since 1970. The last five years have been the globe’s warmest on modern record, and 18 of the 19 warmest years have occurred this century.74

Iowa currently averages fewer than 5 dangerous heat days per year; by 2050, Iowa is projected to experience nearly 40 dangerous heat days per year.75
RAIL
Iowa is a key state for rail due to its central location in the United States and its robust agricultural economy. Iowa is served by 18 freight railroad companies which operate 3,825 miles of track within the state. Five of these railroads are major national companies operating throughout much of the United States. These Class One railroads are BNSF Railway, Canadian Pacific Railway, Canadian National, Norfolk Southern, and Union Pacific. They operate 83 percent of Iowa's total route miles, including much of the grain gathering network.

BNSF Railway Company has 631 miles of track and employs 830 people in Iowa. The railway's annual report states that “the Company's success is dependent on its ability to operate its railroad system efficiently. Severe weather, climate change and natural disasters, such as tornadoes, fires, flooding and earthquakes, could cause significant business interruptions and result in increased costs and liabilities and decreased revenues. In addition, damages to or loss of use of significant aspects of the company’s infrastructure due to natural or man-made disruptions could have an adverse effect on the Company's operating results... Extreme swings in weather could also negatively affect the performance of locomotives and rolling stock.”

Union Pacific Corporation has 1,441 miles of track and 1,509 employees in Iowa. Union Pacific warns, “Severe weather could result in significant business interruptions and expenditures - As a railroad with a vast network, we are exposed to severe weather conditions and other natural phenomena, including earthquakes, hurricanes, fires, floods, mudslides or landslides, extreme temperatures, and significant precipitation. Line outages and other interruptions caused by these conditions can adversely affect our entire rail network and can adversely affect revenue, costs, and liabilities, which could have a material adverse effect on our results or operations, financial condition, and liquidity.”

RESTAURANTS
Iowa ranks 15th in the nation in restaurants per capita. Altogether, the accommodation and food services industry adds more than $4.3 billion to Iowa’s annual GDP.

Fast-food chains like McDonald's (173 locations), Wendy's (42 locations), Arby's (56 locations), Taco Bell (53 locations), and Subway (50 locations) operate restaurants all across Iowa. McDonald's warns investors that severe weather or climate change will adversely impact their supply chains, food pricing, and consumer demand; similar effects are felt by their competitors.
Casey’s General Stores is one of Iowa’s two Fortune 500 companies with headquarters in the state. The chain of convenience stores is based in Ankeny and has 526 locations in Iowa alone. The company warns investors, “All of our stores are located in the central region of the United States, which is susceptible to tornadoes, thunderstorms, extended periods of rain or unseasonably cold temperatures, flooding, ice storms, and heavy snow. Inclement weather conditions could damage our facilities or could have a significant impact on consumer behavior, travel, and convenience store traffic patterns as well as our ability to operate our locations...In addition, we may have a single supplier or limited number of suppliers for certain products. While we believe there are adequate reserve quantities and alternative suppliers, shortages or interruptions in the receipt or supply of products caused by...inclement weather or other conditions could adversely affect the availability, quality and cost of products, and our operating results.”

Dine Brands Global is the parent company of Applebee’s and IHOP. There are a combined 20 Applebee’s and IHOP locations in the state. Dine Brands warns that “we may experience shortages or interruptions in the supply or delivery of food and other products from third parties or in the availability of utilities. Our franchised restaurants are dependent on frequent deliveries of fresh produce, food, beverages and other products. Shortages or interruptions in food and beverage supplies may result from a variety of causes, including shortages due to adverse weather... Such shortages could adversely affect our and our franchises’ revenue and profits.”

Diversified Restaurant Holdings is the parent company to the Buffalo Wild Wings restaurant chain, which has 19 locations in Iowa. Diversified Restaurant Holdings warns investors, “Our financial performance is highly dependent on restaurants located in Florida, Illinois, Indiana, Michigan, and Missouri...In particular, adverse weather conditions can impact guest traffic at our restaurants, cause the temporary underutilization of certain seating areas, and, in more severe cases, cause temporary restaurant closures...approximately 73.4% of our total restaurants are located in Illinois, Indiana, Michigan and Missouri, which are particularly susceptible to snowfall, and approximately 26.6% of our total restaurants are located in Florida, which is particularly susceptible to hurricanes.”
RETAIL

Retail is one of the most significant areas of Iowa’s economy. Nearly 325,000 workers are directly employed by retailers, adding more than $11 billion to the state’s GDP.\(^6\)

Walmart, the United States’ largest retail brand, has 69 total retail units in Iowa, employs nearly 17,000 store associates across the state, and supports almost 35,000 supplier jobs.\(^7\) Walmart warns that “the occurrence of one or more natural disasters, such as hurricanes, tropical storms, floods, fires, earthquakes, tsunamis, cyclones, typhoons, weather conditions such as major or extended winter storms, droughts and tornadoes, whether as a result of climate change or otherwise, severe changes in climate... in a country in which we operate or in which our suppliers are located could adversely affect our operations and financial performance.”\(^8\)

Target Corporation has 22 locations in Iowa.\(^9\) Target warns that “uncharacteristic or significant weather conditions, alone or together with natural disasters, could adversely affect our operations. Uncharacteristic or significant weather conditions can affect consumer shopping patterns, particularly in apparel and seasonal items, which could lead to lost sales or greater than expected markdowns and adversely affect our short term results of operations... Natural disasters in those states or in other areas where our sales are concentrated could result in significant physical damage to or closure of one or more of our stores, distribution centers or key vendors, and cause delays in the distribution of merchandise from our vendors to our distribution centers, stores, and guests, which could adversely affect our results of operations by increasing our costs and lowering our sales.”\(^10\)

Home Depot has ten locations in Iowa and is a leader in the home improvement industry.\(^11\) It reports that “natural disasters, such as hurricanes and tropical storms, fires, floods, tornadoes, and earthquakes; unseasonable, or unexpected or extreme weather conditions; or similar disruptions and catastrophic events can affect consumer spending...They can also, temporarily or on a long-term basis, disrupt or disable operations of stores, support centers, and portions of our supply chain and distribution network, including causing reductions in the availability of inventory and disruption of utility services. In addition, these events may affect our information systems, resulting in disruption to various aspects of our operations, including our ability to transact with customers and fulfill orders and to communicate with our stores. Unseasonable, unexpected or extreme weather conditions such as excessive precipitation, warm temperatures during the winter season, or prolonged or extreme periods of warm or cold temperatures could render a portion of our inventory incompatible with customer needs.”\(^12\)

SEVERE WEATHER TREND

FLOODING

Warmer climate leads to increased moisture in the atmosphere and more precipitation. The January-May period of 2019 was the wettest start to a year in recorded American history, and this heavy rainfall (as well as significant winter snowfall across the Midwest) was a primary cause in the historic Midwest flooding in March.\(^13\)

The percent of days with very heavy rainfall in the Midwest has increased by 37% since the late 1950s, increasing the risk of flooding.\(^14\) Severe rainfall can also flood sewer systems, causing the water to overflow into lakes and rivers and harm the water supply. Since 1988, Iowa has had the fourth most floods of any state.\(^15\)
Hy-Vee is the largest employer in the state of Iowa, with 82,000 employees in the state. The supermarket chain, headquartered in West Des Moines, is privately owned by its employees and has taken steps to reduce its carbon emissions in an effort to display corporate leadership and responsibility to the communities the chain operates in.

TOURISM
Tourism is a proven economic driver for Iowa, generating more than $8.5 billion in revenue (including more than $500 million in state tax revenue) and supporting more than 69,000 jobs. Iowa invests $4.4 million annually to promote tourism to the state.

Key tourist attractions in the state include The National Mississippi River Museum and the city of Des Moines.

The National Mississippi River Museum & Aquarium in Dubuque opened to the public in 2003 and highlights the biodiversity and rich history of the Mississippi River. Since opening, the museum has welcomed 2.25 million visitors and has an estimated economic impact of $10 million per year.

Des Moines is the capital of Iowa and has the highest population of any city in the state, with 217,000 residents. The city is also a growing hub for visitors, with a record 13.7 million tourists visiting the city in 2017, up five percent from the previous year. This tourism generated $838 million for the metropolitan area and is a critical source of state funding for areas like schools, public safety, and infrastructure.

With higher temperatures and more extreme rain events, the Mississippi River faces unpredictable water levels which threatens the water quality and puts a strain on outdoor restaurants, fishing and vacation rentals, and water recreation. Des Moines is also vulnerable to rising temperatures; extreme heat and humidity are particularly dangerous in densely populated urban areas.

Now when it rains, it comes down four or five inches at a pop, or we’ve got tornado warnings. Believe me, the weather is so extreme.

- GENE MEALHOW
OWNER & FARMER,
TINY BUT MIGHTY POPCORN

With more and more concrete and severe weather, I don’t know where the end is if we don’t start doing these things.

- RONNIE WOLFE
OWNER,
WOLFEY’S WASPI OUTBACK
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