



CLIMATE & BUSINESS



OHIO

Ohio companies explain climate change and severe weather risk

February 2018

 **BUSINESS FORWARD**



This report examines how severe weather is distorting commodity prices, disrupting supply chains, damaging plants and equipment, and hurting consumer demand for Ohio 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: *How can we afford **not** to fix it?*

Ohio'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 capture the opportunities severe weather is creating. And they are issuing warnings to their investors about how climate change affects their bottom lines that climate change opponents in Columbus and Washington, DC, should not ignore. Policymakers should also recognize the economic opportunities a transition to cleaner sources of energy brings and the jobs that come with it.

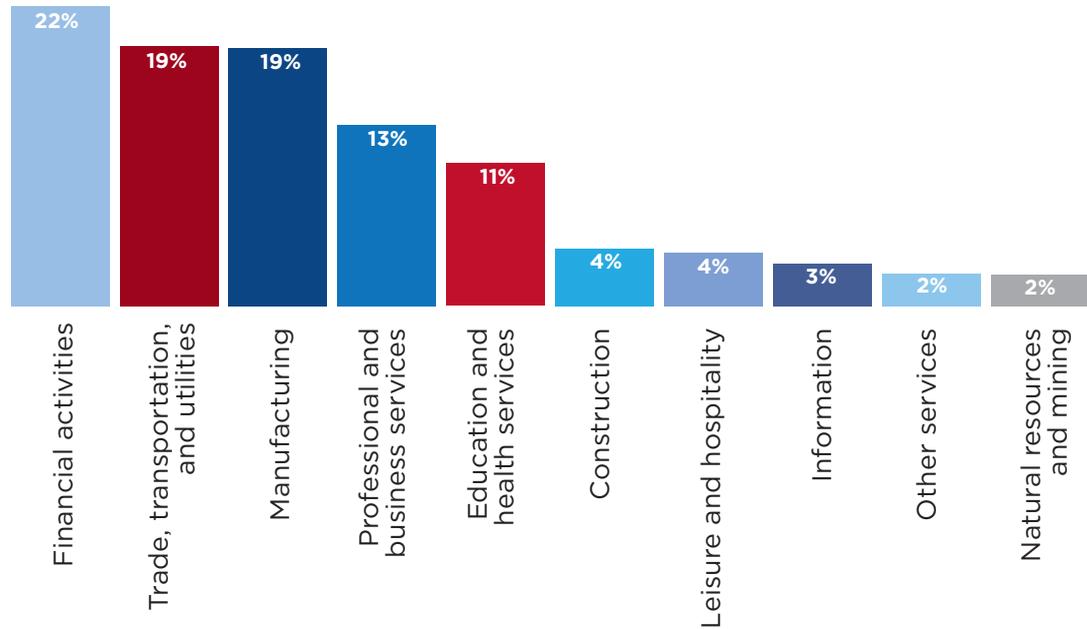
Severe weather is affecting Ohio's key industries, from farms and orchards to aerospace, energy utilities, food distributors, railroads, and shipping. Climate change threatens many of Ohio's greatest competitive advantages, including our fast-moving global supply chains, model climate for soybeans and corn, and ready access to river systems and the Great Lakes.

Business Forward has worked with nearly 4,000 entrepreneurs, executives, and small business owners across Ohio. 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. Nearly 1,200 of them have participated in our climate change and clean energy program, where they have learned about energy options and shared their experience managing severe weather costs. They have also expressed their support for the Clean Power Plan and policies that promote a transition to renewable fuels.

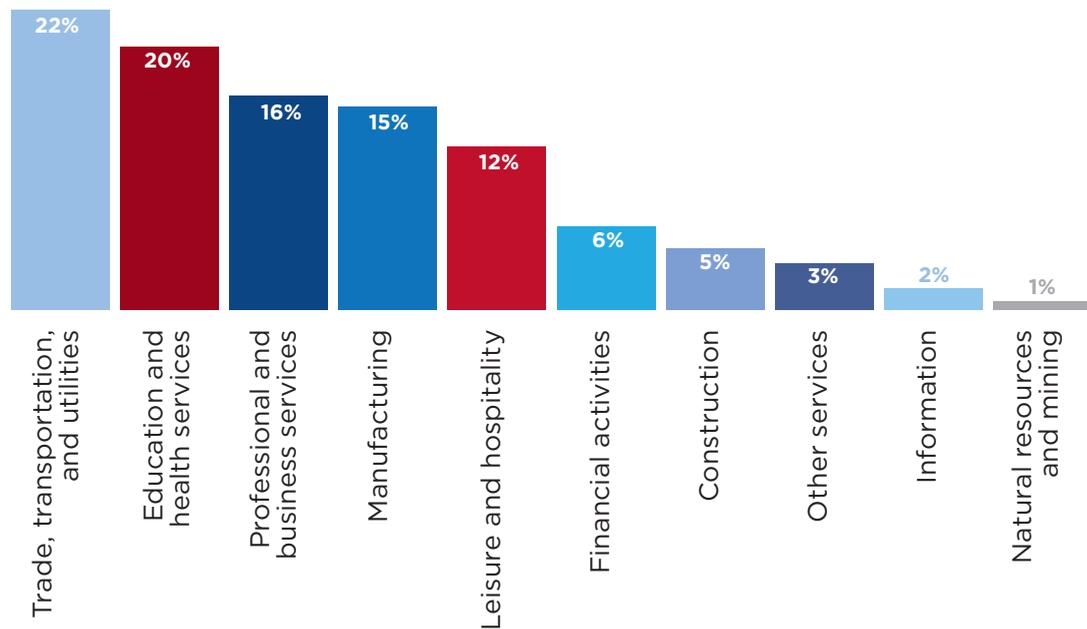
Companies featured in this report include Ohio's largest ski resort operators, insurers, and operators of its largest automotive assembly plants.

A SNAPSHOT OF OHIO'S ECONOMY

OHIO GDP BY INDUSTRY, 2016



OHIO EMPLOYMENT BY INDUSTRY, 2016



Gross Domestic Product (GDP) data is from the Bureau of Economic Analysis. Employment data is from the Bureau of Labor. Natural Resources and Mining includes agriculture and agribusiness data.

HOW SEVERE WEATHER AFFECTS KEY OHIO INDUSTRIES, AS EXPLAINED BY OHIO EXECUTIVES

AEROSPACE

Ohio is ranked the top U.S. supplier state to **Boeing** and **Airbus** and its aerospace and aviation industry employs 37,000 workers.

GE's GE Aviation, in West Chester Township, included potential supply chain and operational risks due to climate change in its SEC filing.²

UTC Aerospace Systems, a division of **United Technologies**, employs 700 workers in Troy.³ They reported that extreme temperature, precipitation, and sea level rise are concerns for its more than 500 manufacturing facilities and suppliers. “[W]e expect that climate change will result in an increasing number of extreme precipitation and drought events effecting our sites and suppliers. Drought and water scarcity is a particular concern for UTC in the Western US, China, India and Mexico.”⁴

Lockheed Martin has a Rotary and Mission Systems facility in Akron. It informs investors that it “anticipates that the extreme weather events associated with climate change could have an increased impact on operations in the coming decades.”⁵

The NASA Glenn Research Center in Cleveland designs and develops innovative technology to advance NASA’s missions in aeronautics and space exploration. **Alcoa Incorporated**, one of its suppliers, operates facilities in Newburgh Heights. The company warns that, “changes in rainfall patterns, shortages of water or other natural resources, changing sea levels, changing storm patterns and intensities, and changing temperature levels...may adversely impact the cost, production and financial performance of our operations.”⁶

OHIO HAS HAD

14

BILLION-DOLLAR WEATHER AND CLIMATE DISASTERS SINCE 2012.¹

Twenty-five Fortune 500 companies are headquartered in Ohio and more than one third of them have issued warnings about severe weather.

Companies operating factories, farms, shops, restaurants, or hotels in Ohio have reported that rising temperatures, extreme weather, and drought are affecting their operations here.

Many also report that increasingly severe weather is affecting their global operations, from higher prices for avocados grown in Mexico, to disrupted shipping supply chains in Lake Erie. As Ohio businesses grow, their severe weather risks grow, too.

Parker-Hannifin, a motion and control technology company based in Cleveland, reported that the predicted sea level rise from climate change may affect its facilities in flood-prone areas. And extreme precipitation, like flooding and drought, may also increase its operational costs and the volatility of agriculture in its service markets.⁷

AUTOMOTIVE MANUFACTURING

Ohio is home to a range of durable goods manufacturers, with automotive manufacturing representing one of the state's largest sectors. Over the past four years, the automotive industry has invested \$5.8 billion in the state. Ohio exported nearly \$7.5 billion worth of vehicles and parts in 2016, representing more than 15 percent of total state exports.⁸

Ford Motor Company and **General Motors** both warn investors that increased "frequency of drought conditions can further depress water availability for production in water-stressed areas."⁹

Ford also warns investors that "extreme weather has the potential to disrupt the production of natural gas, a fuel necessary for the manufacture of vehicles." As a precaution, they have begun installing propane tank farms at key manufacturing facilities as a source of backup fuel.¹⁰

Honda employs more than 12,000 workers in its three assembly plants in Ohio. It warns investors that its production efficiency and supply chain may be adversely affected by natural disasters.¹¹

Toledo Complex manufactures the **Jeep Chrysler** in the United States. Jeep's parent company, **Chrysler-Fiat**, warns investors that extreme weather can pose "risks associated with increases in costs, disruptions of supply or shortages of raw materials, parts, components and systems used in our vehicles."¹²

“We expect that climate change will result in an increasing number of extreme precipitation and drought events effecting our sites and suppliers. Drought and water scarcity is a particular concern for UTC in the Western US, China, India and Mexico.”

United Technologies

EFFICIENCY AND CLIMATE RISK

For decades, Ohio companies have built increasingly large, complex and fast-moving supply chains. To reach the lowest-cost producers, Ohio companies depend more on Asian, South American, and African markets. To maximize each individual supplier plant's efficiency, Ohio companies have encouraged their suppliers to specialize. And, to reduce overhead costs, more Ohio companies are following just-in-time inventory practices, which require their supply chains to operate with greater speed.

As their supply chains become more global, Ohio factories, stores, and plants grow more vulnerable to severe weather in other countries.

Fuyao Glass America Inc., an automotive glass manufacturer, has a manufacturing hub in Moraine. It reports that “frequent extreme weather brought a rapid growth in the demand of aftermarket automotive glass.”¹³

ArcelorMittal, the world’s largest steel producer, has seven facilities in Ohio (with more than 3,000 employees). Many of these facilities produce steel for the automotive industry. The company warns that global climate change could harm their production facilities or adversely affect their operations.¹⁴

CASH CROPS

Ohio’s top four crops are soybeans, corn, hay, and wheat. Together, they represent \$5.8 billion in economic output and the bulk of Ohio’s field crops.¹⁵

Even a small temperature increase can have a profound effect on crop yields.¹⁶ Between 2020 and 2039, corn and soybean yields are expected to decrease 17 percent and nine percent, respectively. These two crops represent \$4.3 billion in annual Ohio output.

Climate change will affect other cash crops in Ohio. Farmers may increase yields of wheat due to higher concentrations of atmospheric carbon dioxide and longer frost-free growing seasons. But hotter summers are likely to reduce yields of corn and possibly soybeans.¹⁷ A number of leading companies (including **ConAgra**, **Anheuser-Busch InBev**, and **SABMiller**) are investing in new seed types that can better withstand a warming climate.

The 2017 growing season in Ohio was very wet, with excess rain and flooding. More moisture can lead to increased disease for soybean crops. Ohio has seen an increase in corn earworm, an invasive species that can cause up to \$1 billion in damages to crops such as sweet corn.¹⁸

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.

Archer Daniels Midland, one of the largest agricultural co-ops worldwide, operates more than 270 plants worldwide. Here in Ohio, it operates an oilseed meal plant in Toledo and several agricultural services processing plants. In its most recent annual report, it warns: “The assets and operations of the Company could be subject to extensive property damage and business disruption from various events such as natural disasters and severe weather conditions.”¹⁹

Ohio is home to a growing number of craft breweries, many of which are impacted by climate change. According to Vincent Valentino at the **Land-Grant Brewing Company** in Columbus, “Almost all U.S. hop production happens in the Pacific Northwest, a region with a historically mild and rainy climate. This year wildfires have sprung up throughout the PNW, which is almost unprecedented. If the strains of demand and poor climate continue to grow in severity, we might see smaller craft breweries struggle to find raw ingredients.”²⁰

CHEMICALS

Marysville-based **Scott’s Miracle-Gro Company** produces lawn care products and has annual revenues of \$2.82 billion. It warns: “The possible effects, as described in various public accounts, could include changes in rainfall patterns, water shortages, changing storm patterns and intensities, and changing temperature levels that could adversely impact our costs and business operations and the supply and demand for our fertilizer, garden soils and pesticide products.”²¹

TRENDS WORSENING: S&P ON CLIMATE RISK

“The economic cost of natural catastrophes has risen significantly over the past 10 years. Yet, through a combination of existing preventative measures, most companies we rate have managed to mitigate the impact of such events on their corporate credit profiles. Nevertheless, with scientists predicting an increase in extreme climatic events, firms’ vulnerability to natural catastrophes is in our view likely to be sorely tested.”

Hexion, a chemical manufacturer located in Columbus, warns its “production facilities are subject to significant operating hazards” and it would be “difficult or impossible for us to relocate these operations.” Its U.S. Gulf Coast region manufacturing facilities were impacted by 2005 and 2008 Hurricanes Katrina, Rita, Gustav, and Ike. “[M]any of our current and potential customers are concentrated in specific geographic areas. A disaster in one of these regions could have a material adverse impact on our operations, operating results and financial condition.”²²

CONSTRUCTION & ENGINEERING

Outdoor construction and engineering is especially vulnerable to unpredictable weather conditions.

Building and remodeling company **Owens Corning**, in Toledo, warns investors of severe storms and adverse weather’s impact on construction, repair, and improvement markets. Though it experiences higher demand for reroofing after severe storms, other segments of its markets are negatively impacted due to demand uncertainty and the cost and availability of raw materials, like asphalt.²³

DAIRY

Ohio ranks eleventh in the U.S. in milk production. Ohio dairy farmers contribute approximately \$2.35 billion to Ohio’s GDP. Dairy farms support more than 14,400 Ohio jobs.

Land O'Lakes is one of the largest dairy companies in the world and operates dairy processing facilities in Kent and Massillon, and a Purina Feed facility in Orville. According to its CEO Chris Policinski, "Climate change is yet another component of the mounting challenges that we face in feeding a soaring global population, while natural resources such as water and arable land are becoming increasingly scarce. As these challenges converge, it is more important than ever that we focus on solutions within our control to increase productivity and sustainability in agriculture."²⁴

Dean Foods operates a Frostbite Novelty Plant in Toledo and relies on Ohio farms such as **Reiter Dairy**, which operates more than 20 Ohio dairy farms. Dean Foods warns investors of the financial risk of climate change on its supply chain and commodity prices.²⁵

ENTERTAINMENT

Peak Resorts Incorporated operates three mountain resorts in Alpine Valley, Brandywine, and Mad River Mountain. In its annual report, Peak Resorts addresses the physical risks of climate change, saying, "Physical risks from climate change may also include an increase in changes to precipitation and extreme weather events in ways we cannot currently predict. Such changes to the amount of natural snowfall and extreme differences in weather patterns may increase our snowmaking expense, inhibit our snowmaking capabilities and negatively impact skier perceptions of the ski season."²⁶

“Climate change is yet another component of the mounting challenges that we face in feeding a soaring global population, while natural resources such as water and arable land are becoming increasingly scarce. As these challenges converge, it is more important than ever that we focus on solutions within our control to increase productivity and sustainability in agriculture.”

Land O'Lakes

FINANCIAL SERVICES

Cincinnati-based **American Financial Group, Inc.** warns that droughts, flooding, and excessive rain can have a significant adverse impact on AFG's crop insurance results and the resulting volatility in crop prices could impact AFG. "In addition, extreme weather events that are linked to rising temperatures, changing global weather patterns and fluctuating rain, snow and sea levels could result in increased occurrence and severity of catastrophes."²⁷

Cincinnati-based **Fifth Third Bancorp** operates banks from the upper Midwestern to lower Southeastern United States. It warns that "[w]eather related events or other natural disasters may have an effect on the performance of Fifth Third's loan portfolios, especially in its coastal markets."²⁸

FOOD PROCESSING & DISTRIBUTION

Ohio has more than 43,000 workers employed in food processing, plus tens of thousands more working for food wholesalers and distributors.²⁹ These firms export their agricultural commodities internationally and rely on affordable and predictable commodity prices.

Cincinnati-based **Kroger** operates more than 200 supermarkets in Ohio under the Kroger and Harris Teeter brands and has five Ohio manufacturing plants. It has advised investors that "[a] large number of our stores and distribution facilities are geographically located in areas that are susceptible to hurricanes, tornadoes, floods, droughts and earthquakes. Weather conditions and natural disasters could disrupt our operations at one or more of our facilities, interrupt the delivery of products to our stores, substantially increase the cost of products, including supplies and materials and substantially increase the cost of energy needed to operate our facilities or deliver products to our facilities."³⁰

SEVERE WEATHER TREND

CONSUMER DEMAND

The best way to understand climate change-related costs to consumer businesses is to appreciate the impact losing marginal business can have on profits. A ski resort in Brandywine depends heavily on the number of snowfall days it enjoys, because it can sell more ski lift day passes. For a tight-margin business, those extra passes can represent the difference between a good season and an unprofitable one.

J.M. Smucker, headquartered in Orrville, monitors climate change's effect on agricultural productivity for "green coffee, grains, peanuts, edible oils, protein meals, sweeteners, and fruit." It may also affect "pricing for water... which could impact our manufacturing and distribution operations. In addition, natural disasters and extreme weather conditions may disrupt the productivity of our facilities or the operation of our supply chain." For example, "substantially all of our coffee production takes place in New Orleans, Louisiana, which is subject to risks associated with hurricane and other weather-related events. Additionally, some of our production facilities are located in places where tornadoes can frequently occur, such as Alabama and Kansas."³¹

HOTELS

Starwood, which operates four hotels in Ohio, warns investors that "[c]hange in average temperature can also lead to increased operational costs for Starwood, due to an increase in utility costs." The company has cited projections by the International Energy Agency that space cooling demand could increase by 170% by 2035.³²

Hyatt,³³ with 13 hotels in Ohio, and **Hilton**,³⁴ with 20 hotels, both warn that climate change and resource scarcity (like water or energy scarcity) may affect consumer demand for hotel rooms.

Hilton also warns: "The potential for changes in the frequency, duration, and severity of extreme weather events that may be a result of climate change could lead to significant property damage at our hotels and other assets, affect our ability to obtain insurance coverage in areas that are most vulnerable, such as the coastal resort areas where we operate, and have a negative effect on revenues."³⁵

Choice Hotels International (Ascend, Comfort Inn, Quality Inn) operates 18 hotels in Ohio. They warn that severe weather can affect the "cost effective and timely construction of hotels."³⁶

“As a specialty coffee roaster, climate change is adversely affecting the long term outlook for coffee, placing additional burdens on small business here at home and putting small farmers in potential financial peril in all the major growing regions worldwide.”

Kelly Wicks, Owner, Grounds for Thought

SEVERE WEATHER TREND

MORE SEVERE STORMS

Heavy downpours are increasing nationally. Across Ohio the amount of rain in the heaviest storms has increased by 71 percent over the past decade. The severity of these storms will continue to rise. Heavy rains and rapid snowmelt can contribute to flooding in the Ohio and Mississippi Rivers.

INSURANCE

Mayfield-based **Progressive** warns investors that “changing climate conditions, whether due to an increase in average temperatures (global climate change) or other causes, may increase how often severe weather events and other natural disasters occur and how much insured damage they cause. Catastrophe losses may adversely affect the results of our Property segment more than they affect the results of our other businesses... Hail storms, tornadoes, wind, and flooding contributed to catastrophe losses each year” and in 2016, “industry losses from severe thunderstorm catastrophes were double the most recent 19-year average.”³⁷

The Cincinnati Insurance Companies warns investors of the potential for a high level of losses in certain geographic regions, including parts of Ohio and its headquarters in Fairfield. “[O]ur ability to appropriately manage catastrophe risk depends partially on catastrophe models, which may be affected by inaccurate or incomplete data, the uncertainty of the frequency and severity of future events and the uncertain impact of climate change.” For example, a 2011 storm system including a tornado in Joplin, MO, and a hail storm in Dayton, OH, resulted in a loss of \$223 million before reinsurance.³⁸

Cincinnati Financial, headquartered in Fairfield, warns investors of its exposure to climate change risk and the potential financial effects on its results and on those it insures. “[C]hanging climate conditions have added to the unpredictability, frequency and severity of such natural disasters in certain parts of the world and have created additional uncertainty as to future trends and exposures.” In 2016, its underwriting profit dropped \$144 million from 2015 profits, driven by a “\$175 million unfavorable effect from a higher amount of natural catastrophe losses, mostly caused by severe weather.”³⁹

SEVERE WEATHER TREND

HIGHER TEMPERATURES

Temperatures across the U.S. are 1.3 to 1.9 degrees warmer, on average, than they were when measurements were first recorded in 1895, and most of this increase has occurred since 1970. Nineteen of the 20 hottest years on record occurred in the past two decades. Heat waves have become more frequent and intense.

In Ohio, although springtime is likely to be wetter, summer droughts are likely to be more severe. In 2012, a drought caused navigation restrictions on the lower Mississippi River, which cost the region more than \$275 million.

MANUFACTURING

Goods exported from Ohio supported about 260,000 jobs in 2015. More than 90 percent of these jobs were supported by manufactured goods exports.⁴⁰ Ohio's largest export by value is industrial machinery, valued at \$9.1 billion. Nationally, Ohio is ranked second in plastics industry employment. Plastics and dependent industries combined employ 1.7 million people in Ohio.⁴¹

Goodyear Tire & Rubber in Akron produces 93 percent of its natural rubber in Southeast Asia. While synthetic rubber alternatives have been developed, there is still no absolute substitution for natural rubber. Changes in annual rainfall or temperature can affect the yield from rubber trees and, subsequently, its supply costs.⁴²

Whirlpool, a home appliances manufacturer, operates five plants in Ohio and bases 43 percent of its national workforce here. Whirlpool manufactures dishwashers out of their Findlay facility, and KitchenAid stands out of their Greenville facility. Whirlpool warns investors that extreme weather around the globe could impact its supply chain, interrupting its ability to manufacture products.⁴³

Worthington Industries, a metals manufacturer based in Columbus, warns investors that its business could suffer if the supply of "flat-rolled steel or other key raw materials, such as aluminum, zinc or helium, or other supplies is curtailed" because of a "shortage of capacity in the supplier base of raw material...[or] other significant events affecting supplier facilities, [like] significant weather events."⁴⁴

“ Changing climate conditions have added to the unpredictability, frequency and severity of such natural disasters in certain parts of the world and have created additional uncertainty as to future trends and exposures.”

Cincinnati Financial

“ We supply emergency preparedness supplies to faith-based organizations. We've seen a large increase for the needs of these supplies to help deal with the effects from climate change, and we feel these organizations won't have the resources in the future to deal with future issues.”

James Wilson, CEO, CHES

Greif, an industrial package manufacturer located in Delaware, warns of the physical risks of climate change, like increased sea levels, precipitation, droughts, and extreme weather events, on its raw materials and supply chain. For example, the ability to purchase and transport “steel, resin, pulpwood, old corrugated containers for recycling, used industrial packaging for reconditioning, and containerboard” may be disrupted by severe weather.⁴⁵

Sherwin-Williams operates four manufacturing facilities in Ohio and is headquartered in Cleveland. The paint and coat manufacturing company has experienced severe weather in the U.S. that has had “an adverse effect on our sales of paint, coatings and related products. For example, unusually cold and rainy weather could have an adverse effect on sales of our exterior paint products.”⁴⁶

Global manufacturer **Procter & Gamble** is headquartered in Cincinnati and operates 24 U.S. manufacturing sites. This includes three Ohio plants, including a laundry detergent facility in Lima and a global packaging facility in West Chester.⁴⁷ It warns investors that “[c]ertain raw materials used in our products or production processes are subject to price volatility caused by weather, supply conditions, political and economic variables and other unpredictable factors.”⁴⁸

AK Steel in West Chester highlights the risk of severe weather disruptions on supply chain and production: “extreme cold weather conditions in the United States and Canada can impact shipping on the Great Lakes and could disrupt the delivery of iron ore to us and/or increase our costs for iron ore.” It aims to operate its production facilities at or near capacity, which means it may lack redundant facilities to assist during plant outages or severe weather.⁴⁹

SEVERE WEATHER TREND

DROUGHT & LOW WATER LEVELS

Low water levels in 2013, caused by an unusually hot and dry summer the year before, created navigational hazards in Great Lakes waterways for commercial carriers.

Shippers compensated for these low water levels by reducing the amount of cargo they carried (allowing their ships to float higher in the water, reducing their draft). To gain a single inch of waterline, a large cargo ship must dump 270 tons of cargo. In 2013, Lakes Huron and Michigan were 23 inches below their normal levels. Ships crossing those lakes carried 6,000 fewer tons per trip than they carried in 1997 (from 71,000 tons to 65,000 tons). One ship, for example, left 18 percent of its iron ore cargo on the dock. Erratic water levels add uncertainty to freight shipping schedules and have economic repercussions across the region.

Perrysburg-based glass bottle manufacturer **Owens-Illinois** warns investors that its products are subject to seasonality, and “[u]nseasonably cool weather during peak demand periods can reduce demand for certain beverages packaged in the Company’s containers.”⁵⁰

MILITARY BASES

Wright-Patterson Air Force Base is the largest Air Force base, with more than 28,000 workers on base. With two airfields and the largest Ohio workplace site, the base contracts meteorologists to study how severe weather may impact its facility, pilots, and operations.⁵¹

PHARMACEUTICALS

Ohio’s largest company, Dublin-based **Cardinal Health Inc.**, reported that the “[i]mpact from extreme weather events could disrupt Cardinal Health’s ability to produce and/or distribute goods and services to customers due to energy disruptions and/or closed public highways.” As temperatures rise, its facilities would need to “increase energy use to maintain Heating, Ventilation, and Air Conditioning (HVAC) temperature control” to meet product temperature requirements.⁵²

PORTS & SHIPPING

Ohio has 11 deep-water ports with access to the Great Lakes and the Ohio River, including commercial ports in Toledo, Cleveland, and Cincinnati.⁵³ The Lake Erie system accommodates 58.8 million tons of cargo annually, with an annual value of \$5.7 billion in shipments.⁵⁴

The Army Corps of Engineers dredges the Port of Toledo each year to ensure that traffic can pass without delay. Climate change has made the calculations behind dredging more unpredictable, leading to more dredging, slower turnaround times, and delays for businesses. According to the **Lake Carriers Association**, a Cleveland-based trade group of U.S. flagged vessels, there is “a lot of variability in water levels, and it affects our operations.”⁵⁵ Lock and dam systems, as well as wooden and steel docks throughout the ports, can also be at risk due to the physical impact of climate change.

Travel Centers of America, based in Westlake, warns that severe weather may affect its individual properties and the price and availability of diesel fuel and gasoline.⁵⁶

RAIL

CSX, which operates and manages 4,000 miles of railway track and 19 yards and terminals in Ohio, has warned that “[h]urricane events can temporarily interrupt operations in a specific area by creating unsafe work conditions. Extreme winds or flooding resulting from hurricane activity can damage track structure or signal systems and lead to an increase in repair or recovery costs in addition to interrupting operations.” Extreme temperature events can decrease the velocity of operations on its 21,000 miles of track.⁵⁷ In fact, “[a]ny increase in the number or severity of hurricanes on the eastern half of the United States could result in significant business interruptions and expenditures.”

SEVERE WEATHER TREND

HIGHER WATER TEMPERATURES

The Great Lakes provide 20 percent of the world’s fresh surface, and 95 percent of the U.S. supply. Warmer temperatures can increase the presence of toxic algae in the Great Lakes’ water supply.

In 2014, nearly 500,000 citizens in Toledo were advised not to use the tap water in any capacity for 3 days due to increased toxins in Lake Erie from the presence of algae. In 2015, the algae bloom in Lake Erie severely impacted the local fishing industry. Captain Paul Pachowski of the Lake Erie Charter Boat Association directly addressed the impact of the algae, saying, “I’ve seen a 25 percent drop in revenue this season. People cancelled their fishing trips after hearing about the lake’s toxic algae.”

RESTAURANTS

Restaurant owners say they are more sensitive than other hospitality businesses to extreme temperatures and severe weather.

Diversified Restaurant Holdings Inc. operates 20 **Buffalo Wild Wings** in Ohio. Its “primary food products are fresh bone-in chicken wings, ground beef and potatoes. Our food, beverage and packaging costs could be significantly affected by increases in the cost of fresh chicken wings and ground beef, which can result from a number of factors, including but not limited to, seasonality, cost of corn and grain, animal disease, drought and other weather phenomena, increase in demand domestically and internationally, and other factors that may affect availability.” It is also sensitive to bad weather impacting guest traffic, which causes “the temporary underutilization of certain seating areas, and, in more severe cases, cause temporary restaurant closures, sometimes for prolonged periods.”⁵⁸

Chipotle, the fast casual Mexican restaurant with more than 150 Ohio locations, has warned, “Increasing weather volatility or other long-term changes in global weather patterns, including any changes associated with global climate change, could have a significant impact on the price or availability of some of our ingredients... such as chicken, beef, cheese, avocados, beans, rice, tomatoes and pork...Any such changes to our available menu may negatively impact our restaurant traffic and comparable restaurant sales, and could also have an adverse impact on our brand.”⁵⁹

“Increasing weather volatility or other long-term changes in global weather patterns, including any changes associated with global climate change, could have a significant impact on the price or availability of some of our ingredients.”

Chipotle

RETAILERS

Major retailers have advised investors that severe weather and extreme temperatures affect the demand for their services or products.

Shoe retailer **DSW**, headquartered in Columbus, operates 21 stores and a fulfillment center in Ohio. Its seasonal merchandise business is affected by changing weather patterns. For example, its 2015 “[m]erchandise margin for the DSW segment decreased [from 2014] as a percentage of net sales due to higher mark-downs, which were a result of unseasonably warm weather that created a challenging retail environment.”⁶⁰

Clothing retailer **Express**, with 19 stores across Ohio and a distribution facility and headquarters in Columbus, warns its business is affected by seasonal consumer demand, shipping costs, and the availability of raw materials. All are vulnerable to adverse weather conditions and changing weather patterns.⁶¹

Clothing retailer **Abercrombie & Fitch**, based in New Albany, typically experiences seasonal net sales and operational income in the fourth fiscal quarter. It warns that severe weather and changing weather patterns can “influence customer trends, consumer traffic and shopping habits” and make it difficult to calculate accurate indicators of its annual results. Any negative factors in the second half of the fiscal year, “including inclement weather, could have a material adverse effect on our financial condition and results of operations for the entire year.”⁶² In addition, its supply chain can be disrupted by rising sea levels, as its “suppliers’ manufacturing facilities are located in low-lying areas throughout Asia...and must be shipped via ocean freight.”⁶³

“While we know that no single weather event can be directly tied to climate change, we also know that snow in Florida, floods in the Carolinas and unprecedented fires in California are all small indicia of a warming climate that impacts nearly every aspect of our business—from farming to cow pastures, from logistics to customer travel patterns.”

John Lowe, CEO, Jeni’s Splendid Ice Creams

L Brands (Bath & Body Works, Victoria's Secret, La Benza, Henri Bendel) is headquartered in Columbus and warns extreme weather affects its retail traffic, "particularly in markets where we have multiple stores... For example, heavy snowfall, rainfall or other extreme weather conditions over a prolonged period might make it difficult for our customers to travel to our stores and thereby reduce our sales and profitability." Local severe weather may also disrupt its supply chain to its concentration of central Ohio supplier and distribution facilities.⁶⁴

Columbus-based **Big Lots** operates 96 storefronts, a regional distribution center, and two warehouses in Ohio. Its seasonal product net sales "may be threatened when we experience extended periods of unseasonable weather. In particular, economic conditions and weather patterns of four states (Ohio, Texas, California, and Florida) are important as approximately 33% of our current stores operate and 35% of our 2016 net sales occurred in these states."⁶⁵

Surprisingly, winter storms that keep consumers home hurt online sales as well, because most people do their online shopping at work. **Adobe** analyzed the impact of a 2015 storm that left three feet of snow across the Northeast United States. Sales on the day of the storm dropped by \$35 million, or 4.5 percent, below the national average.⁶⁶

TIMBER

The Central U.S. Hardwood Forest covers 296,000 square kilometers of land, including a large portion of Ohio's forests. Warmer winters are allowing invasive species to migrate north; it is estimated that 40,000 acres of pitch pine forests from Ohio to Maine will be hospitable to the southern pine beetle, an invasive species.⁶⁷ Ohio's forest products industry contributed an estimated \$22.1 billion to Ohio's economy in 2010—this industry will continue to feel the physical and economic impacts of climate change.⁶⁸

Universal Forest Products manufactures and distributes wood products, with annual revenues of \$3.24 billion. It owns three wood manufacturing and distribution centers in Blanchester, Dayton, and Hamilton. The company warns investors: “We experience significant fluctuations in the cost of commodity lumber products from primary producers... A variety of factors, including weather conditions and natural disasters, impact the cost of lumber products and our selling prices.”⁶⁹

UTILITIES

In Ohio, natural gas provides about 24 percent of the state’s power, two nuclear reactors supply about 14 percent, and coal provides about 58 percent. The remainder is generated by biomass, hydro, and a small but growing portfolio of wind and solar.⁷⁰

CMS Energy Corporation, an electric utility provider, monitors changes to the water levels in the Great Lakes and its tributaries that “could have a significant financial impact on our generating fleet due to increased dredging or greater fuel costs due to operation of coal barges at less than capacity to meet requirements of shallower channels.”⁷¹

Akron-based **FirstEnergy** warns investors that “more frequent or more extreme weather events, changes in temperature and precipitation patterns, changes to ground and surface water availability” could result in increased supply chain and other operational costs. For example, an “extreme weather event within the Utilities’ service areas can also directly affect their capital assets, causing disruption in service to customers due to downed wires and poles or damage to other operating equipment.” And climate change “could also affect the availability of a secure and economical supply of water in some locations, which is essential for continued operation of generating plants.”⁷²

“Our business is designed to impact climate change—Ohio’s regressive renewable energy policies make it nearly impossible to promote investment in the space. We need to strengthen the state’s RPS and focus on Ohio’s transition to a clean energy economy.”

Ron DeLyons, CEO, Creekwood Energy Partners

American Electric Power, in Columbus, warns “[s]evere weather impacts AEP’s service territories, primarily when thunderstorms, tornadoes, hurricanes, floods and snow or ice storms occur. To the extent the frequency of extreme weather events increases, this could increase AEP’s cost of providing service. Changes in precipitation resulting in droughts, water shortages or floods could adversely affect operations... A negative impact to water supplies due to long-term drought conditions or severe flooding could adversely impact AEP’s ability to provide electricity to customers, as well as increase the price they pay for energy.”⁷³

Based in Findlay, the **Marathon Petroleum Corporation** has revenues of \$77 billion and operates more than 7,000 gas stations worldwide. It warns: “Severe weather events may adversely affect our facilities and ongoing operations....physical effects, such as increased frequency and severity of storms, droughts and floods and other climatic events; if any such effects were to occur, they could have an adverse effect on our assets and operations.”

“To the extent the frequency of extreme weather events increases, this could increase AEP’s cost of providing service. Changes in precipitation resulting in droughts, water shortages or floods could adversely affect operations.”

American Electric Power

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