

Climate Change Preparedness and the *Small Business Sector*



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Acknowledgements

This report is the product of a collaborative effort by Small Business Majority and the American Sustainable Business Council.

Small Business Majority was founded and is run by small business owners to focus on solving the biggest problems facing small businesses today. Since 2005, we have actively engaged small business owners and policymakers in support of public policy solutions that promote small business growth and drive a strong, sustainable economy. We are a team of 20 working from our offices in Washington, D.C., California, Colorado, Missouri, Ohio, New York, Virginia and Washington state. To do this, we deploy our network of 12,000 small business owners and 5,500 business organizations, along with a strategic partnership program including 80 business organizations to reach more than 300,000 small business owners. Our extensive scientific polling, focus groups and economic research helps us educate and inform policymakers, the media and other stakeholders about a multitude of issues including healthcare, clean energy, immigration, taxes, access to capital, financial reform and workforce development.
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Introduction

This report outlines how small businesses can emerge as leaders in climate preparedness by maximizing climate-related opportunities and minimizing climate-related risks. Most significantly, small businesses can maximize revenue by reorienting their business model or launching new products or services to take advantage of increased consumer demand for alternatives to traditional products as a result of climate change. For example, the report highlights a landscape architecture firm in the western U.S. that experienced increased demand for native, drought-tolerant plants rather than more vulnerable, ornamental plantings. Furthermore, small businesses can simultaneously minimize losses from extreme weather by strategically investing to make their businesses more resilient; by developing business continuity plans and by engaging with their local communities to increase education on responding to climate change.

To illustrate how small businesses across the U.S. are preparing for and responding to the impacts of climate change, this report presents six case studies from a wide range of sectors, including roofing, retail, tourism, landscape architecture, agriculture, and small-scale manufacturing. Each of these case studies tells a unique story of the challenges and successes of integrating climate resilience into small business strategy and operations.

Executive Summary

The U.S. business community is increasingly analyzing the risks, opportunities, and financial implications of climate change and integrating them into long term business plans. In recent years, the financial repercussions of weather variability and extremes have significantly impacted the U.S. economy by affecting both supply and demand for the products and services of almost every industry. According to the National Oceanic and Atmospheric Administration (NOAA), 2011 and 2012 were the two most extreme years on record in the U.S. for destructive weather events. A record 14 weather disasters costing over \$1 billion each occurred in 2011, resulting in total economic losses of \$60.6 billion, and 11 weather disasters occurred in 2012, causing more than \$110 billion in damages.¹ Specifically, Superstorm Sandy and the record-breaking drought that covered nearly two-thirds of the nation cost the U.S. approximately \$65 billion, and \$30 billion, respectively, in 2012.² Following these disasters, in February 2013, the Government Accountability Office (GAO) made a decision that “climate change poses significant financial risks to the federal government”, and consequently added climate change to its “High Risk” list in 2013, a list that is released at the start of each new Congress to identify vulnerabilities of the federal government.

While larger businesses are driven to report and respond to climate change to demonstrate to investors and stakeholders that they are well-positioned to mitigate climate-related business risks, small businesses are driven to consider the risks of climate change due to their unique vulnerability to its impacts. Lacking access to the capital and resources of large corporations, small businesses can suffer lasting economic damage as a result of a single extreme weather event. For example, according to the U.S. Chamber Foundations Business Civic Leadership Center, of the 60,000 to 100,000 small businesses negatively affected by Hurricane Sandy, up to 30 percent are estimated to have failed as a direct result of the storm.³

The majority of small businesses operate out of a single physical location. According to the U.S. Small Business Administration, up to 90 percent of small businesses get the majority of their business from within two miles of their front doors.⁴ This makes small businesses more vulnerable to loss compared to larger companies that have backup resources at alternate facilities or branch locations. As a result, small businesses will be more heavily impacted by technological or telecommunications failures, the absence of employees, power failures, supply chain interruptions, and rising insurance costs. Direct damage from extreme weather events such as flooding, sea level rise, storm surge, and drought will impact small businesses more severely than a larger business with more financial and human capital.

According to the Institute for Business and Home Safety, an estimated 25 percent of small to mid-sized businesses do not reopen following a major disaster.⁵ Furthermore, the median cost of downtime from a small business affected by an extreme weather event is \$3,000 per day.⁶ Small businesses' physical assets tend to be more concentrated: a single building or factory could represent most of the book value of a small business, whereas large businesses benefit from greater geographic diversification. The majority of small businesses have not closely analyzed the potential economic losses from extreme weather events or other climate-related risks, in part due to a lack of resources to do so. In fact, 57 percent of small businesses have no disaster recovery plan, and for those small businesses that do have continuity, or risk management plans, 90 percent spend less than one day a month preparing and maintaining them.⁷ Because small businesses are distinctly critical to the U.S. economy, and at the same time uniquely vulnerable to damage from extreme weather events, collective actions by the small business community could have an enormous impact on insulating the U.S. economy from climate-related risk.

Extreme weather events associated with climate change pose a variety of direct and indirect risks to small businesses that vary by geographic region, proximity to coastlines, and the nature of the business affected. Directly destructive events include hurricanes, tornadoes, droughts, wildfires, floods, storm surge, and ice storms, as well as extremes of heat and cold. Indirect risks of extreme weather can include power

outages, lack of access to water, increased demand for heat or air conditioning, rising insurance costs, supply chain disruptions, lack of access to natural resources, and loss of work hours.

Small businesses must recognize both their vulnerability to these changing climate conditions and their role as critical participants in national climate preparedness. According to a June 2013 poll by Small Business Majority, one-third of small business owners report they have been personally affected by extreme weather, and 57 percent believe extreme weather events are an urgent problem.⁸ With small business employing 60 million Americans, roughly half the private sector workforce,⁹ the small business community can play a vital role in bolstering our nation's overall resilience to climate change.

Background: Business and Climate Change

Discussions about how to respond to climate change have historically emphasized mitigation, or reducing the greenhouse gases that contribute to climate change. But in recent years there has been an increased focus on adaptation, or preparedness to help reduce the impacts of climate change. Given that the world is currently not on a path to meet the International Panel on Climate Change's (IPCC) mitigation target of a 50 percent reduction in global greenhouse gases by 2050, a goal set to avoid the world's average temperature from rising in excess of 2 degrees Celsius, strategies to prepare for a warming climate and related impacts appear increasingly necessary. Many businesses in the U.S. are now recognizing that waiting to address the repercussions of extreme weather events as they occur is less cost-effective than planning in advance.

In 2012, the Carbon Disclosure Project's (CDP)¹⁰ annual investor survey found that more than 80 percent of companies within the Global 500 acknowledged that climate change poses physical risks to their business.¹¹ Of these companies, 37 percent identified these risks as posing real and present danger, a 10 percent increase since 2011.¹² This announcement follows a summer of record heat, drought and other extreme weather events in the U.S. that have gained attention from corporations due to their financial implications. The CDP also has seen companies increasingly emphasizing economic reasons for improving their resilience to climate risk.

Furthermore, policymakers, economists, and scientists are increasingly recognizing the impact of extreme weather events on the nation's economic well-being. Nine of the top ten insured-loss events occurred in the United States during 2012—six related to severe weather, two were tropical cyclones and one was a drought. In addition, 2012 was the 36th consecutive year of above average global temperatures.¹³ In June 2011, the American Meteorological Society (AMS) calculated that the aggregate dollar variation in U.S.

economic activity associated with weather variability was \$485 billion, or 3.4 percent of the 2008 gross domestic product.¹⁴ This number represents the maximum amount U.S. GDP could be expected to vary given the impact of weather variation occurring over the 70 years used for this analysis.

While climate scientists affirm that specific extreme weather events or individual deviations from “normal” seasonal weather patterns cannot be directly attributed to climate change, the frequency of extreme events and deviations from historic norms are increasing and are consistent with projections of climate models. One of the world's largest reinsurance companies, Munich Re, has compiled the world's most comprehensive database of natural disasters, which indicates that the number of extreme weather events is rising. According to Munich Re’s research on climate change since 1973, the change in the world’s climate system is unmistakable and will result in greater and more frequent precipitation and temperature extremes in the medium- to long-term (20-50 years).¹⁵

The impacts of climate change go beyond physical damage, and also threaten human health. For example, a study in the journal *Health Affairs* estimated the health costs associated with six climate change–related events that struck the United States between 2000 and 2009, including ozone pollution, heat waves, hurricanes, infectious disease outbreaks, river flooding, and wildfires. The study estimated that “the health costs [of these impacts] exceeded \$14 billion, with 95 percent due to the value of lives lost prematurely. Actual health care costs were an estimated \$740 million.”¹⁶

As a result of the extreme impacts climate change could have on the U.S. economy, both corporate and government entities are addressing vulnerability to climate change by focusing on policies and strategies to enhance disaster risk management. These strategies range from incremental steps that increase the preparedness of existing systems, such as improving emergency response plans, to the transformation of infrastructures to adapt to climate extremes, such as strengthening future building codes to withstand more intense and frequent storms.

Small Business Sector: Critical Actors

Small businesses have a critical role to play in building climate resilience into their business strategies. For the past two decades, small businesses have been responsible for creating two out of every three new jobs. Currently, the U.S. boasts 28 million small firms that employ 60 million Americans.¹⁷ This positions the small business sector as critical to the overall strength of the U.S. economy and essential participants in preparing for climate-related risks.

Case Studies:

Because climate change will affect each small business differently based on its geographic location, size, and type of business, it is necessary to speak directly to the small business owners and employees who have experienced the types of impacts and opportunities associated with climate change first-hand. From these experiences, we can better learn how climate is affecting the individuals whose small businesses are most vulnerable to the financial implications of climate change.

The following case studies highlight a group of small businesses and their integration of climate preparedness into their business models.

Brendan Shea, Recover Green Roofs, LLC.

Somerville, Massachusetts

Recover Green Roofs is a small firm specializing in designing, installing, and maintaining rooftop gardens, or “green roofs”, on residential, commercial, and municipal buildings throughout New York and New England. Recover Green Roofs is involved in every stage of the development process from design to installation to permitting and ongoing maintenance. According to Brendan Shea, Project Manager and Founder of Recover Green Roofs, the majority of Recover Green Roofs’ clients are municipal entities, including buildings owned by city, town, state, and federal governments, such as public school buildings. Recover has completed green roof projects for supermarkets, restaurants, schools and other entities.

According to Shea, “we founded the business because we were advocates for more green space in urban areas for the associated environmental benefits, such as addressing the ‘heat island effect’ of hotter temperatures in cities due to vegetation loss. However, we also found that, at a city level, there was a need to address flooding and sewage release caused by large rain events that cities weren’t built to accommodate, especially older cities throughout New England like Boston, Philadelphia, and New York.”

While sewage flows in urban areas are typically delivered directly to wastewater treatment plants, these flows can double or triple during very heavy rains, overloading the system. At that point, built-in overflows act as relief points by releasing excess flows into the nearest body of water.

According to Shea, “Boston has 100 points where excess flow can be released, but over time, these have been closed by the city, posing significant risk as extreme precipitation events become more frequent and more severe. There are currently only 60 points of excess flow. New York currently experiences 100 events annually where raw sewage is discharged into the nearby harbor. Green roofs help ease these threats, as the installed vegetation reduces the storm water flow that can often overflow city infrastructure and sewage systems.”

Since founding the business, coastal cities and municipalities have become increasingly concerned with storm water management due to precipitation events and rising sea levels that have caused flooding. As a result, Recover Green Roofs has noticed more cities implementing alternative ways to mitigate potential water-related damage. For example, a plan in Philadelphia for a \$1.5 billion upgrade to a sewage plant has been put on hold, and money is being invested instead in green roofs, permeable pavement, and wastewater management improvement. Not only are these alternative solutions effective, but they are also economical.



According to Shea, “non-point source stormwater solutions costs a half to a third of an investment in a new sewage plant, while providing additional economic benefits including increasing the lifespan of external waterproofing systems, increasing energy savings for the building, and increasing real estate value.”

Water risks associated with extreme weather events, such as sea level rise and storm surge, pose significant economic as well as environmental costs to the U.S. For example, annual costs of \$360 billion are estimated by the end of the century due to sea level rise damaging residential properties. Furthermore, the Natural Resources Defense Council (NRDC) estimates that annual costs to meet water demands alone could reach \$950 billion by 2100, without accounting for the damage to water infrastructure caused by precipitation extremes.¹⁸

Recover Green Roofs provides clients with alternative and less expensive solutions to manage the costly risks associated with storm water, including flooding, storm surge, sea level rise, and increasing frequency and severity of precipitation events. While Recover Green Roofs created a small business focused on the environmental benefits of green spaces within cities, their business model was adapted to respond to the economic risks present in these same urban areas.

**Frank Knapp, Jr., CEO, South Carolina Small Business Chamber of Commerce,
and Sandra Bridges, Co-Owner, Palmetto Hammock & Resort Shoppe**

Charleston, South Carolina



Frank Knapp, Jr., President and CEO of the South Carolina Small Business Chamber of Commerce, is leading an initiative throughout coastal South Carolina to educate the public on the vulnerability of the area’s local economy to sea level rise, which is predicted to rise 6 feet by 2100, according to NOAA. Knapp’s initiative, known as South Carolina Businesses Acting on Rising Seas (SCBARS), stems from the economic impact that sea level rise could have on this region, and includes grassroots advocacy efforts to garner support from local businesses. The initiative, of which ASBC is a partner, educates the public by visibly illustrating with signs in local neighborhoods where sea level could reach by

2100. SCBARS encourages tourists to be local advocates for preserving the South Carolina coast.

One local business that Knapp has worked with is Palmetto Hammock & Resort Shoppe, a retail store selling outdoor equipment, apparel and accessories in the historic market district of Charleston, SC.

Palmetto Hammock is jointly owned by Carl Dupree and Sandra Bridges, and was established in 2003.

According to Bridges, “From a location perspective, we are in the low country. We are on a full moon, high tide cycle, and frequently experience minor flooding. Therefore, whether the future brings a small rise in the sea level or the worst case scenario, either would impact us.”

Bridges’ small business is located in a favorite shopping area for both residents and tourists, and is housed in a freestanding building with 1,000 square feet of retail display space. According to Knapp, the building Palmetto Hammock is located in is projected to have four feet of sea water at high tide at the end of the century. To raise awareness about this risk for tourists and other businesses in downtown Charleston, Bridges has posted a sign on her store’s front door, and blue tape that indicates the level at which the sea could reach by 2100.

For Bridges, there is little she can do to prepare her business for the potential physical impacts of sea level rise, but participating in Knapp’s SCBARS’ effort is one way to bring attention to the issue and its possible impact on tourism and local business in Charleston.

With more than 190 miles of coastline and 600,000 acres of tidal wetlands, South Carolina is especially susceptible to the effects of sea level rise and storm surge due to hurricanes and tropical storms. The state’s beaches and coastal communities are critical to South Carolina’s economic well-being, providing recreational opportunities, commercial port access, commercial fisheries, and a foundation for the state’s flourishing tourism economy.¹⁹

In fact, a 2010 report to the Environmental Protection Agency reported that tourism has emerged as South Carolina’s primary growth industry, and state economic officials estimate that one job is created for every 120 visitors. Tourists to the Grand Strand, Hilton Head, and Charleston areas alone account for approximately \$5 billion of the \$9 billion spent by tourists in the state each year.²⁰

Bridges notes that while tourists are not currently bothered by wading through the occasional flood, attitudes may change if this becomes a more frequent or severe occurrence.



Bridges says, “Every small business can survive small, occasional issues over the course of the year. Currently, the flooding we experience in Charleston is a small nuisance, but it’s not enough to cause major damage to our business. However, if flooding became more severe and more frequent as a result of sea level rise, Palmetto Hammock could reach a point where we are not able to survive the cumulative economic impacts of damaged merchandise, property damage, and lost revenue during a flood event.”

Tedd Saunders Chief Sustainability Officer, The Saunders Hotel Group , & President, EcoLogical Solutions Inc.

Boston, Massachusetts

Tedd Saunders is part of the third generation of this family hotel business. The Saunders Hotel Group owns and operates hotels along the Eastern seaboard from Massachusetts to Virginia. As a business leader, Saunders has spent 23 years working to demonstrate how socially responsible operations are simply smart business. For the last 15 years he has also advocated for business action on climate change. As Chief Sustainability Officer of The Saunders Hotel Group and President of EcoLogical Solutions Inc., Saunders is an active member of Boston’s business community, and specifically examines opportunities to integrate sustainability into the tourism industry. Saunders’ work focuses on how businesses strengthen their company by reducing environmental impacts and their associated business costs while also benefiting local communities. Over the last decade, Saunders noted that while energy efficiency and climate change mitigation were discussed at length in the hotel industry, adaptation to climate change was rarely if ever part of the conversation. However, in the last year, numerous major storms and power outages in the Northeast have elevated the discussion of the risks of extreme weather.



According to Saunders, “climate risk is beginning to influence our business decisions in relation to assessing a site’s current and future vulnerability.”

The tourism industry is especially prone to direct economic losses as a result of weather disruptions. In terms of cost, climate affects the travel industry through interrupted travel plans, cancelled events, and the various losses associated with power outages in the hotels. Unlike a product-based company, which can sell all undamaged goods after a weather event passes, hotels have a “highly perishable product” with a “shelf life” of only one day. If room reservations or events are cancelled, there is no ability to sell those rooms in the future. In the tourism industry, the old adage of “time is money” could not be truer, and downtime from extreme weather has an even more profound negative financial impact. As an example, Mr. Saunders recounted that in recent years, two extreme weather events caused separate week-long power outages at one of Saunders Hotel Group’s hotels in New Haven, Connecticut. The first outage, caused by Hurricane Irene in 2011, cost nearly \$5,000 in guest refunds. The second outage, caused by Superstorm Sandy in 2012, involved damage to the property and cost a total of \$33,940. These

costs reflect lost rooms, guest refunds, spoiled food, and cancelled events. Saunders notes that these numbers are each in the context of a one-week period. If these events happen with more severity and more frequency there would be an even greater negative impact on the company.

Because Saunders Hotel Group's business includes acquiring and renovating existing buildings, it is essential to consider potential disruptions or damage to these facilities. This is particularly true for certain parts of Boston that are more prone to storm surges and flooding. According to a recent study by the World Wildlife Fund and Allianz, Boston has more real estate assets at risk from climate change than any other U.S. city besides New York, Miami and New Orleans.²¹ A Boston Harbor Association report released in February 2013 shows that by 2050, with sea level expected to rise as much as 2.5 feet, a Sandy-like storm at high tide would put a full 30 percent of the city underwater. Almost all of Boston's numerous older buildings have critical equipment in the basement, which makes them particularly vulnerable to flooding, sea level rise, or storm water events. Given this risk, The Saunders Hotel Group has had to consider whether to spend the time and money on retrofits to increase resilience in advance of a catastrophic event. For example, for some of its more vulnerable hotel sites, the Saunders team must consider whether it is worth the near-term investment to move expensive equipment up from the basement floor or install a retaining wall to protect that equipment from flooding.

For a small business, making these types of investment decisions to protect against future risk is difficult. A larger company has the financial ability and resources to closely analyze risks and employ experts to assess potential damage and calculate the costs of those scenarios. A small business is required to make these decisions with limited resources or outside expertise. As a result, for a small business, some of these decisions end up being more intuitive.

Saunders Hotel Group is in the beginning stages of integrating resiliency into its business strategy by engaging in discussions about options to prevent future losses like those from Irene and Sandy.

"In the travel industry we cannot simply resume selling our product when the lights come back on," Saunders states. "The risks to our business are more complex - advance notice of a storm will prompt increased cancellations, and past storm-related experiences can prevent future travel. Economic losses due to extreme weather events are highly tangible to our business."

John Royster, President and CEO, Big Muddy Workshop Inc.

Omaha, Nebraska

Big Muddy Workshop Inc. is a small landscape architecture firm located in Omaha, Nebraska that emphasizes sustainable design. Over the past few years, the vulnerability of Big Muddy's project sites to heat and drought has become an increasing concern to the firm's clients, and has also resulted in certain changes within the business. For example, as a result of an increasingly hot and dry climate, the firm has had to begin using different types of plants and trees in its projects.



According to John Royster, President and CEO, "In designing plantings today that will live for anywhere from 10 to 100 years, you have to look into the future and assess what weather could be occurring. In the past, many clients have preferred to use ornamental plants, though they are more vulnerable and require more watering, chemical applications, and maintenance. Now, to minimize potential economic and environmental losses, we are persuading them to use native plants, including some drought-tolerant species, as well as amending site soils so they are better able to retain moisture."

The Western and Great Plains regions of the U.S. have experienced unprecedented changes in temperature and precipitation in recent years. According to the U.S. Drought Monitor, the summer of 2012 was the driest in history for Nebraska, Colorado, and Wyoming. At the end of 2012, federal crop insurance payments as a result of the drought had reached \$8 billion nationwide, costing Nebraska farmers nearly \$483 million.²² Furthermore, the 2012 drought contributed to Nebraska's worst wildfire season since 1919, and the Nebraska Forest Service estimated that wildfires burned more than 400,000 acres and destroyed 65 structures in the state in 2012 alone.²³

Within the city of Omaha, increasing temperatures are also driving the importance of storm water management. When the city gets rainfall, it must be managed well and collected through rainwater harvesting practices so that it can be put to good use until the next rainfall. In response to changes in precipitation and temperature in the region, and in response to EPA's enforcement of the Clean Water Act, Big Muddy has expanded the portion of its practice that involves green infrastructure related to storm water management. For example, to decrease "heat island" effects of paved surfaces, the Workshop's

landscape architects minimize the extent of paved areas and select pavement types that reflect more light, thereby reducing the amount of heat absorbed on sunny, hot days. In addition, storm water run-off, which used to flow to storm sewers, can be diverted to provide moisture for on-site plantings and replenish local groundwater through sustainable site design.

The shifting climate in the state of Nebraska is perhaps most evident when looking at the U.S. Department of Agriculture's (USDA) plant hardiness map, which divides the U.S. into 10-degree zones to help determine which plants are most likely to thrive in a given location. Since John Royster began working as a landscape architect 30 years ago, Nebraska has shifted into a different zone. During that timeframe, Royster has become more aware of the effects of drought on the areas in which he works.

As a firm that provides professional design services to clients, Big Muddy doesn't directly buy or sell plants. Instead, its landscape architects act as knowledgeable advisors and select plant species to be included in planting plans that are publicly bid and installed by contractors. In this capacity, Big Muddy provides guidance on what will and will not help clients avoid economic losses. For Big Muddy, the largest potential economic loss as a result of climate change would come as a result of poor plant selection.

"For example, one project our firm is involved in includes planting 800 new trees. Depending on the species of tree, each is worth between \$150 and \$400, for a total cost of \$200,000. If the plants used for the project are not climate-adapted, the client could suffer \$200,000 in losses, and would look to us to pay for the trees. If this were to happen, we'd suffer the economic loss that could be up to ten times the value of the fee that a client has paid us for the design. If we had to pay to replant a project, we could have a loss equal to 100 times our potential profit on the project," says Royster.

The potential economic impacts of climate change to Big Muddy are too great to not be addressed directly. In response, Big Muddy has integrated climate risk management into their business strategy by emphasizing both ecological and economic design strategies, as well as by investing in a continuing education program on the impacts of climate change. This long-term view of the impacts of climate change has resulted in an opportunity for Big Muddy to build a niche that sets it apart from its competitors.

Bill Niman and Nicolette Hahn Niman, BN Ranch, LLC

Bolinas, California

Bill and Nicolette Niman own and operate BN Ranch in Bolinas, on the coast of California. Bill has been in the ranching business for over 40 years, and knows well the vulnerability of agricultural practices to changes in the weather. However, the weather in his locale has been particularly challenging in recent years.



According to Bill, “Our business is raising animals for food, and our primary focus is in the naturally occurring pasture or grassland for our cattle. Agriculture depends on soil, sun, and rain, with water being the key variable. Until recently, we felt that water was a predictable and reliable resource.”

The Nimans see grass-fed animal ranching as a seasonal endeavor, similar to harvesting tomatoes in the summer, or strawberries in the spring. Similar to these crops, there is a two-week window where the grass upon which our cattle graze is in peak condition – perfectly ripe, and with the most energy for the animals to convert and store as intramuscular fat (marbling). Therefore, the challenge for the Nimans is to extend the season as much as possible to maximize the timeframe for optimal harvesting. To do this, the Nimans own cattle in different regions throughout California and parts of Oregon, where the climate varies considerably.

During the summer months, the Nimans rent some flood-irrigated land for their cattle, where water is distributed onto the pastures by gravity. However, the Niman’s cattle spend the majority of the year, October through May, on land where the water source is natural rainfall. In both 2012 and 2013, there was barely any rain in these areas in January, February, or March – the height of the rainy season. If there is no rainfall, the grass does not grow, and the availability of naturally occurring forage is limited.

“Our whole business depends on grass growing, and now there is enough for the animals to survive, but not enough for them to flourish.”

This is an issue that is challenging ranchers and farmers throughout the western U.S. The widespread drought in the U.S. ranked as the second most expensive disaster globally in 2012, resulting in insured

agricultural losses of \$11 billion - the highest loss in the history of agriculture insurance.²⁴ According to Niman, as a result of these conditions, some ranchers have had to liquidate or move their cattle to other locations, although the opportunities for that are limited. Alternatives include feeding cattle corn and other row crops, but that is challenging because of the increasing price of corn.

According to Niman, it is the “perfect storm in animal-based food operation. Up until three years ago, everything was perfect; in fact we had a banner year. A year later, due to increasingly dry conditions, there was 16 to 20 percent less meat per animal - they were 100 pounds lighter. We expect this year to be worse.”

Due to drought conditions, last year the ranch experienced a 15 to 20 percent loss, amounting to a difference in revenue of hundreds of thousands of dollars. Fortunately, the Nimans were able to sell their grass-fed beef at a premium price, because of increased customer demand.

Niman is currently engaging in business planning discussions to determine what can be done to provide the necessary conditions for his cattle and reduce the possibility of future losses even worse than last year. As a result of these discussions, in early 2013, Niman made a decision to invest in irrigated pasture in California. The rent for this land is expensive, and as a result the cost of production will increase and negatively impact the margins of the business.

However, according to Niman, “it will keep us in the business, which is critical so we can maintain the brand for better years to come.”

Spotlight: Hurricane Sandy

On October 29th, 2012, Hurricane Sandy hit the eastern seaboard of the U.S., resulting in particularly severe damage to New Jersey and New York. According to the Department of Energy, Hurricane Sandy resulted in the loss of electric power to about 8.5 million customers on the East Coast. At its peak, the storm reached 1,000 miles across. It killed more than 100 people in 10 states, and forced the cancellation of nearly 20,000 flights. According to the US Geological Survey, the storm caused roughly three decades' worth of erosion on New York's Long Island in three days. Its storm surge hit New York City, flooding streets, tunnels and subway lines and cutting power in and around the city.

Recovering from Hurricane Sandy is estimated to cost nearly \$37 billion in New Jersey and \$32 billion in New York, with \$19 billion in losses to New York City alone.^{25,26} In January 2013, Congress approved a \$51 billion aid package to assist with recovery efforts. The package comes in addition to nearly \$10 billion that Congress approved to support the state and city recovery efforts in New York, New Jersey, and Connecticut. Overall, the storm cost the economy more than \$50 billion, making it the most expensive disaster globally in 2012.²⁷

While many major businesses shut down by the storm will be covered by business interruption insurance, many small businesses that are shut down for an extended period of time due to lack of power may not be covered by insurance, and are less likely to recover economically from lost sales. According to the ADP Research Institute's National Employment Report, Hurricane Sandy cost the U.S. private-sector economy 86,000 jobs in November 2012, mostly among small businesses. According to Moody's Analytics, "the manufacturing, retailing, leisure and hospitality, and temporary help industries were hit particularly hard by the storm".²⁸

Sarah Corey, Marketing Manager, IceStone

Brooklyn, New York

One small business that was severely affected by Sandy is IceStone, a small business located in the Brooklyn Navy Yard. IceStone makes surface materials from recycled glass and cement, creating sustainable alternatives to traditional products in an effort to drive positive environmental and social impacts. IceStone has been in this location for a decade, and employs almost 40 people. Since its creation, IceStone has identified as a business that is actively making an effort to counter climate change.



Therefore, according to Marketing Manager Sarah Corey, "It is a strange paradox that the company was impacted so greatly by an unprecedented extreme weather event like Hurricane Sandy".

The main damage to the company included severe flooding and storm surge in IceStone's manufacturing facilities on the bottom floor of the building, while the offices on the floor above remained intact, despite losing heat and power for several weeks. As of July 2013, the total cost of Sandy to IceStone's business, including all

losses, equaled \$1,929,919. Following the October storm, all of IceStone's manufacturing equipment was out of commission for roughly six months. During those months, IceStone lost \$1,300,000 in sales due to the shutdown. Of this, \$910,000 equals actual income lost. Production resumed in March 2013.

According to Corey, the majority of the time following the storm has been spent cleaning up the extensive damage to the building. In addition, a large part of every day was spent working with the federal Small Business Administration (SBA) to seek loan assistance.

"It has been a disruption to normal operations," Corey says, "there is an opportunity cost there."

As of December 2012, IceStone and other small businesses in the Navy Yard had experienced difficulties getting approval of loan applications from the SBA. However, in an act of grassroots perseverance, IceStone employees implemented a crowdsourcing campaign to aid with storm recovery, raising \$8,000 as a result (this campaign was to recover lost marketing materials and packing tools). In early March 2013, IceStone was approved for an SBA loan amounting to nearly \$1 million to cover damages from the October storm.

Since Sandy, IceStone has begun to consider the future of their current space, and how to be mindful of future storms. This is the first time the area has been hit so hard by an extreme weather event, even with Hurricane Irene in 2011. At this point, any plans to prepare for or prevent future damage from extreme weather events are still being discussed, and definite decisions about how to invest in resilience measures for the future have not been made. However, because most of IceStone's inventory was wiped out by Sandy, there have been initial discussions to shift the flow of materials through the space to meet future challenges from storms. As with many of the nearby small businesses in "hurricane alley", a nickname for the Navy Yard since Sandy, IceStone's priority is getting the company back into full operational mode as soon as possible.

After this experience, Corey believes that assessing the preventative infrastructure needs in the Navy Yard should be a priority. According to Corey, "we need to think about how small businesses can push local government administrators to look seriously at how to avoid a similar event this summer and in future years".

The Costs of Climate to Small Business

The economic impacts of climate change to small businesses range from costs associated with direct damage such as flooding or storm surge, to gradual challenges arising from changes in temperature. In addition to the physical risks of climate change, many small businesses also face indirect risks, such as reputational risk or changes in customer demand. For example, if a hotel business experienced a power outage with guests on-site, these customers may not return for a future visit. Each of the small businesses highlighted in this report are actively evaluating the risks to their business, as well as the actions needed to best prepare their small businesses for increased future risk.

Preparing for potential impacts of climate change, whether for the risks of sea level rise, storm surge, drought, or more frequent and severe storms in general, will position small businesses to recover more quickly from an extreme event if it occurs. Investing time, money, and effort in the potential risks of climate to their business will reduce lost sales, disaster recovery costs, and lost work hours from the disruption in operations of a future extreme weather event.

Recommendations

To integrate climate-related strategy into small business plans, small business owners can take a number of initial steps:

Identify a Business Continuity Plan

Developing a business continuity plan, or a risk management plan, is essential for a small business to build resilience in the face of future climate-related events. A continuity plan will help identify the risks of climate change impacts specific to their business. Any event that could impact business operations is included, such as supply chain interruption, and loss of or damage to critical infrastructure. This may lead to developing an energy management plan to determine ways to lower energy and water use and reduce waste, which can simultaneously lower normal operating costs.

Partner with Local Authorities

Collaborating with state agencies, including departments of environmental protection, public utility commissions, chambers of commerce, and city planning commissions can help small businesses prepare for future extreme weather events. These partnerships can serve as a conduit for information sharing

among local businesses and government within the state, and can also inform businesses of any financial incentives available to them for climate-preparedness actions.

Use Education and Outreach

Among small businesses, there is a need for education on the potential impacts of extreme weather events, and an opportunity to raise awareness based on the experiences of businesses that have faced extreme weather events. Encouraging small businesses to share their experiences and communicate the results of their implementation efforts is essential to raise awareness of the potential impacts of extreme weather conditions.

Seek Input from the Community

Small businesses are closely tied to the communities in which they operate. A community's vulnerability to climate change can have a negative impact on the financial standing of small businesses, and vice versa. Members within a local community, including academic institutions, state and local policymakers, and local agricultural and natural resource organizations, can provide valuable input and technical knowledge for implementing and supporting climate preparedness plans. Joint planning among various local sectors can result in communities that sustain less economic damage and recover faster from extreme weather events. For example, local universities can provide forums for educating communities on coastal protection in the case of a flood. Furthermore, local businesses can partner with the public sector to build resilience in areas of their value chain that they do not control, such as critical transportation networks.²⁹

Call for Action to Address Climate Change across Local, State, and Federal Levels

Business owners cannot always fully prepare for unexpected natural disasters, extreme weather events, or long-term climate change effects such as changes in temperature, seasonality, natural resource availability, sea level rise, and other effects of climate change. As a result, some small businesses will not remain viable in the face of these challenges. For this reason, climate change action must be taken at all levels of government, and must include not only efforts to prepare and adapt to its impacts, but to mitigate the effects of climate change through greenhouse gas reduction. While the small businesses and local constituencies represented in this report serve as invaluable indicators for the effect of climate change on the broader economy of the U.S., state and federal officials must collaborate with local communities and businesses to address these effects through effective policy mechanisms that will work to reduce greenhouse gas pollution and strengthen the economy from the risks associated with climate change.

Conclusion

Hurricanes, floods and droughts are putting increasing strain on the federal budget. According to recent reports, Congress spent at least \$136 billion on disaster relief between 2011 and 2013, or \$400 per household per year.³⁰ If climate change leads to more frequent extreme weather, these costs are likely to rise in coming years.

Small businesses are particularly vulnerable to the risks posed by climate change. Given their high level of exposure to extreme weather events, small businesses must recognize both their vulnerability to these extremes and their role as critical participants in national climate change preparedness and planning. While climate change has typically driven business owners to strategize around minimizing loss, some small business owners have been able to maximize revenue by capitalizing on climate-related opportunities.

Responsible for creating two out of every three new jobs over the past twenty years, small businesses will continue to play a vital role in coming years to drive our nation's economy. By engaging with local communities, partnering with state agencies, and responding to customers' needs in the face of a changing climate, and with the robust support of federal policy mechanisms that recognize their unique vulnerability, small businesses can continue to serve their essential role within the U.S. economy.

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