Insights for Impact

Using Data to Support Artisans Through Climate Change

NEST

Patrick J McGovern FOUNDATION

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Background

The Patrick J. McGovern Foundation (PJMF) Data to Drive Climate Action Accelerator project is a dynamic and innovative initiative established to support organizations in leveraging data to increase their impact and effectiveness. The Accelerator focused on building a community of data professionals, providing training and resources, and facilitating collaboration and knowledge-sharing among participating organizations. Nest was honored to be selected and enrolled in the 2022 cohort of the Accelerator. During that time, we actively participated and built on our data strategy to become a more agile and data-driven organization while simultaneously improving our programming and analysis of the impacts of climate change on artisan and handworker communities globally.

Throughout the duration of this project, our team has had the opportunity to dive deeper into our organization's climate change data and explore new approaches to organizing, analyzing, and utilizing this information. We have gained valuable insights into the effectiveness of our programs, identified areas for improvement, and uncovered new opportunities for impact, all through the lens of climate change. These insights have not only advanced our organization's environmental mission but also provided a roadmap for other nonprofits facing similar data challenges. We are confident that the experience gained through this data approach will be a valuable asset to our team's work in the future.

This report reflects on Nest's time within the PJMF's Data Practice Accelerator, with a focus on the programmatic outcomes of the project as well as an analysis of data insights using the systems established during the accelerator. In this report, we explore the impact of the PJMF's Data Practice Accelerator, including the insights gained and how they might be applied to advance climate action and adaptations for artisans and makers. Furthermore, we will examine how the experience of this data approach may serve to enhance our team's future work by completing a comprehensive analysis of a survey of Nest's artisan business network on their experiences with climate change. We also discuss the broader implications of our use case and learnings for other organizations facing similar data challenges and offer recommendations for future projects in this area.

Nest

Nest is a nonprofit 501(c)(3) supporting the responsible growth and creative engagement of the artisan & maker economy to build a world of more significant gender equity and economic inclusion. For centuries, craftspeople worldwide have played critical roles in reviving and sustaining local creative economies, often working from their homes and community workshops. The scale of these informal workers is more extensive than many realize. Although incredibly challenging to estimate the total number of home based workers worldwide, the International Labour Organization (ILO) found that 87% of 50 million identified homeworkers are engaged in work in the informal sector, which includes craft-based handwork (ILO, 2021). Predominantly women, these workers are often unrecognized, and the implementation of their social protections is the exception rather than the norm. We believe that when artisan and maker businesses, brands, and philanthropists come together, we can unlock the potential of the handworker economy to grow with economic dignity and greater social inclusion —enabling millions of individuals and their surrounding communities to thrive.

Through programs supporting the well-being of artisans both in the United States and globally, Nest is bringing radical transparency and opportunity to the informal handworker economy. Nest's comprehensive range of programming is designed to meet artisans and maker partners where they are in partnership with brands, philanthropists, and Nest's network of more than 2,000 artisan businesses.

WHAT WE STAND FOR

Craft work is a fundamental source of employment for women globally, yet has been historically dismissed as niche, non-scalable, or "women's work."[1] Nest advocates to prioritize gender equity in economic investments in the global handcraft sector to ensure these investments benefit women's wellbeing.

We are committed to building a more vibrant and inclusive makers movement by providing maker entrepreneurs who often face barriers to accessing the support they need with the resources and market opportunities they need to thrive.

The global handwork market reached around $752.2BN in 2022,[2] yet the implementation of their social and economic protections are often the exception rather than the norm. We believe that in partnership with brands and philanthropy, we can harness the massive potential of craft to drive economic opportunity for workers everywhere.

In recent years, Nest's scope has expanded to include programming specific to other forms of handwork, like wastepicking, to bring greater attention and opportunity to these overlooked and underrepresented workers within the informal economy.

1 Dhamija, 1981.
2 Research and Markets, 2023.

Data to Drive Climate Action Accelerator

Business Challenge and Project Goals

Nest operates at the crossroads of social impact and private business, aiming to empower handworkers and artisans in their workplace. The organization's goals are accomplished through various programs and initiatives, such as programming with a global guild of artisans and makers, an accelerator program for handworker businesses, social compliance training and assessments, and community-based support. This diverse range of programming has been carefully cultivated and tailored to address the industry's specific needs. However, as a result, Nest contends with a complex web of independent data sources to increase programs' effectiveness.

Adding to this complexity, Nest has embarked on significant research efforts to understand the impacts of climate change on maker communities, both in the US and globally. Currently, a paucity of data about the effects of climate change on handworkers has limited the ability of stakeholders to support, adapt, or respond to the ever-changing environment in which these businesses and workers find themselves. Many artisans live within vulnerable communities and depend on the land and local resources to produce their goods. It is widely known that climate change and climate disasters disproportionately impact low-income households and communities (Portner, 2022). The majority of artisan enterprises and individuals in handworker supply chains live and work in low-income communities and are thus exposed to the adverse effects of increased climate risk. While we have countless anecdotes about how artisan businesses have experienced negative impacts on production and well-being from recent natural disasters, no comprehensive dataset highlights these impacts. The complexity of the research necessitates restructuring the data strategy to integrate multiple, dispersed data sets stored in different locations.

Leveraging access to data from over 2,000 handworker businesses employing 280,000+ individuals, Nest's data experiment was conceptualized to fill a critical gap in public knowledge and inform solutions that can support low-income communities. The project quantifies current climate impacts and identifies solutions for one of the largest working populations in the world. While understanding these impacts is critical to designing and scaling programs, emphasizing risk mitigation and solution building is also imperative to move from knowledge to action.

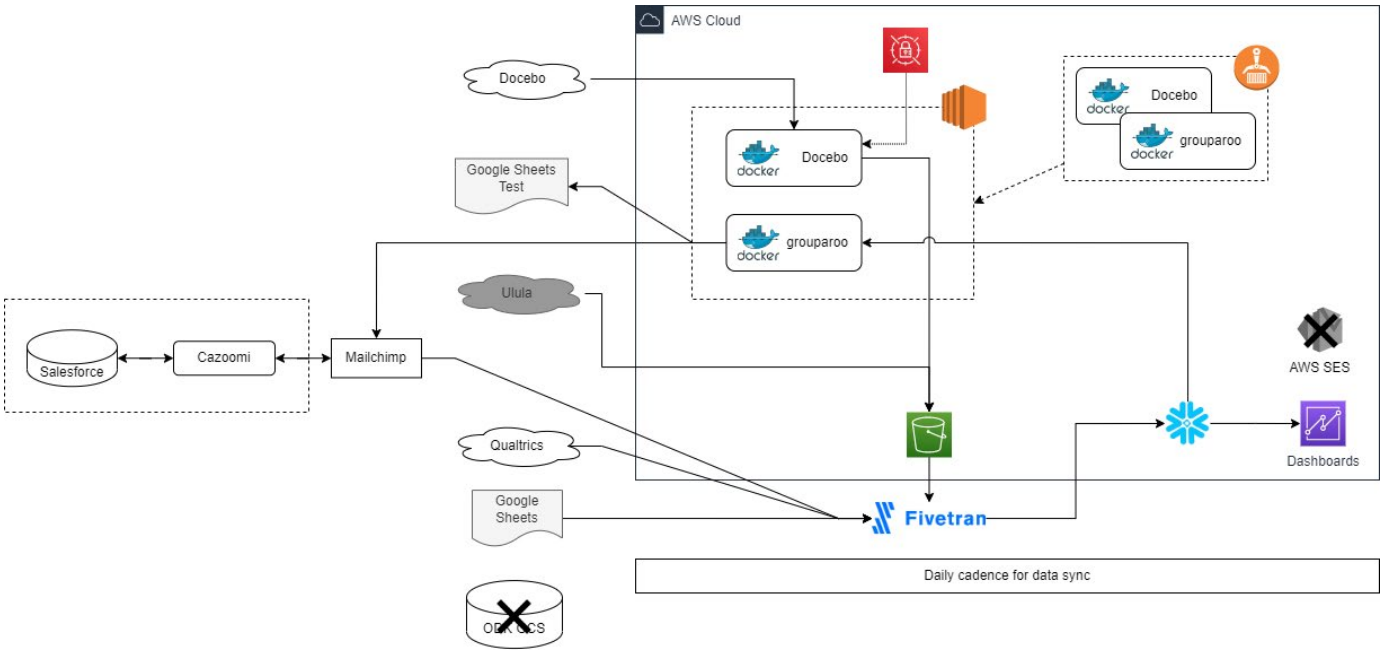
Goals of the PJMF's Data Practice Accelerator

1. Derive insights from Nest's climate datasets by analyzing key trends around climate risks to handworkers and identifying the variables that may put a handworker at greater risk of facing climate change impacts
2. Highlight innovative solutions being utilized by handworker businesses to minimize environmental harm and address existing climate threats
3. Perform a comparative analysis of climate risks and solutions identified from analyzing Nest handworker survey responses
4. Establish a knowledge base on climate impacts in the handworker sector through white papers and publications; share findings publicly and with key stakeholders to inform the potential scaling of solutions identified
5. Create efficiencies in Nest's data systems to better process and analyze data collected from beneficiaries for external reporting and knowledge sharing

The Data Journey

Beginning in January of 2022, Nest participated in and utilized the resources provided by PJMF as a participant in the Data Practice Accelerator cohort. Throughout this journey, Nest was able to meet with PJMF experts to help define and determine a data strategy that would not only support Nest's climate change research, but also inform business development goals and program impact on an organization-wide scale. As the project continued, it became clear that for Nest to succeed in its climate research goals, there needed to be a more defined organizational data strategy and governance. As such, the project goals shifted to prioritize the sixth goal: *Create efficiencies in Nest's data systems to better process and analyze data collected from beneficiaries for external reporting and knowledge sharing.* This ensured the achievement of the five goals related more specifically to climate change research.

Nest contracted BlueOrange Digital to assist in developing and implementing a comprehensive data architecture utilizing a combination of native systems within Amazon Web Services (AWS) and more user-friendly applications and interfaces to ensure Nest's capacity to maintain the system. Nest's internal process refinement continued between the initial scoping and implementation of the project, and as such, the architecture and schemas have also changed over time. Nest project management shifted during the build-out of the system such that the Director of Research and Data Systems overseeing the efforts changed in late January 2023, while the consultancy with BlueOrange Digital was completed in mid-February.



The Data Strategy

Based on the mapping of data sources and strategy discussions completed throughout the accelerator, an initial data architecture was designed that aggregates multiple data sources using Simple Storage Service (S3) running in the AWS cloud. Data sources pull from various locations, including Qualtrics survey software, Mailchimp, Google Sheets, Ulula (a bespoke project management application), and Docebo (a learning management system), into either an S3 bucket or directly into a Structured Query Language (SQL) data warehouse. All data sources are refreshed and reloaded once weekly to accommodate any changes or updates to the data. The S3 bucket and other data sources are then connected to Snowflake, a cloud-based data warehousing and analytics platform that handles large amounts of structured and semi-structured data. Snowflake provides a range of features and capabilities to support data warehousing and analytics, including support for SQL queries, data transformation and preparation, data sharing, and real-time data ingestion. It was selected as the warehousing and analytics platform over AWS Redshift because it allows automatic optimization and tuning of data and a more user-friendly interface than Amazon Redshift, which requires more technical expertise and familiarity with data warehousing concepts to manage successfully. Snowflake further connects to AWS QuickSight to provide near-real-time analytics and data visualization as information is processed and updated.

Nest and BlueOrange elected to use Fivetran for most data integration and connection tasks, as the interface allows data maintenance within Nest's skillset and capabilities. Fivetran simplifies the process by automating the setup, maintenance, and monitoring of data pipelines, eliminating the need for manual coding or scripting. It also provides built-in data transformations and normalization, ensuring data is accurately and consistently represented in the destination system. Grouparoo, an open-source data synchronization tool, was utilized for pipelines that could not be supported through FiveTran's platform.

Artisans in a changing climate

While studies regarding the impact of climate change on artisans are severely limited, several factors suggest that artisans and handworkers are particularly vulnerable populations when it comes to climate change. Artisans and handworkers comprise a large proportion of the informal economy, limiting their visibility. Workers in the informal economy are largely female, of low socio-economic status, and have fewer protections and access to government resources through their employment. Additionally, many artisans are located in developing countries or rural areas, dependent on agriculture for subsistence or income and reliant on natural resources for raw materials related to their craft (Chambwera, MacGregor, and Baker, 2011). Within the United States, the effects of climate change are expected to disproportionately impact marginalized communities, including low-income communities and communities of color, which are more likely to include artisanal and handworker businesses (Reidmiller et al., 2018). Unlike traditional businesses, many artisan workspaces are located in the home, making these climate-related damages doubly destructive.

While climate change is a long-term process defined by cumulatively worsening trends, its impacts can be largely split into short-term (though often recurrent) events and long-term trends. The former is categorized as extreme weather events such as hurricanes, super typhoons, droughts, floods, landslides, and wildfires. The latter consists of trends such as increasing mean temperatures, sea level rise, and less predictable seasonality. Both categories pose active harm to artisans worldwide. In response, many have begun implementing sector-specific adaptation measures to protect their families, communities, and businesses.

Artisans and Extreme Weather Events

A driving factor behind climate change, atmospheric levels of greenhouse gases have increased steadily in the past decade (IPCC, 2021). Increased levels of greenhouse gases change the atmosphere's composition such that Earth's hydrological cycle is affected along with changes in heat retention. These patterns mean that arid and dry seasons experience greater evaporation, leading to more frequent droughts, while more tropical and rainy seasons experience more extreme rainfall and flooding (Dore, 2005). Droughts can decimate farmland, greatly reducing the yields needed for subsistence or income generation.

> "In 2020 we started working with shepherds of Churu on indigenous wool. However, that year saw the hottest summer with temperature reaching 50 degree Celsius. This resulted in loss of livestock & directly impacted the nomadic shepherd community thereby impacting the wool collection for making woolen products."
>
> **—Founder of a handspun clothing brand**

This is especially true for countries relying on rain-fed agriculture. Livestock can also suffer from decreased water and grazing land, reducing herd numbers and productivity. Many artisans rely on agriculture as a primary source of income, supplementary income, or a direct food source for their families (Chambwera et al., 2011). In the United States specifically, from 2000 to 2019, droughts caused an estimated $218 billion in damages and affected 84% of the country's land area, which in turn affects the ability of artisans and handworkers to source cost-effective raw materials (National Centers for Environmental Information, 2020). Droughts in the midwestern U.S. have increased reliance on groundwater supplies, depleting aquifers in the High Plains and California Central Valley to the degree that 35% of the Southern Great Plains will be unable to support agricultural irrigation within the next 30 years (Scanlon et al., 2012). Thus, drought years can reduce the financial resources handworkers have to invest in materials or other business ventures, as well as limit household food supply.

Drought can impact municipal water sources in more urban locations, which can be devastating in already water-scarce areas. A lack of safe drinking water can greatly limit artisans' ability to work due to increased heat exhaustion and dehydration risks. The effects of drought and extreme heat compounded can be fatal and can, over time, lead to chronic health issues such as kidney disease from repeat exposure. These effects are more pronounced among those who work outside or within facilities lacking air conditioning, as is the case for many home-based workers (Levy & Roelofs, 2019). Secondary effects of dry periods include increased incidence of wildfires, which can cause direct infrastructure damage to communities, homes, and workspaces, as well as decreased air quality due to the dispersion of particulate matter (Shuhlte et al., 2016).

Similar but opposite to droughts, extreme rainfall events, and flooding have negative impacts on agriculture and cause damage to personal, community, and business-related infrastructure. Flooded roadways limit transportation and market access (Schulte et al., 2016), while workspaces or facilities may be rendered unusable.

"Our artisans based in the West Region of Cameroon have been battered and bruised by floods landslides and extreme heat which has destroyed homes , materials and lifes. And till this day some of our artisans in these Regions have nowhere to call home due to the devastating consequences of extreme weather conditions."

—Leader of a handcraft association

For example, in 2011, Super Typhoon Haiyan killed thousands in the Philippines and displaced millions of people. Even during lesser periods of heavy rain, tikog (native reed) weavers could not use the drying facilities necessary to process their materials, and the quality of mats woven under these conditions was reduced (Cuaton, 2018). Similarly, floods in Odisha, India, from 2011-2012 saw widespread destruction of the stock, equipment, and infrastructure of weavers and other artisans (Patel et al., 2019). Within the United States, flooding events have impacted multiple artisan communities. For example, the Gullah Geechee people, known for their exquisite natural fiber basket weaving, have lived in a coastal corridor from Jacksonville, South Carolina, to Jacksonville, Florida for centuries. However, they are now facing a dire threat as one of the most vulnerable populations to climate change in the United States due to persistent flooding and rising sea levels (Newsome, 2022). Further, the instability of flooded land can lead to landslides in prone areas, leading to additional damage and fatalities while simultaneously making recovering from flooding more challenging.

Artisans and Slow Onset Events

"In Ghana, many of the women work outside under a tree, so if it is too hot it can be difficult to meet outside to work for the full day. They prefer to work at home, but then there is a risk of [quality control] problems when the women can't help each other on challenges."

—Brand director for a global artisan business

In addition to the increase in extreme weather events, there are long-term shifts caused by climate change that are currently being felt by artisans, with the severity only likely to increase in the near future. For example, the increase in temperature averages and associated effects are well documented and are leading to changes in seasonality (IPCC, 2021). One of the most well-understood climate change processes is the warming temperatures caused by greenhouse gas emissions. Emissions of certain gases, such as carbon dioxide and methane, trap heat, raising global temperatures by an average of 0.89˚ C (1.6˚ F) since 1880 (NASA, 2022). Global warming is not, however, distributed equally across the planet, and some nations have experienced significantly higher warming than others. These temperatures can become deadly with other climate trends, such as rising humidity and more frequent heat waves. Many artisans work outside or cannot access air-conditioned facilities to escape the heat. Working unprotected through high temperatures can cause heat stroke, heat exhaustion, heat syncope, or death (Schulte et al., 2016). Chronic exposure to heat stress can cause complications of chronic kidney disease, diabetes mellitus, chronic obstructive pulmonary disease, and coronary artery disease. The impact of rising temperatures can be so significant that scientists have posited that certain areas, such as some Middle Eastern nations, may soon become uninhabitable (Levy & Roelofs, 2019). Even artisans in locations not yet hot enough to cause severe health complications may suffer from decreased productivity in higher temperatures. Furthermore, raw materials or

finished products may degrade in quality from higher temperatures. In the case of tikog, for example, heat can make the grasses dry and stiff, making weaving difficult (Cuaton, 2019).

Additional complications come from rising temperatures, such as rising sea levels, worsening air pollution, and the increased prevalence of vector-borne diseases like malaria. Increased temperatures cause glacier melt and seawater expansion, causing severe damage to coastal communities and the forced migration of entire island nations (Leatherman & Beller-Simms, 1997). Not all businesses will have the necessary resources to relocate facilities or continue crafting after migration.

"The wildfire destroyed several products in our inventory: approximately 100 prints and 1000 greeting cards. Last year's flood damaged 70 percent of our packaging materials."
—Artisan & entrepreneur in Los Angeles, California

Global warming is also expected to worsen air quality from ozone and particulate matter and increase seasonal allergens such as tree pollen (Dodman et al., 2023). The recommended course of action for poor air quality days is staying indoors in well-ventilated areas, which can hinder production processes and cause delays or eliminate sales.

Seasonal changes in timing and duration can pose an increased risk and high economic costs to the informal economy. For example, in mid-latitude regions such as the United States, unpredictable shifts would occur from summer to fall or winter to spring (EPA, 2021). In tropical regions near the equator, this leads to less consistent and more destructive rainy and dry seasons (Dore, 2005). The difference between seasons has also become more extreme, with rainy seasons more likely to have major storms and flooding, while dry seasons result in more severe or prolonged droughts. While locals of these regions may previously have been able to plan for these seasonal changes to determine production schedules and raw material harvests, these same patterns have become less reliable in recent times, leading to disruptions of raw materials. In addition to raw material cultivation and preparation, this also has consequences for artisan production. Raheem and Olorunfemi (2013) report that artisans in Ilorin, Nigeria, must keep fewer goods in stock during the rainy season to avoid heavy losses, and the vast majority are without insurance to recoup lost capital.

"The families of our artisans do farming. Because of drought, farming became difficult, and there was no income from that source. Some families migrated to cities, so there was a reduction in number of artisans."
—Leader of a registered society of women artisans in Tamil Nadu, India

Artisans and Solutions

While artisans may be particularly vulnerable to the impacts of climate change, they are also important facilitators of adaptation and show extreme resiliency. This is particularly true when underserved individuals working in the informal economy, such as women, rural, and lower-class individuals, are given the necessary access to capital and other resources. After attending capacity-building classes in practical and entrepreneurial skills, women in the uPhongolo municipality of South Africa could pivot from crafting with local grasses to soapstone, a more climate change-resistant material. This change helped combat the region's extreme poverty caused by a loss of income after climate variability led to sharp agricultural declines (Nzama, 2021). Another study suggests mobility as a resilience strategy used by Ghana after major flooding in 2007 to adapt to changing weather patterns. Rather than migration being forced, it had long been practice for traditional weavers to migrate from North to South periodically to take advantage of educational opportunities and better sale prices (Olwig & Gough, 2012). Nest's collaboration with the Gullah Geechee basket weaving community in the United States identified that they have successfully adapted to the challenges posed by the decrease in the local availability of sweetgrass by widening the area from which they source this vital material. These findings suggest that providing artisans with the necessary tools, information, or capital allows vulnerable communities to boost their own resiliency to the impacts of climate change on their families and livelihoods.

Nest Study Methodology

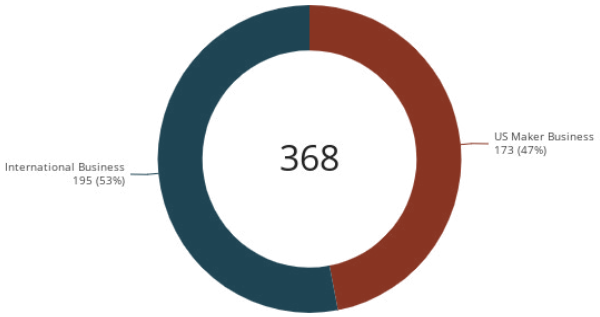
A survey was conducted among artisan or handcraft business owners to understand the impacts of climate change on Nest's artisan business network. The survey was administered using an online platform, Qualtrics, and emailed to the entire Nest artisan Guild of 2,156 businesses. The survey consisted of a series of closed-ended questions in addition to a few open-ended questions to gather information on extreme weather events experienced by the business leader, their knowledge and awareness of climate change, and revenue changes caused by climate-related damages. Survey questions related to climate change are provided in Appendix I. The survey also asked about the adaptive solutions that artisans have implemented, including changes in production techniques, changes in the types of materials used, and changes in marketing and distribution strategies. A sample size of 326 artisans was needed to make the sample representative of the entire Guild, with a 95% confidence and a 5% margin of error.

In total, 559 artisans responded to the survey, representing a response rate of 26%. However, 191 responses were dropped from the analysis because of partial or incomplete survey responses, leaving 368 responses. The initial data collected from the survey was deposited into the data warehouse, where it was queried in Snowflake to determine data quality, which led to the decision to drop incomplete survey responses. Data were downloaded and analyzed in Stata using descriptive statistics to identify trends and patterns in the data prior to data visualization. Additionally, bivariate analyses were completed on selected variables to determine the significance of differences by location, reported understanding of climate change, and reported worry about climate change. The analysis results determined how data should be focused and visualized. Once initial data analysis was completed, clean data in a comma-separated values (CSV) file format was uploaded to Snowflake using an Extract, Load, Transform (ELT) process created via FiveTran connectors. AWS Quicksite analysis was performed to create relevant data visualizations to create an interactive results dashboard. The dashboard was designed to be interactive, allowing for drill-down and filtering results based on desired analytics approach and viewing all distinct qualitative responses.

Results

Complete data tables on the analysis results and a static version of the visual dashboard created to communicate the results to organizational leadership can be seen in Appendices II-IV. Of the survey respondents, 53% (n = 195) of businesses are international, while 47% (n = 173) have their production and headquarters exclusively in the United States. Additionally, 91% (n = 170) of all business owners surveyed identify as female, 8% (n = 2) as male, and the remaining 1% (n = 1) as a different gender or non-binary. Within the 47% of businesses that are included in the United States, 52% of businesses owner identify themselves as white or Caucasian, 29% as black or African American, 7% as Asian, 6% as Hispanic or Latinx, 4% as another unlisted race or ethnicity, 1% as Middle Eastern or North African, and 0.6% as Native Hawaiian or Pacific Islander.

Business by Guild Enrollment

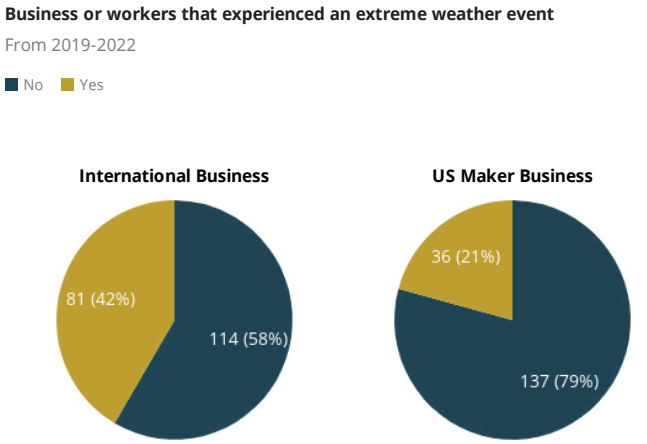


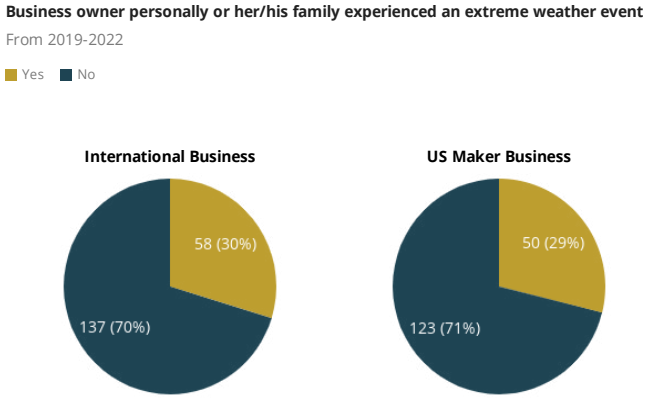
The business structure also varied depending on whether a business was based in the United States or internationally. About double the proportion of businesses based internationally reported a mature business stage (31%), as compared to those in the United States (15%). Businesses earned an average reported revenue of USD 131,535.30 in 2021, an increase from the previous two years. Additionally, about eight times as many internationally-based businesses reported working directly with artisans (n =169) compared to businesses in the United States (n=20). About four times as many businesses in the United States (n=163) described themselves as an individual maker and owner businesses compared to international businesses (n=45). These differences lead to a distinction in the worker population as well. Businesses in the United States report that they have, on average, only around one full-time (1.38, range: 0-15), part-time (1.81, range: 0-37), contracted (1.14, range: 0-20), and volunteer (1.08, range: 0-25) worker. However, there is an average of 189 artisans or handworkers (range: 0-6000) per business outside the United States.

EXPOSURE TO CLIMATE DISASTERS & DAMAGES

"The storm delayed a lot of projects and cancelled income for other projects that were already in motion. It was difficult to emotionally reset after these events and it took me a while to be able to work again."
—Beadwork artist based in Austin, Texas

Businesses were asked to reflect on both their personal and business experiences with extreme weather events. 32% of business owners reported that their business or workers experienced an extreme weather event in the past three years, while 29% reported that they or their families personally experienced an extreme weather event in the same time frame. In total, 22% of businesses experienced extreme weather events that affected them personally and professionally over this period from 2019-2022. Businesses based outside of the United States were statistically significantly more likely to experience extreme weather events (difference: 20.7%, 95% CI: 11%, 30%, $p < 0.01$), and for owners to experience extreme weather events in both their business and personal lives (difference: 8.75%, 95% CI: 0%, 17%, $p = 0.45$) than those within the United States.





The most commonly experienced extreme weather event was flooding (54%), followed by storms (43%), high winds (25%), drought or water shortages (21%), extreme heat (16%), wildfire (8.5%), hail (8%), and extreme cold or ice (6.8%). An additional 8.5% reported experiencing other extreme weather events, including cyclones, hurricanes, monsoons, extreme rainfall, severe air pollution, mudslides, and landslides. International and US maker businesses experienced differing rates of each of the these extreme weather events. However, none of these differences are statistically significant except for extreme cold, reported exclusively by businesses based in the United States ($p<0.01$).

Similarly, there were no statistically significant differences between international artisan businesses and US makers in the damages caused by exposure to extreme weather events. Businesses were most likely to report difficultly geting supplies as a result of the events (43.5%), followed by the inability of workers to get to work due to road or transportation problems (41%) or damage to their household, friends, family, or community (41%). Business leaders also commonly reported that extreme weather events caused damage to materials (35%) or workspaces (31%).

"Because of the storm and flooding, a lot of my workers could not come in to the studio. This made me lose some clients because I could not get everything done on my own without them."
—Luxury pattern and sample maker in New York City

Total damages to businesses caused by extreme weather events from 2019-2022

$1,068,135.00

Median cost of damages to businesses caused by extreme weather events from 2019-2022

$5,000.00

An additional 15% of respondents reported other damages, including power outages, the destruction of finished products, the persistence of low-quality materials post-disaster, the outmigration of workers, and cuts or limited access to clean water. Many other business leaders reported delays to production, including that products did not have the required weather to dry or that it was too hot for artisans to work where they normally do outside. Others reported a loss of income due to the business challenges caused by damages, such as the canceling of orders, lower quality of production, changes to material suppliers, missed sales opportunities or events, and damages to equipment or machines.

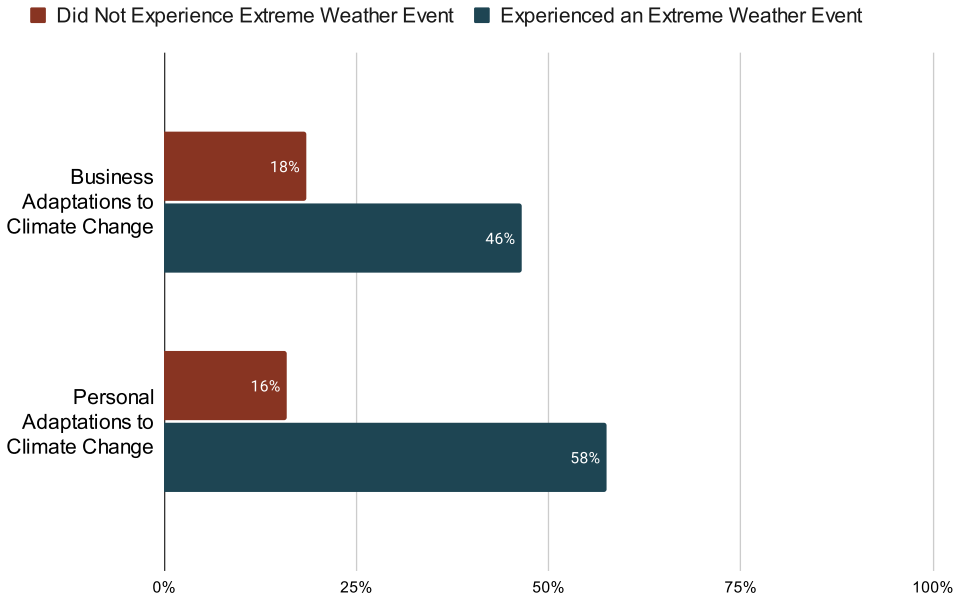
Some business owners noted that the artisans in their supply chain also receive supplemental income from farming or agriculture activities. Hence, damages caused by extreme weather events affect their ability to participate in artisan production and impact their other forms of livelihood.

The reported monetary value of the damages sustained by 97 businesses due to extreme weather events totaled USD 1,068,135 with a median of USD 5,000 of estimated damages per business.

Climate Adaptations and Solutions

Around 35% (n=122) of business leaders reported that they had implemented at least one adaptation or solution to protect either themselves or their business and workers from the future effects of climate change (95% CI: 30.8%-41.0%). Business leaders were statistically significantly more likely to implement climate change-related solutions if they had experienced an extreme weather event in the past. 64% of business leaders who had experienced an event implemented an adaptation, compared to only 16.5% of business leaders who had not experienced an extreme weather event (difference: 47%, 95% CI: 56%, 37%, $p < 0.01$). However, reported concern about the impacts of climate change did not affect the likelihood of implementing a climate change solution.

Percentage of businesses leaders that have implemented climate adaptations, by previous extreme weather experience



Overall, the responses show a range of measures business leaders take to protect themselves or their businesses from climate change. The most commonly mentioned solution implemented by business leaders was purchasing additional home, business, or flood insurance. Many others reported rebuilding from past experiences but did not necessarily mention future preparedness. Other solutions mentioned included reinforcing existing structures or adding new features like water pumps, drainage, fire extinguishers, hurricane shutters, or solar panels. Emergency preparedness was also a common theme. Several business leaders mentioned putting together evacuation and contingency plans, emergency kits for themselves or their workers, or stocking up on emergency-related equipment like backup generators or water tanks. Some businesses have moved production or workers to new areas or higher grounds to avoid future flood risks. Many individuals noted the difficulties associated with implementing a climate solution, due to the costs associated with the change or being unsure about what solutions to implement.

"We make sure all the members are stay informed, have plan for evacuation and keeping emergency kits on hand. We also provide them guidelines with graphic instruction for them to follow when the disaster happens."

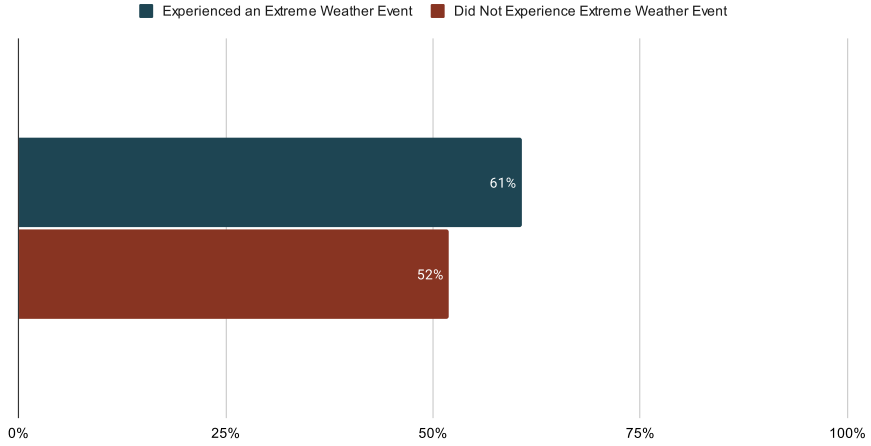
—Founder of a business preserving heritage craft in Myanmar

Besides climate solutions and adaptations, over half (56%) of the business leaders reported that they had taken measures to reduce the environmental impacts of their business (95% CI: 51%, 61%). Business owners were more likely to report eco-friendly efforts if they previously experienced an extreme weather event (12% difference, $p < 0.05$) or if they reported that they were worried about the effects of climate change (22% difference, $p < 0.05$).

"We use recycled materials whenever possible. 85% of our packaging is recycled or upcycled, while 50% of our materials are recycled from previously constructed jewelry. Our entire studio is furnished from thrifted or salvaged furniture and appliances to minimize the impact of our space."

—Jewelry maker in Brooklyn, New York

Percentage of businesses that have implemented solutions to minimize environmental footprint, by previous extreme weather experience



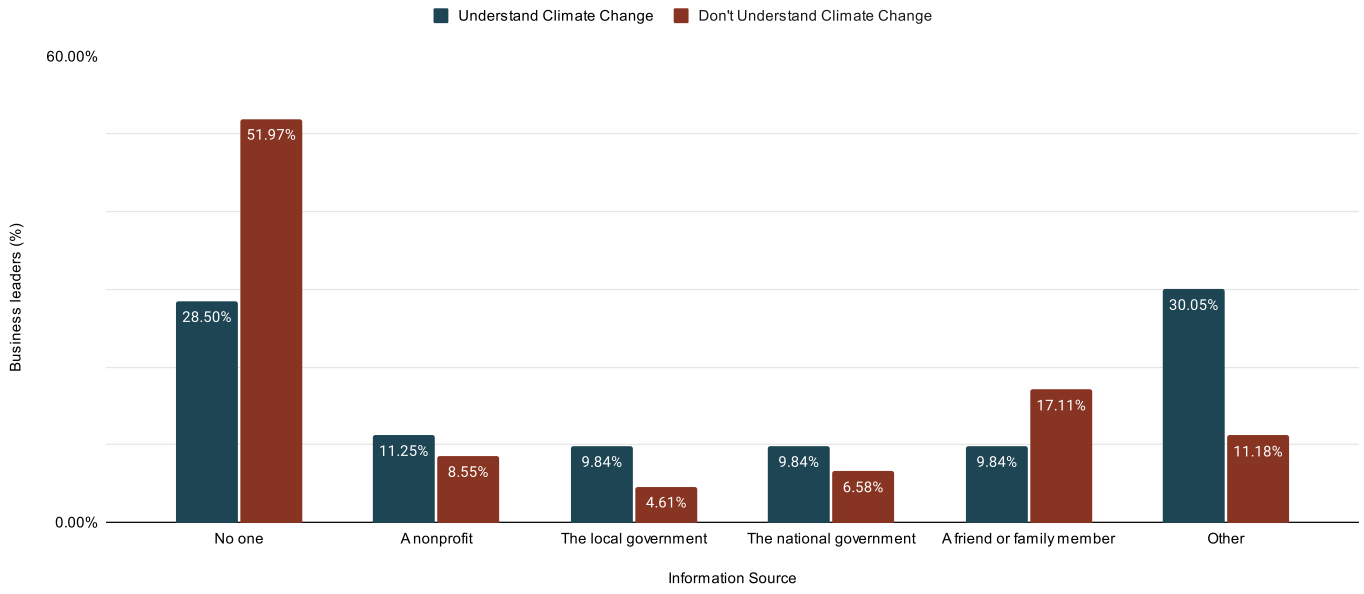
The methods for reducing environmental impact varied but focused on some common themes. Most often, businesses report the use of environmentally sustainable materials. Many businesses mentioned using natural materials and organic dyes; some even go so far as to source materials locally or repurpose/recycle existing materials. This includes upcycling fabric, using deadstock leather, and weaving with handwoven fabrics.

e efforts extended to product packaging, with many businesses noting their use of recycled packaging and elimination of single-use plastics. Further, several businesses highlighted their efforts to minimize resource use, such as energy and water. This includes implementing solar water, striving for low waste and low water use in production, and choosing more environmentally friendly transportation options. Businesses also approach environmental stewardship through advocacy and education. A few businesses mentioned their efforts to educate their customers or community about environmental issues, including holding workshops on environmental topics, providing information on wastewater and watershed preservation, raising awareness about the impact of freight and shipping, and donating to environmentally focused organizations. Additionally, a few businesses noted native plant or tree planting programs associated with their business.

PERCEPTIONS OF CLIMATE CHANGE

The vast majority of artisan business leaders report that they are worried about the future impacts of climate change on themselves or their business (82%, 95% CI: 77%, 86%). Additionally, business owners that had previously experienced a climate emergency were 10% more likely to report this worry ($p < 0.05$). Despite high levels of concern, only about half of business leaders (56%) report that they understand climate change (95% CI: 50%, 61%). However, the proportion who report understanding climate change is significantly higher if they have past exposure to extreme weather events ($p < 0.05$). The reported lack of understanding is further reflected in that most artisan business owners report receiving no information on climate change (39%), followed by receiving most information from a friend or family member (13%). Other common sources of information include another non-listed source (often news and media coverage; 10.86%) or a non-profit (10.29%). The least common primary source of climate change information for business leaders is local or national governments (8% each). Interestingly, there was a significant association between the primary information source and the reported understanding of climate change. Those who reported not understanding climate change primarily received information from no one (52%) or a family member or friend (17%). In comparison, those who report understanding climate change are more likely to receive information from the news or other sources (30%) or a non-profit organization (28%).

Primary source of climate change information



NEST

Final Insights and Future Direction

The research and analysis of the impacts of climate change on artisan and handworker businesses globally has made it clear that the need for comprehensive and actionable data has never been greater. Through participation in the Data to Drive Climate Action Accelerator, led by the Patrick J. McGovern Foundation, this report has outlined how Nest has built and streamlined a data architecture, from surveys to visualizations, on the intersection of climate change and artisan businesses. The architecture has enabled Nest to build an interactive visual dashboard that provides valuable insights into the challenges facing artisan and handworker businesses due to climate change and adaptations and solutions to the challenges posed.

This section presents our final insights and future directions for how Nest, funders, and stakeholders can work together to further develop and leverage climate intelligence to benefit artisans and handworkers worldwide.

FINAL INSIGHTS

1. **Artisan and handworker businesses are feeling the effects of climate change.** Three out of every ten business leaders experienced extreme weather events that adversely affected their business and the individuals that worked for them between 2019 and 2022. These events have caused over USD 1 million of damages across 97 businesses, with a median average cost of USD 5,000 per business. The median amount of business damages is more than 20% of a typical annual artisan business revenue during the same timeframe. Further, the damages caused by these extreme weather events impacted not just the economic livelihoods of small business owners and their workers but also the well-being of the communities and workers. Even after the weather has improved, the downstream consequences of these climate-related disasters can delay orders, production, and sales; so revenue may never be recovered.

> "There has been huge changes due to the climate crisis in Kenya. Even now we are waiting for the long rains to begin though they haven't. The future is even more uncertain and scary."
> —Founder & owner of artisan design collaboration

2. **Artisan businesses are currently more reactive than proactive when implementing climate solutions and adaptations that protect their businesses from a changing climate.** Business leaders are 46% more likely to report implementing measures to protect themselves personally or professionally from the effects of climate change if they have previously experienced an extreme weather event. Furthermore, there is no statistically significant evidence to show that business leaders who worry about climate change are more likely to implement measures than those who do not. This provides evidence that artisan and handworker businesses often fail to put protective measures into place early enough, adding them only after a traumatic event. Further research needs to be completed to determine the exact reasoning for this trend, but it can be speculated that businesses may not have the necessary capital or knowledge to protect themselves from climate change proactively. The median reported annual revenue of artisan businesses surveyed in 2020 was only USD 24,000, despite the US Small Business Administration's Office of Advocacy showing the median annual revenue for small businesses in the United States over the same time as USD 450,000. More often than not, artisan and handworker businesses require additional resources or capital to invest in climate solutions proactively. Furthermore, enhancing leaders' comprehension of the potential economic losses stemming from climate-related disasters can assist businesses in making informed and financially savvy decisions.
3. **Information from trusted sources is critical to support artisans and handworkers through climate change.** A statistically significant association exists between the primary source of information and artisan business leaders' understanding of climate change, whereby business leaders who lack understanding of climate change are 24% more

likely to not receive information on climate change compared to those who report understanding it. The ideal source of this information deserves further investigation. However, a lack of publicly available information on the impacts of climate change on artisan and handworker businesses creates uncertainty for business leaders. It is crucial for industry stakeholders, including brands, buyers, sourcing agents, and non-profit organizations, to collaborate in building a global library of actionable information for artisan and handworker businesses. This collaboration would help businesses adapt to the changing climate and increase their resilience to its impacts, ensuring the long-term sustainability of their livelihoods.

4. **The majority of artisan and handworker businesses are considering their environmental footprint.** Over half of the surveyed businesses have put in place measures to minimize their environmental impact, showing that they are considering their contribution to sustainability in consumer purchasing decisions. Their approaches varied greatly and included initiatives like using recycled or reused packaging, utilizing natural dyes and eco-friendly raw materials, planting trees, or raising community awareness. Artisans and handworkers bring unique skills and creativity to the table that can benefit brands and consumers globally and support consumers in meeting their sustainability purchasing goals. In fact, 73% of global consumers state that they would change their consumption behavior to reduce their environmental impact (Nielsen, 2018). By supporting them in considering the impacts of their work on the planet, we can continue to contribute to the cultural and economic fabric of the communities in which they are based.

"The focus of my business is on environmental awareness and every decision I make is based on best practices for people + planet. My art prints are made with sustainable paper + non-petroleum VOC-free inks. My production costs are higher because of this but it's worth it for me."

—Home decor artisan based in Portland, Oregon

5. **Industry leaders must advocate for policies and programs that support the sustainability and resilience of businesses in the face of climate change.** These results are clear: artisans and handworkers are vulnerable to the effects of a changing climate and are already feeling its impacts acutely. The artisan and handworker sectors are considered part of the frequently overlooked informal economy, so it is of utmost importance that they are elevated and considered as part of the economic and social costs of the current climate emergency. Even though the sector is currently excluded from many policy conversations, our collective efforts can support artisans in the face of the challenges posed by climate change. Public and private organizations must support businesses to prepare for and adapt to extreme weather events and recover post-disaster. Policies and programs should be developed to address the differing needs of businesses based on their location and structure, including unique considerations. This could include resources for disaster planning, training on emergency response, and access to funding or insurance to help cover damages.

As Nest's time in PJMF's Data Practice Accelerator concludes and we reflect on the analysis and insights gained by using data to improve support for artisans through climate change, it is important to consider the future direction of research and program efforts. While the findings provide valuable insights into the current landscape of artisanal and handworker businesses, there is still much work to be done to address the challenges faced by climate change. As such, Nest will continue investing in data-driven approaches to identify and prioritize the needs of artisans and handworkers, focusing on creating targeted interventions and advocacy that can beneficially impact businesses and communities. Nest is collaborating with industry-leading organizations to continue these research efforts, highlighting artisan female climate leaders, elevating worker experiences in Kenya, Guatemala, and the Philippines, and publishing synthesized results in the State of the Handworker Economy (SHE) report in early 2024. The data systems established through the accelerator have laid the foundation to integrate information across multiple projects and sources. By leveraging the power of data to inform our efforts, we can better support these vital industries and ensure their long-term sustainability in the face of a changing climate.

References

Chambwera, M., MacGregor, J., & Baker, A. (2011). *The informal economy*. International Institute for Environment and Development.

Cuaton, G. P. (2019). A post-disaster study of a women-led handicraft industry in rural Philippines. *Journal of Enterprising Communities: People and Places in the Global Economy*, *13*(4), 489–507. https://doi.org/10.1108/jec-10-2018-0074

Dhamija, J. (1981). Women and handicrafts: Myth and reality. SEEDS no. 4. New York: Population Council. https://knowledgecommons.popcouncil.org/cgi/viewcontent.cgi?article=1213&context=departments_sbsr-pgy

Dodman, D., Sverdlik, A., Agarwal, S., Kadungure, A., Kothiwal, K., Machemedze, R., & Verma, S. (2023). Climate change and informal workers: Towards an agenda for research and Practice. *Urban Climate*, *48*, 101401. https://doi.org/10.1016/j.uclim.2022.101401

Dore, M. H. I. (2005). Climate change and changes in global precipitation patterns: What do we know? *Environment International*, *31*(8), 1167–1181. https://doi.org/10.1016/j.envint.2005.03.004

EPA. (2021). Seasonality and Climate Change: A Review of Observed Evidence in the United States. U.S. Environmental Protection Agency, EPA 430-R-21-002. https://www.epa.gov/climate-indicators/seasonality-and-climate-change.

International Labour Orgaization (ILO). (2021). Working from home From invisibility to decent work. https://www.ilo.org/global/publications/books/forthcoming-publications/WCMS_765806/lang--en/index.htm

IPCC. (2021). Weather and climate extreme events in a changing climate supplementary material. In V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, . . . B. Zhou (Eds.), *Climate change 2021: The physical science basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://www.ipcc.ch/.

Leatherman, S. P., & Beller-Simms, N. (1997). Sea-level rise and small island states: An overview. Journal of Coastal Research, 1–16. http://www.jstor.org/stable/25736084

Levy, B. S., & Roelofs, C. (2019). Impacts of climate change on workers' Health and Safety. *Oxford Research Encyclopedia of Global Public Health*. https://doi.org/10.1093/acrefore/9780190632366.013.39

Nielsen. (2018) Analysis: A 'natural' rise in sustainability around the world. https://nielseniq.com/global/en/insights/analysis/2019/a-natural-rise-in-sustainability-around-the-world/

Newsome, M. (2022). Rising seas threaten the Gullah Geechee culture. Here's how they're fighting back. *National Geographic*. https://www.nationalgeographic.com/environment/article/rising-seas-threaten-the-gullah-geechee-culture-heres-how-theyre-fighting-back

Nzama, A. T. (2021). Tackling climate change through craft development: The case of rural women in Uphongolo Local Municipality. *Jàmbá Journal of Disaster Risk Studies*, *13*(1). https://doi.org/10.4102/jamba.v13i1.1140

Olwig, M. F., & Gough, K. V. (2013). Basket weaving and social weaving: Young Ghanaian artisans' mobilization of resources through mobility in times of climate change. *Geoforum*, *45*, 168–177. https://doi.org/10.1016/j.geoforum.2012.11.001

Patel, S. K., Mathew, B., Nanda, A., Pati, S., & Nayak, H. (2021). A review on extreme weather events and livelihood in Odisha, India. *MAUSAM*, *70*(3), 551–560. https://doi.org/10.54302/mausam.v70i3.258

Pörtner, H.-O., D.C. Roberts, H. Adams, I. Adelekan, ... and Z. Zaiton Ibrahim, et al. (2022). Technical Summary. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 37–118, doi:10.1017/9781009325844.002.

Raheem, U., & Olorunfemi, F. (2013). Urban vulnerability and adaptation to extreme weather events: A case study of rainstorm victims in Ilorin, Nigeria. *GEOGRAPHY, ENVIRONMENT, SUSTAINABILITY*, *6*(2), 80–93. https://doi.org/10.24057/2071-9388-2013-6-2-80-93

Reidmiller, D.R., Avery, C.W., Easterling, D.R., Kunkel, K.E., Lewis, K.L.M., Maycock, T.K., & Stewart, B.C. (Eds.). (2018). Impacts, risks, and adaptation in the United States: Fourth national climate assessment, volume II. U.S. Global Change Research Program. doi: 10.7930/NCA4.2018

Research and Markets. (2023). Handicrafts Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2023-2028- Product Image Handicrafts Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2023-2028. https://www.researchandmarkets.com/reports/5732596/handicrafts-market-global-industry-trends

Scanlon, B. R., Faunt, C. C., Longuevergne, L., Reedy, R. C., Alley, W. M., McGuire, V. L., & McMahon, P. B. (2012). Groundwater depletion and sustainability of irrigation in the US high plains and Central Valley. *Proceedings of the National Academy of Sciences*, *109*(24), 9320–9325. https://doi.org/10.1073/pnas.1200311109

Schulte, P. A., Bhattacharya, A., Butler, C. R., Chun, H. K., Jacklitsch, B., Jacobs, T., Kiefer, M., Lincoln, J., Pendergrass, S., Shire, J., Watson, J., & Wagner, G. R. (2016). Advancing the framework for considering the effects of climate change on worker safety and health. *Journal of Occupational and Environmental Hygiene*, *13*(11), 847–865. https://doi.org/10.1080/15459624.2016.1179388

Appendix I
Climate Survey Questions

	QUESTION	RESPONSE OPTIONS
1	Have you or your family experienced an extreme weather event in the past three years? This could include flooding, severe storms, drought, or wildfire for example.	1. Yes 2. No
2	*If yes to #1:* What type of extreme weather event did you experience? [Check all that apply]	1. Flood 2. Storm 3. High winds 4. Drought/water shortage 5. Wildfire 6. Extreme heat 7. Hail 8. Other (please specify)
3	*If yes to #1:* What type of damage did the extreme weather cause for you? [Check all that apply]	1. It damaged my home. 2. It damaged some of our belongings. 3. It damaged crops, food, livestock, or gardens. 4. It prevented me or someone in my home from working. 5. It hurt someone in my home, requiring medical care. 6. It damaged roads or other transportation. 7. Other: _____ 8. It did not cause any damage.
4	Has your business or individuals working for you experienced an extreme weather event in the past three years? This could include flooding, severe storms, drought, or wildfire for example.	1. Yes 2. No
5	*If yes to #4:* What type of extreme weather event did your business experience? [Check all that apply]	1. Flood 2. Storm 3. High winds 4. Drought/water shortage 5. Wildfire 6. Extreme heat 7. Hail 8. Other (please specify)

6	*If yes to #4:* What type of damage did the extreme weather cause for your business? [Check all that apply]	1. It damaged our workspace. 2. It damaged some of our materials. 3. It made it impossible for workers to get to work for some amount of time since roads or transportation were impacted. 4. It made it impossible for workers to get to work for some amount of time because their own household or those of their friends, family, or community sustained damage. 5. It made it difficult to get some supplies for some length of time. 6. Other: _____ 7. It did not cause any damage.
7	*If yes to #4:* Please elaborate on the damage your business sustained.	
8	*If yes to #4:* What is the financial estimate of the damage your business sustained? Please enter a value in USD.	
9	Have you done anything to protect yourself, your home, or your family from weather-related disasters?	1. Yes; Please describe: _____ 2. No
10	Have you done anything to protect your business from weather-related disasters?	1. Yes; Please describe: _____ 2. No
11	Have you implemented any solutions to minimize your business impact on your surrounding environment and/or climate?	1. Yes; Please describe: _____ 2. No
12	Are you worried about climate change hurting your or your business?	1. Yes 2. No 3. I don't know
13	Do you feel like you understand how climate change will impact you, your community, or your business?	1. Yes 2. No
14	Has any group provided you with information about climate change?	1. A nonprofit: _____ 2. The local government 3. The national government 4. A friend or family member 5. Other: _____ 6. No one has given me information about climate change

Appendix II
Business Structure

	n	%				
Businesses Outside of the United States	195	52.9	**United States**		**International**	
US Maker Businessess	173	47	**n**	**%**	**n**	**%**
Gender of Business Owner						
Female	333	90.74%	170	98.27%	163	84.02%
Male	30	8.17%	2	1.16%	28	14.43%
Non-binary	1	0.27%	1	0.58%	0	0.00%
Prefer to self-describe	2	0.54%	0	0.00%	2	1.03%
Prefer not to say	1	0.27%	0	0.00%	1	0.52%
Race & Ethnicity of Business Owner						
Caucasian or White			90	52.02%		
African American or Black			50	28.90%		
Asian			12	6.94%		
Hispanic or Latinx			11	6.36%		
Another race or ethnicity			7	4.05%		
Middle Eastern or North African			2	1.16%		
American Indian or Alaska Native			0	0.00%		
Business Stage						
Idea phase	2	0.55%	2	1.16%	0	0.00%
Early start-up	102	27.87%	68	39.31%	34	17.62%
Mid-stage/growth	176	48.09%	77	44.51%	99	51.30%
Mature	86	23.50%	26	15.03%	60	31.09%
Business Structure						
Individual maker and creator	208	56.52%	163	94.22%	45	23.08%
Work directly with artisans	189	51.36%	20	11.56%	169	86.67%
Source handcrafted products from an artisan or collective	57	15.49%	4	2.31%	53	27.18%
Source handcrafted products from other businesses	37	10.05%	7	4.05%	30	15.38%
Work with intermediary who works directly with artisans	31	8.42%	3	1.73%	28	14.36%
Work with multiple layers of intermediaries who work directly with artisans	13	3.53%	6	3.47%	7	3.59%

Appendix III

Maker Business Income & Workers

	Overall						International Businesses						United States Businesses					
	n	mean	SD	Min	Max	Median	n	mean	SD	Min	Max	Median	n	mean	SD	Min	Max	Median
Revenue in 2021	350	131535.3	270513.7	0	2500000	30500	187	162618.6	335717.6	0	2500000	65000	163	72930.46	147569	0	1100000	20000
Revenue in 2020	351	100608.1	2166066.8	-630	1930000	24000	188	143494.6	271528	0	1930000	49000	163	51143.78	105645.1	-630	600000	14000
Revenue in 2019	349	118078.8	253956.5	0	2300000	21000	163	47033.96	117577.1	0	1000000	10000	186	180338.5	317597.6	0	2300000	60000
Number of Workers																		
Full time workers													172	1.38	1.89	0	15	1
Part time workers													164	1.81	3.4	0	37	1
Contracted workers													162	1.14	2.16	0	20	0
Volunteer workers													164	1.08	3.15	0	25	0
Artisans							143	189.3	599.65	0	6000	33						
Staff							143	9.9	23.29	0	250	5						
% female workforce	395	86.9	64.02	0	1200	100	192	77.44	25.04	1	100	86	171	90.56	23.86	0	100	100

Appendix IV
Climate Change

	n	Proportion	SE	Intern-ational	U.S.	Diff	95% CI	p
Your business experienced an extreme weather event (2019- 2022)	117	0.3179	0.243	0.4154	0.2081	0.2073	0.11, 0.30	0.000*
Personally experienced an extreme weather event (2019-2022)	108	0.2934	0.023	0.2974	0.2890	0.0084	-0.08, 0.10	0.859
Both your business and personally experienced an extreme weather event (2019-2022)	83	0.2255	0.0218	0.1792	0.2667	0.0875	0.00, 0.17	0.045*
Types of extreme weather events your business experienced								
Flood	63	0.5385	0.0461	0.5679	0.4722	0.0957	-0.10, 0.29	0.338
Storm	51	0.4359	0.0458	0.4198	0.4722	-0.0525	-0.25, 0.14	0.597
High winds	29	0.2479	0.0399	0.2716	0.1944	0.0772	-0.08, 0.24	0.372
Drought/water shortage	25	0.2137	0.0379	0.2469	0.1389	0.1080	-0.04, 0.25	0.188
Extreme heat	19	0.1624	0.0341	0.1975	0.0833	0.1140	-0.01, 0.24	0.122
Wildfire	10	0.0855	0.0258	0.0864	0.0833	0.0833	-0.10, 0.11	0.956
Hail	9	0.0769	0.0246	0.0494	0.1389	-0.0895	-0.21, 0.03	0.094**
Extreme cold or snow	8	0.0684	0.0234	0.0000	0.2222	-0.2222	-0.36, -0.07	0.000*
Other type of event	10	0.0855	0.0258	0.1111	0.0278	0.0833	-0.00, 0.17	0.136
Types of damages to business caused by extreme weather event								
Difficult to get some supplies	51	0.4359	0.0458	0.4938	0.3056	0.1883	0.00, 0.37	0.058**
Impossible for workers to work; roads or transportation blocked	48	0.4103	0.0455	0.4321	0.3611	0.0710	-0.12, 0.26	0.471
Impossible for workers to get to work; damage to their own household, friends, family, or community	48	0.4103	0.0455	0.4444	0.3333	0.1111	-0.08, 0.30	0.259
Damaged materials	41	0.3504	0.0441	0.3704	0.3056	0.0648	-0.12, 0.252	0.498
Damaged work space	36	0.3077	0.0427	0.2840	0.3611	-0.0772	-0.26, 0.117	0.404
Other	18	0.1538	0.0334	0.1111	0.2500	-0.1389	-0.30, 0.018	0.055**
It did not cause any damage	15	0.1282	0.0309	0.1358	0.1111	0.0247	-0.10, 0.152	0.712

*Statistically significant difference where $p < 0.05$
**Statistically significant difference where $p < 0.10$

Monetary value of damage							
	n	mean	SD	min	max	median	Total
All businesses that experienced extreme weather event	97	11011.7	23080.1	0	180000	5000	1068135
US Maker Businesses that experienced extreme weather event	32	5451.263	11422.36	0	65000	2500	174450
International Guild that experienced extreme weather event	65	13749	26697.8	0	180000	5000	893685

Implemented protections from weather-related disasters													
	n (N)	proportion	SE	No extreme weather event	Extreme weather event	diff	95% CI	p	Worried about climate change	Not worried about climate change	diff	95% CI	p
Personal protections	98 (338)	0.2899	0.0247	0.1595	0.5755	-0.4160	-0.52, -0.31	0.00*	0.3333	0.34146	0.0081	-0.15, 0.17	0.92
Business protections	94 (336)	0.2798	0.0245	0.1847	0.4649	-0.2802	-0.38, -0.17	0.00*	0.3366	0.3023	-0.0343	-0.19, 0.12	0.66
Elther business or personal protections	122 (341)	0.3578	0.0260	0.1650	0.6312	-0.4662	-0.56, -0.37	0.00*	0.4087	0.3721	-0.0366	-0.20, 0.12	0.66
Both business & personal protections	70 (341)	0.2053	0.0219	0.105	0.3475	-0.2425	-0.33, -0.15	0.00*	0.2548	0.2558	0.0010	-0.14, 0.14	0.99
Implemented measures to minimize the business' impact on the environment													
Implemented business measures	192 (346)	0.5549	0.0267	0.5153	0.6325	0.1172	0.22, 0.01	0.038*	0.6428	0.4223	-0.221	-0.38, -0.06	0.006*
Perceptions and knowledge of climate change													
Worried about the imact of climate	217 (264)	0.8220	0.0235	0.7778	0.8829	-0.1051	-0.19, -0.02	0.027*					
Understand climate change	196 (351)	0.5584	0.0265	0.4905	0.6596	-0.1691	-0.27, -0.06	0.002*					
Information sources on climate change													
	n (N)	proportion	SE	Understand climate change	Not understand climate change	diff	p (Chi²)		Worried about climate change	Not worried about climate change	diff	p (Chi²)	
No one	136 (350)	0.3886	0.0261	28.50%	51.97%	-23.47%	0.00*		43.27%	43.48%	-0.21%	0.02*	
A friend or family member	46 (350)	0.1314	0.0181	9.84%	17.11%	-7.27%			8.92%	17.39%	-8.47%		
A nonprofit	36 (350)	0.1029	0.0162	11.25%	8.55%	2.70%			12.68%	8.70%	3.98%		
The national government	29 (350)	0.0829	0.0147	9.84%	6.58%	3.26%			8.45%	10.87%	-2.42%		
The local government	28 (350)	0.0800	0.0145	9.84%	4.61%	5.23%			10.33%	6.53%	3.80%		
Other	75 (350)	0.2143	0.0219	30.05%	11.18%	18.87%			25.35%	13.04%	12.31%		

*Statistically significant difference where $p < 0.05$

** Statistically significant difference where $p < 0.10$

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Appendix V
Artisans in a Changing Climate Dashboard

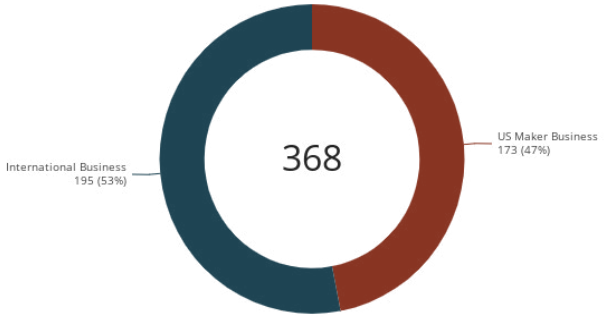
Artisans in a Changing Climate

Explore and understand the effects of climate change on artisan and handworker businesses

This dashboard is designed to provide an interactive and insightful way to explore and understand the effects of climate change on artisan and handworker businesses, based on information gathered from surveys of artisan business leaders. It presents key data and analysis from our research, which has been collected through a streamlined and efficient data architecture built by Nest in partnership with the Patrick J. McGovern Foundation. Users can filter the data by region, type of business, and other factors to gain deeper insights into the specific challenges faced by these communities. Through this dashboard, we hope to increase awareness and understanding of the impact of climate change on artisan and handworker businesses and inspire action to support these communities in adapting to the changing climate.

Business by Guild Enrollment

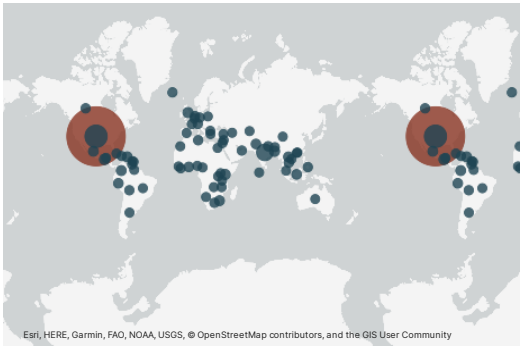
US maker businesses are those with both headquarters and production exclusively in the United States and no other countries. All other businesses are classified as international businesses.



Business Headquarters Location

The size of the circle indicates the number of businesses with headquarters located in that country.

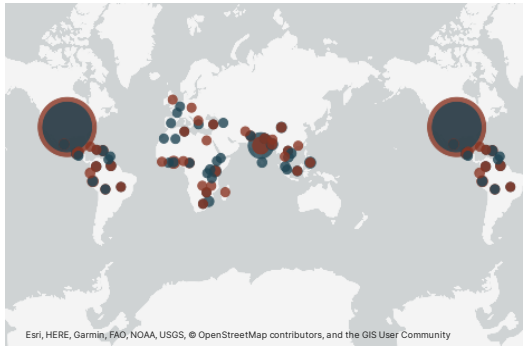
International Business US Maker Business



Countries With Artisan and Handworker Production

The size of the circle indicates the number of businesses with production in that country.

International Business US Maker Business

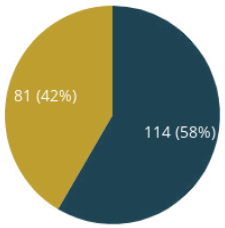


Business or workers that experienced an extreme weather event

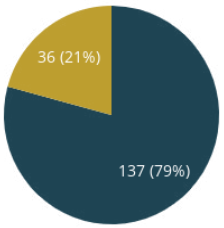
From 2019-2022

No Yes

International Business



US Maker Business



Total damages to businesses caused by extreme weather events from 2019-2022

$1,068,135.00

Median cost of damages to businesses caused by extreme weather events from 2019-2022

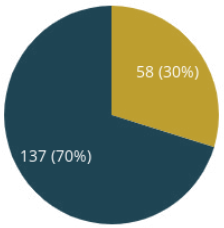
$5,000.00

Business owner personally or her/his family experienced an extreme weather event

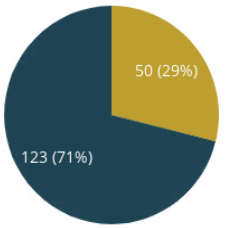
From 2019-2022

Yes No

International Business



US Maker Business

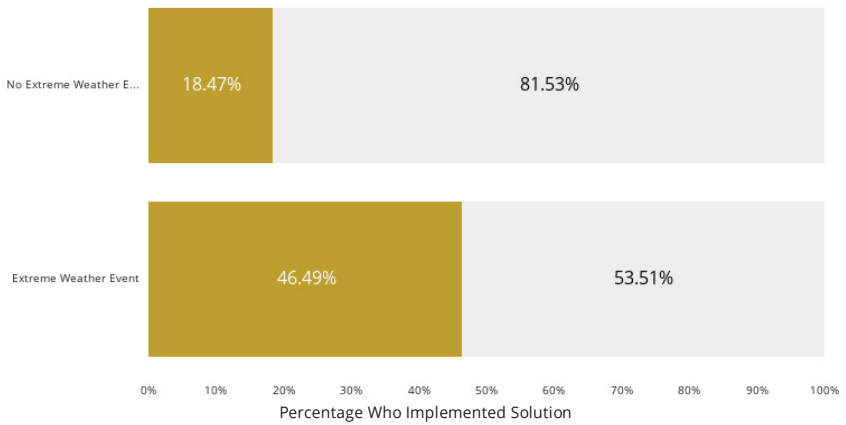


Artisan and handworker business leaders experiences with and damages caused by climate change varied greatly

An ice covered tree fell on the roof, causing major damage.
As a result of flood and mold damage in my storage I basement filled will vital material was damaged
Basement sewage flooding, the city of cleveland came out to have it fixed for me at no charge
Because we had to close down completely, we were unable to continue production of goods which we were unable to do during Covid
Broken workroom / roads blocked by Banyan trees
Damage to vehicles, some materials and stock damaged
Damages to work sheds, artisans homes, machinery & tools.
Delayed working
Delays in fulfillment of orders
Drought experience make more difficult to process production
Due to flood and heavy rains we have lost our business opportunities
During the extreme winter storm in February of last year, the entire city was shut down, and due to power grid failure, many of us were without power and water for several days. Luckily, the interior of my business was ok, but our mimosa tree in front died, along with some cacti.
During urban floods, our stocks were damaged and we were unable to get new supplies due to blockages
Extreme weather causes damages of raw materials, it hampers the normal working ability of our artisans which decrease production and revenue.
Felt wool raw material
Flood damage to the basement and Water damage to the roof
Flooding and Typhoons on east coast damaged artisan facilities and production.
Furniture , salaries to be paid , repair of broken window , tiles ,food and financial support to our employees as well as other communities .
Had to move out of home and have partial home rebuild
Home repair; Non work wages, illness & Basic food hiking price aid.
Homes of artisans were lost, production was put on hold, no electricity for a month, communication limited
I was unable to work because I was out of electricity and. Water for three weeks. My home had some water damage from burst pipes.
If the artisans we work with are affected by these extreme weather events it means that deadlines for production delivery is compromised, their performance lowers as they are faced with severe impact, like loosing their homes due to cyclone.
Impacted our ability to fulfil orders - artisans still had to be paid.
Impassible roads and closed schools make it impossible for artisans to come to work. We could not produce product during that time, setting back our production schedule and delivery dates.
In 2019, Phnom Penh had an extreme heat spell and drought, which resulted in power outages for more than a month due to the country's dependence on hydro-power and the lower water levels. As such, our sewing was impacted for over a month and we could not open the worksh
In 2020 we started working with shephards of Churu on indigenous wool. However, that year saw the hottest summer with temperature reaching 50 degree Celsius. This resulted in loss of livestock & directly impacted the nomadic shepherd community thereby impacting the wool co
In Canada, Chilliwack BC, we experienced an atmospheric river in November 2021. This led to road closures and we were unable to attend key Christmas events.
Inability to work for 3 weeks due to damage to the home, no hot water for 3 weeks, almost one week without electric due to a freeze, delayed materials arriving In studio
Increase in diseases like TB, Asthma, flu etc in employees as well as the communities leading to many leaves being taken in that period
It did electiric damage, tore the elected lines off the garage, frizzled surge protectors.
It mostly damaged the houses of our partner weavers and their weaving center. But this di not stop them from work. It was only a temporary disruption but they went on with their tasks. On our part, we got donations from our clients and friends to help the weavers fix their houses, fi:
It was sustained by our artisans, not directly by our business in KL.

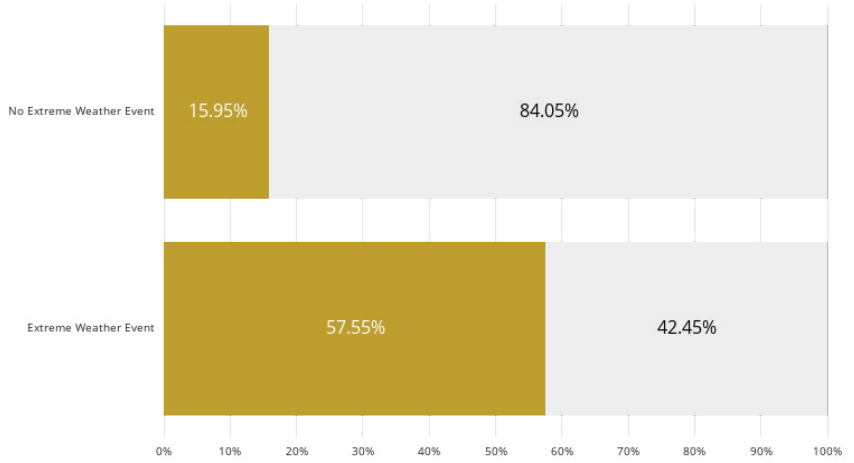
Percentage of business owners who implemented a solution to protect their business from weather-related disasters

Previous experiences with extreme weather events significantly increases the probability of a businesses implementing a solution (P<0.05)



Percentage of business owners who implemented a solution to protect themselves/family from weather-related disasters

Previous experiences with extreme weather events significantly increases the probability of a owners implementing a solution to protect themselves personally (P<0.05)

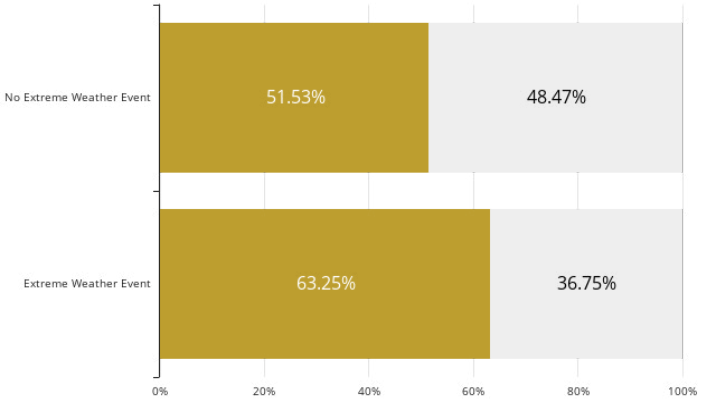


Business solutions implemented to protect against climate change

Bars on windows
Business insurance
But it is not possible to go for permanent settlement because Bangladesh is a Disaster-prone country and if we are planning to go for parmanent solution then we need our own land in a safe place and construct our own slandered production house/shade maintaining high quality ar
Coolers at work place
Cover pipes in freeze
Fixed strong walls and roof though not 100 percent complete
Flood insurance
Food and essential support to artisan families
Got a larger oxygen tank. Got in contact eith other metalsmiths to purchase in bulk supplies to have more supplies at a better price. Got a rolling mill to fabricate my own wire.
Have purchased fire extinguishers as our working area is well structured and well ventilated..
Homeowner & flood insurance
I don't store anything in the basement now
Increased my business insurance policy
Installed sump pump, and got solar powered batteries for machinery
Insurance
Insurance, weather-related work policies
Leased a new workspace on a second floor

Implemented any solutions to minimize business impact on environment and/or climate

Previous experiences with extreme weather events significantly increase the probability of an owner implementing a solution (P<0.05)

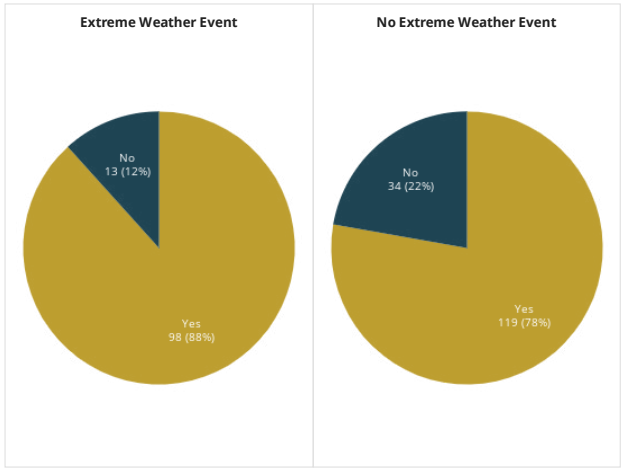


Artisan business leaders have taken many different creative approaches to reduce their environmental footprint

All our products, process are environment friendly. Our products are natural dyed and organic which reduces the carbon footprint and water footprint
All packing materials are environmentally friendly or recycled.
Almost all our products are made with surplus fabrics or waste cut pieces from. industry
Avoiding use of harsh chemicals in the making process, using recycled materials in my work, recycling all metal scrap and dust produced from making, working fr
Being substainable, recycling
Better packaging solutions
Better packing options
Buying domestically and sourcing sustainably
Choosing natural materials,
Clean ingredients, only recyclable, reusable and compostable packaging
DEW Crafts is a Certified Guaranteed Fair Trade Social Enterprise, so we are very much concern on environmental protection and promotion because we are proc
ETP for water used in dyeing
Eco friendly products and packaging.
Eco-friendly packaging.
Emphasizing local sourcing for raw material and packaging. And encouraging the embracing of the traditional wisdom that works in tandem with seasons and nat
Focus on local (US) production to eliminate carbon emissions, use of eco-friendly/water-based inks only in our screenprinting (Rainforest Alliance certified), focus
Focus on sustainable raw materials, changes in production processes, small tools, waste water treatment solutions, bio-degradable packaging

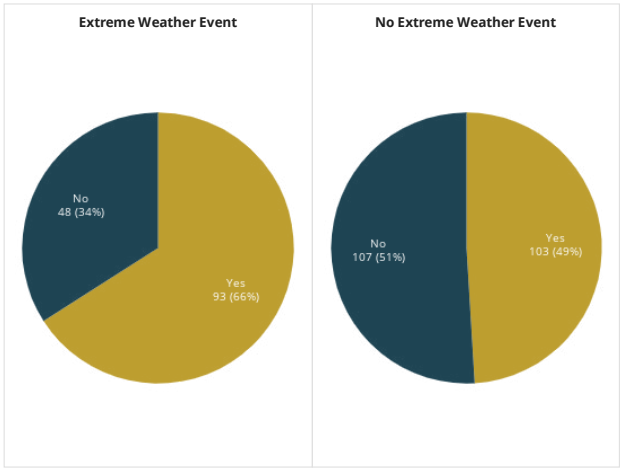
Reported worry about climate change hurting business, by previous experiences of weather event

Previous experiences with extreme weather events significantly increases the probability of a business reporting worry about climate change (P<0.05)



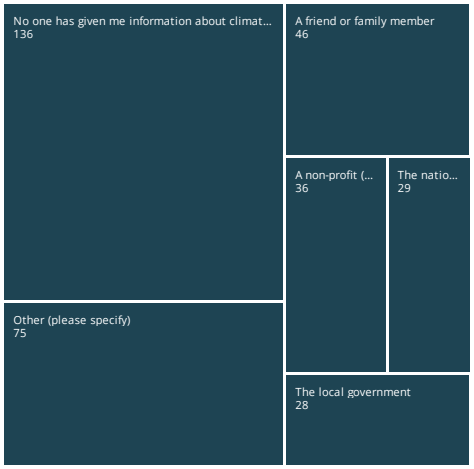
Reported understanding of climate change, by previous experiences of weather event

Previous experiences with extreme weather events significantly increases the probability of a business reporting understanding of climate change (P<0.05)



Information sources for climate change

There is a significant association between the primary information source and reported understanding of climate change (p<0.05)

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