



# Exposed

Social vulnerability and climate change  
in the US Southeast



**Port Sulphur, LA:** As of May 11, 2009—nearly four years after Hurricane Katrina—approximately 2,000 families in the New Orleans metropolitan area still lived in FEMA trailers, including these in Port Sulphur, LA. Eighty percent of those still in trailers were homeowners unable to return to their storm-damaged houses.

*Photo by Mario Tama / Getty Images*

The effects of natural disasters and climate change vary widely by state, county, and community. Although social variables such as income and age do not determine who will be hit by a natural disaster, they do determine a population's ability to prepare, respond, and recover when disaster does strike.



# Introduction

“It’s the poorest of the poor in the world, and this includes poor people even in prosperous societies, who are going to be the worst hit.”

Rajendra Pachauri, chairman of the Intergovernmental Panel on Climate Change

The effects of natural disasters and climate change vary widely. And while social variables such as income and age do not determine who will be hit by a natural disaster, they do determine a population’s ability to prepare, respond, and recover when disaster does strike.

Historically, studies about climate hazards and social vulnerability have been conducted in separate silos. The Social Vulnerability Index (SoVI) is the first study of its kind to examine both the potential impact of natural hazards and which populations are most likely to be negatively affected. The application of SoVI to climate change-related hazards was developed by Dr. Susan Cutter and Dr. Christopher Emrich at the Hazards and Vulnerability Research Institute at the University of South Carolina. The SoVI statistically examines the underlying social and demographic characteristics of the population and how they impact certain segments of the population in disabling ways when it comes to climate change-related hazards.

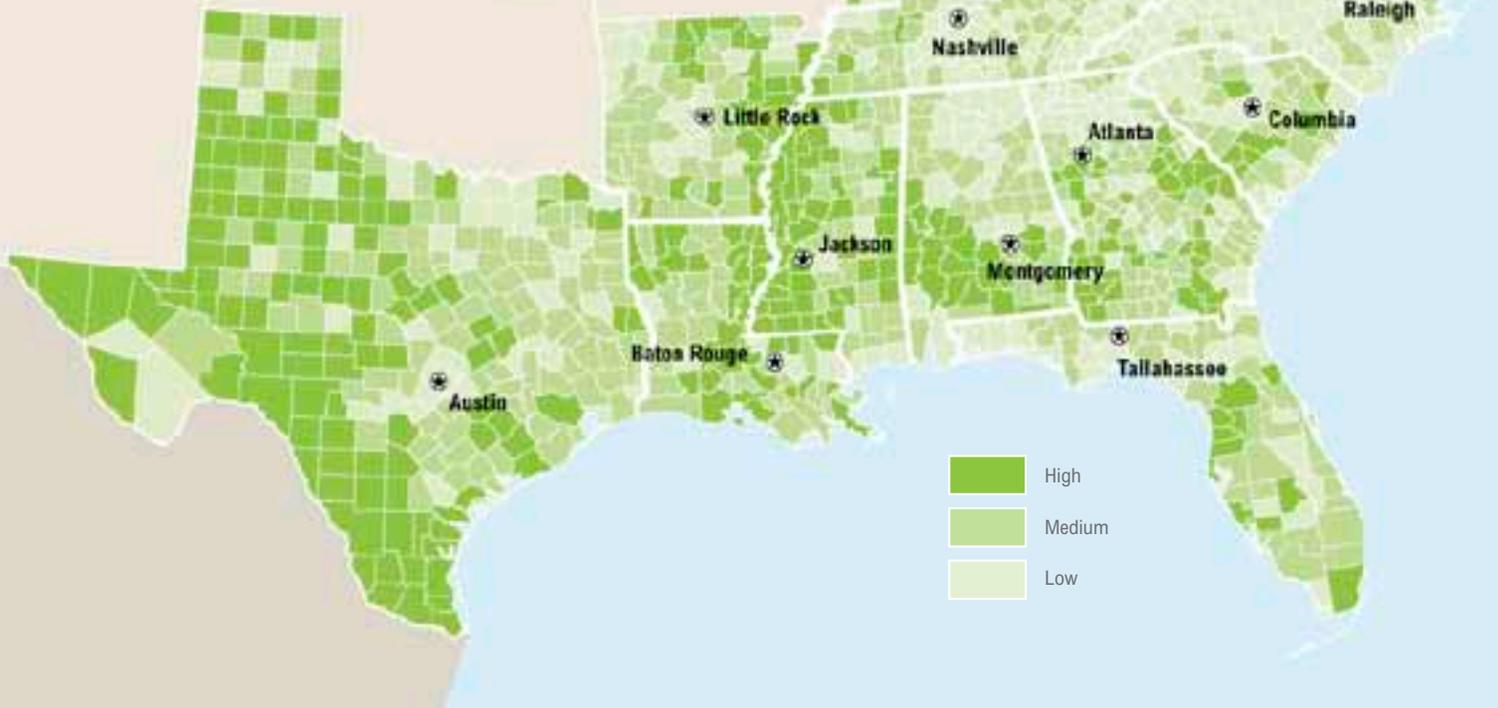
This research, commissioned by Oxfam America, includes a series of layered maps that depict social and climate change-related hazard vulnerability. The maps assist in identifying hotspots in the US Southeast, which are at significant risk in the face of four particular climate change-related hazards: drought, flooding, hurricane force winds, and sea-level rise. The specific region of focus is the 13-state region of the US Southeast: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. Roughly 80 percent of all US counties that experience persistent poverty (defined as a county in which at least 20 percent of the population experiences poverty for three decades or more) lie in this region.

## What is the Social Vulnerability Index?

The Social Vulnerability Index is a quantitative measure of social vulnerability to environmental hazards. Originally developed in 2003, SoVI provides a way to measure the difference in social vulnerability across states and regions within states. The SoVI uses 32 variables to define the multiple dimensions of vulnerability—called components—and then adds them up to arrive at a single reference point to measure vulnerability. Eight components account for most of the variation in social vulnerability in the study: wealth, age, race, gender, ethnicity, rural farm populations, special needs populations, and employment status (Table 1).

► **Map:** Driven by a combination of factors including rural poverty, race, gender, and age, social vulnerability within the US Southeast is concentrated in three primary areas: the traditional cotton belt, the Mississippi River Delta region, and west Texas.

## Social vulnerability in the US Southeast



**Table 1. Social vulnerability index—southeast (SoVI-SE)**

Component	Variable	% variance explained	Most influential variable/correlation
1	Wealth	23.09	Per capita income (0.93), median rent (0.90), % poverty (-0.67)
2	Age	14.64	People per housing unit (0.84), pop over 65 (-0.88), median age (-0.89)
3	Race	10.79	% African American (0.87), % female headed household (0.84)
4	Ethnicity	6.56	% Hispanic (0.72)
5	Rural	5.1	% employed in natural resources extraction (0.55), % rural farm residents (0.50)
6	Special needs populations	5.0	Hospitals per capita (0.70); Nursing home residents (0.62)
7	Gender	4.6	% females (0.91)
8	Employment	4.6	% employed in utilities, transportation, or communications (0.73)
<b>Total Variance Explained</b>		<b>74.40*</b>	

\*Eight distinct social indicators explain 74% of the variance in the data for social vulnerability to climate hazards. These components include wealth, age, race and gender, ethnicity, rural farm populations, special needs populations, and employment.

Equation for SoVI-SE = (-) Factor 1 + (||) Factor 2 + Factor 3 + Factor 4 + Factor 5 + Factor 6 + Factor 7 + (-)Factor 8



Three months after Hurricane Katrina, a destroyed house in New Orleans' Ninth Ward bears the spraypaint used to mark dwellings in the immediate aftermath of the storm.

Photo by David Howells / Corbis

# Climate hazards

Across the Southeast, four climate hazards in particular threaten socially vulnerable populations: drought, hurricane force winds, flooding, and sea-level rise.<sup>2</sup> Climate change and its associated hazards could exacerbate traditional risks long faced by those living in the region (Table 2).

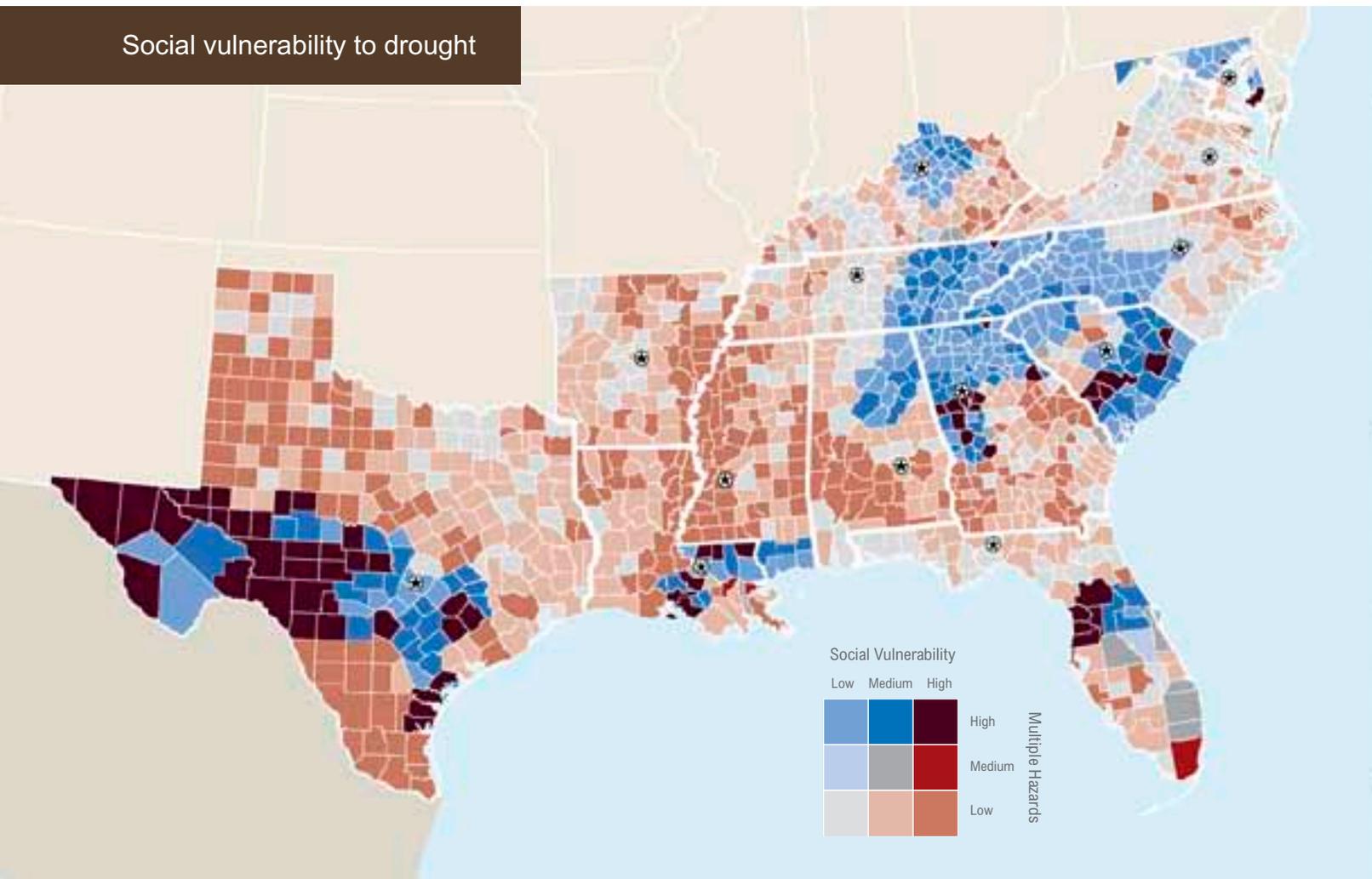
Climate hazard	Current and projected impacts in the Southeast <sup>3</sup>
<b>Drought</b>	Decreased water availability owing to increased temperature, longer periods of time between rainfall events, and increase in water demand are all very likely to affect many sectors of southeast economy.
<b>Hurricane force winds</b>	The destructive potential of Atlantic hurricanes has increased since 1970, correlated with an increase in sea surface temperature.
<b>Sea-level rise</b>	An increase in average sea level of up to two feet or more and the likelihood of increased hurricane intensity and associated storm surge are likely to be among the most costly consequences of climate change for this region.
<b>Flooding</b>	More intense rainfall can lead to severe floods that cause significant deadly impacts regionally.

**Table 2. Climate hazards and impacts**

# Drought

Drought exposure is highest in western Texas, followed by Florida, South Carolina, and western Georgia. Almost three-quarters of South Carolina experienced extreme drought during the past three decades. While communities in western Texas have long adapted to periods of drought, rural farming communities in southwestern South Carolina have had less exposure to such conditions so they've had harder times bouncing back when droughts happen.

## Social vulnerability to drought





**Photo:** Texas farmer David Stelzel stands over his cotton field in Wharton County, revealing soil cracked by a July 1998 drought that Stelzel called the worst he had seen in 25 years.

*Photo by Paul S. Howell / Getty Images*

**Map:** More than one quarter of the US Southeast lies within a drought zone. Within that area the most socially vulnerable regions are in west Texas, western Georgia, South Carolina, and central Florida.

## Community case study | Drought

In Rock Springs, South Carolina, fall 2007 is remembered as the time that the wells ran dry. The time that parents had to haul home bottled water by the caseload so children could have something to drink. The time that the church ran out of water to perform baptisms.

That fall, record drought coupled with economic factors put Rock Springs's mostly low- and middle-income families at risk when the entire community's water supply dried up.

Tough economic times meant that the community just didn't have the funds—over half a million dollars—to pay for municipal water service when their private wells ran out of water. The results were “devastating,” Max Mintz, a member of the town's water committee, told a local TV station. “I just can't begin to describe how bad it is in some of these homes,” he said.

Throughout the Southeast, the summer of 2007 had been exceptionally dry. And when the hurricane season failed to bring the heavy rainstorms that usually replenished local reservoirs, 26 percent of the region found itself in the grip of an “exceptional” drought—the National Weather Service's most severe category.

“The vulnerability in the Southeast has changed,” Michael J. Hayes, director of the National Drought Mitigation Center, told *The New York Times*. “Population shifts, increased competition and demand for water ... that's made this drought worse than it might have been.” In Georgia, conditions were so bad that they threatened even the water supply of major cities like Atlanta.

But it was small towns, like Rock Springs, and the people living in such areas that were often most vulnerable. The drought led to an estimated \$1.3 billion worth of lost crops.

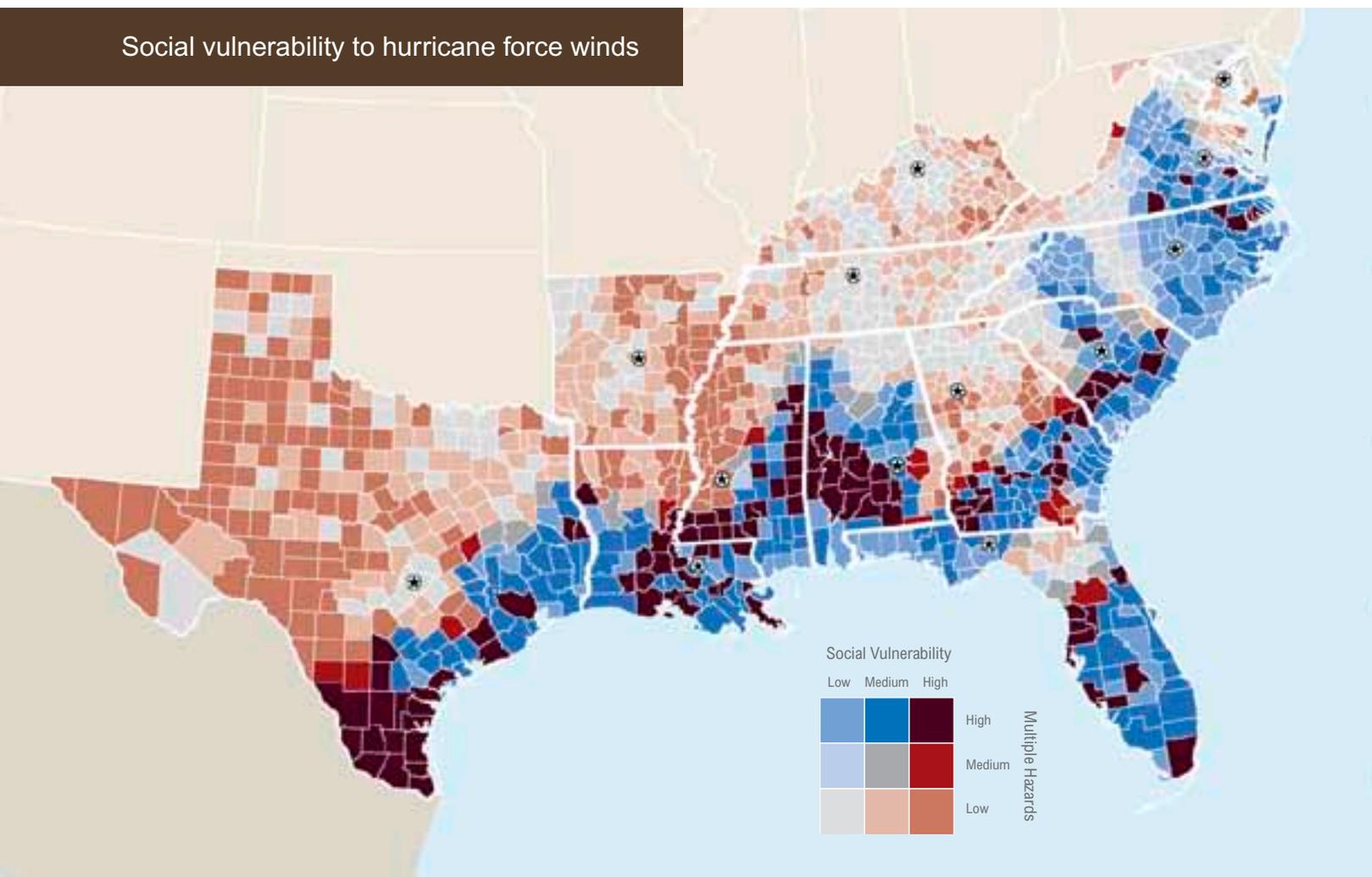
“I'm 64 years old. The conditions are worse now than I've ever seen,” resident Alvin Wiley told National Public Radio. “I have a little farm about 100 acres, and we got two streams that come through it ... But there's no water running through either stream now.”

*Sources for this case study can be found on page 20.*

# Hurricane force winds

The pattern of hurricane winds clearly demonstrates the nature of coastal exposure stretching from south Texas to the Delmarva Peninsula in Maryland, and graphically depicts the US hurricane coasts. Nearly 38 percent of the land area in the region is within the hurricane wind zone. Yet there are a few interesting findings. First, the big bend region of Florida is noticeable by the relative absence of hurricane winds. The second finding is the penetration inland of hurricane force winds, hundreds of miles inland, well beyond the coastal counties. This is especially significant in South Carolina (Hurricane Hugo in 1989), Alabama and Mississippi (Hurricane Camille in 1969, Hurricane Frederick in 1979, and Hurricane Katrina in 2005), and northern Virginia (Hurricane Isabel in 2003).

## Social vulnerability to hurricane force winds





**Photo:** Strong winds from Hurricane Frances lash a seaside trailer in Jensen Beach, FL, on September 4, 2004.

*Photo by Chris Hondros / Getty Images*

**Map:** Nearly 38 percent of the land area in the US Southeast is within a hurricane wind zone, yet it is the less wealthy inland areas that are the most socially vulnerable.

## Community case study | Hurricane force winds

Sharon Hanshaw was out of town visiting family on August 29, 2005, when Katrina's winds drove the Gulf of Mexico into her East Biloxi, MS, neighborhood. Thirteen feet of water surged through the streets that day, filling Hanshaw's house with mud, burying her belongings, tearing the bumper off her car. The waters swept inland to downtown Biloxi, flooding the hairdressing business she ran for 21 years.

But for Hanshaw and her neighbors, those losses were just the beginning. Although the US government allocated hundreds of millions of dollars for Gulf Coast recovery, somehow those funds never reached East Biloxi's mostly low- and middle-income residents. Meanwhile, the city's beachfront casinos and wealthier neighborhoods began rebuilding soon after the waters receded.

Maybe the recovery would just take time. But fast-forward three years: Many houses in this once-vibrant neighborhood still stood abandoned, their boarded-up windows turning a blank face to the street. Some damaged homes—like Hanshaw's—were razed after the storm, leaving behind only vacant lots. Others were flanked by boxy white trailers, where families live cramped together waiting for the government grants, insurance settlements, or other resources that had been promised to them for rebuilding.

Those who lack homes face other obstacles. Rents have nearly doubled in the years since the storm, and good jobs are hard to come by, so many displaced residents haven't been able to move back home.

"We need affordable housing—not projects, but homes that people can pay for on a living wage in Mississippi," says Hanshaw. "But the message right now is, 'if you're not rich, get back.'"

The confluence of economic vulnerability and unequal recovery is not lost on Hanshaw, so she and others have taken matters into their own hands. They've formed Coastal Women for Change (CWC), a grassroots group working to give women, people of color, and low-income residents a voice in the Gulf Coast recovery process at the local, state, and federal levels.

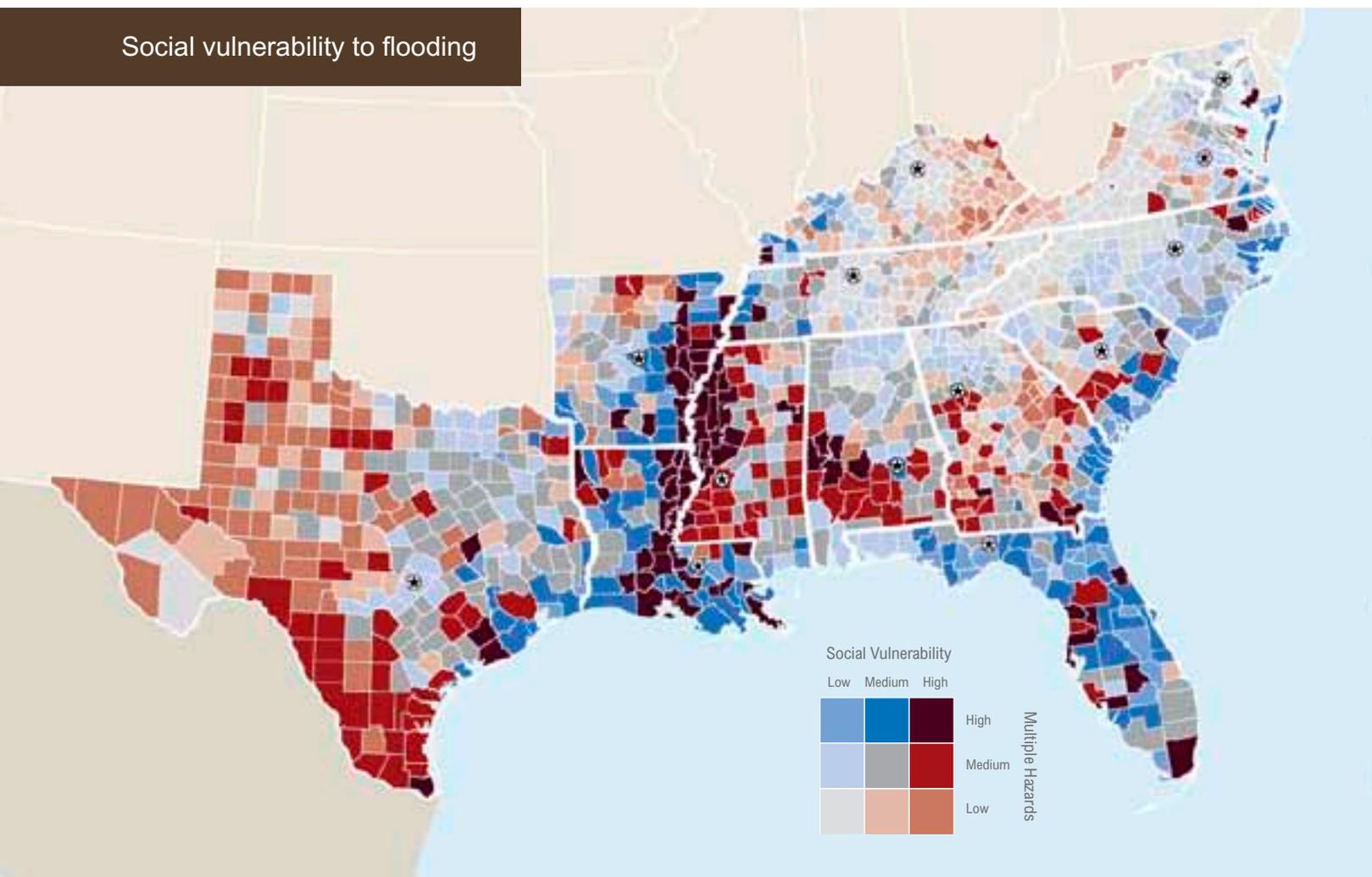
"This is our community," says Hanshaw. "We want it back the way it was—or better."

*Sources for this case study can be found on page 20.*

# Flooding

There is a distinctive regional pattern with elevated exposure to flooding occurring along the Mississippi River and its tributaries, and along many stretches of the hurricane coast from south Texas to North Carolina. Since 2000, there have been more than 900 flood events in Mississippi, resulting in \$410 million in property damage and \$7.5 million in crop damage. Sharkey County, MS not only has the highest level of social vulnerability in the state, 79 percent of the population falls within a 100-year floodplain.

Social vulnerability to flooding





**Photo:** A view of a local car dealership reflects the severity of flooding in Lithia Springs, GA, following Hurricane Dennis in July 2005.

*Photo by Tami Chappell / Reuters / Corbis*

**Map:** Social vulnerability to flood hazard is concentrated in the lower Mississippi Valley, southwestern Alabama and in coastal counties in Texas, Florida and Maryland. While other areas are at risk of flooding, levels of social vulnerability are elevated in these regions.

## Community case study | Flooding

Founded by freed slaves just after the Civil War, Princeville, NC, was the first US town incorporated and governed by African-Americans—many of whose descendents still live there today. But “when a group of newly freed slaves here wanted to form a community of their own ... they had to take whatever land they could get,” writes The New York Times’s Emily Yellin. “In 1865, that was a snake-infested, mosquito-ridden swamp in a flood plain. It was land that the white people in nearby Tarboro, on the northern side of the river, did not want.”

Turns out, some things don’t change.

When the muddy waters of the Tar River coursed through eastern North Carolina on September 16, 1999, it was Princeville that bore the brunt of the flooding. All told, the rising waters killed six of the town’s residents and destroyed or damaged 1,183 houses, apartments, and mobile homes.

For Linda Whitest, the floods destroyed not only her own year-old house on Walston Street, but her grandmother’s house, where she grew up, and her mother’s house as well. All three lived on the street named for Frank Walston, the son of slaves and Whitest’s great-grandfather.

What caused the flood? A storm—and its aftermath.

On September 15, Hurricane Floyd drenched eastern North Carolina with as much as 20 inches of rain during a 12-hour period. But for Princeville, the worst came the next day. Under clear skies, the saturated Tar River overflowed its banks, rising 24 feet higher than previous flood levels. According to NASA’s Earth Observatory, the surging waters “all but erased the town of Princeville.”

Still, not long after the floods, the town’s leaders voted against a federal buyout that would require residents to relocate, opting instead to stay and rebuild their community with stronger and more modern buildings. Today, on the tenth anniversary of the flooding, the recovery process is still underway.

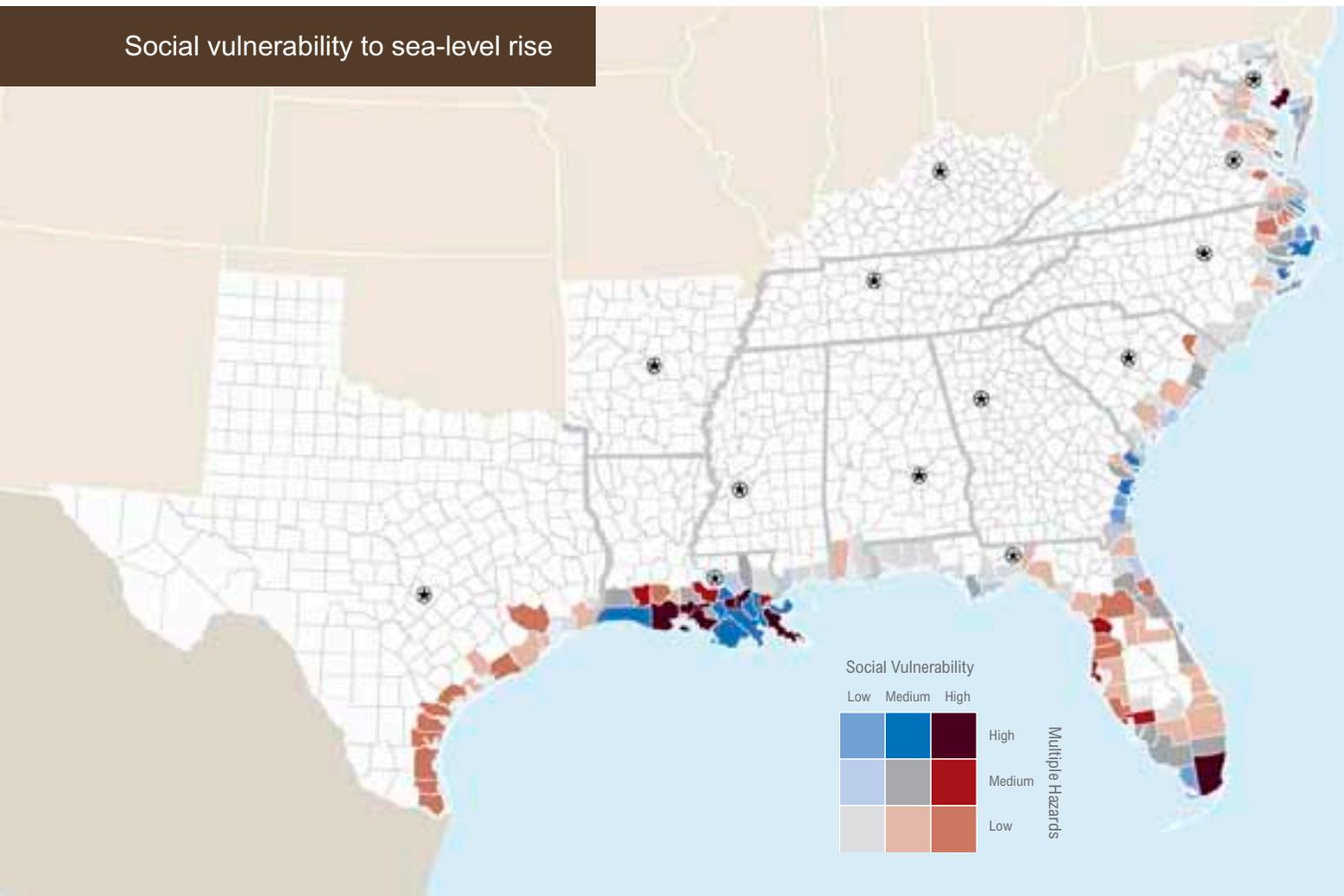
“A month ago I said there is no way I’m going back, I was so devastated,” Whitest told The Times in November 1999. “But then I thought about it, and I said, why should I give up what my ancestors worked so hard to leave us?”

*Sources for this case study can be found on page 20.*

# Sea-level rise

Exposure to land inundation associated with sea-level rise varies greatly among the 184 coastal counties in the Southeast, stretching from south Texas to the Chesapeake. Of the 115,000 square miles of land area subject to this hazard, nearly 15 percent, or 17,250 square miles, face elevated risk levels. The coastal counties with the greatest potential for inundation based on current sea-level rise projections are in southern Louisiana, where 48 percent of those counties could be inundated. There are other states (Georgia: 25 percent, and North Carolina: 20 percent) with significant coastal land areas at risk to sea-level rise.

## Social vulnerability to sea-level rise





**Photo:** Sea-level rise will affect US coastal communities to varying degrees, with the most severe impacts projected along the Gulf of Mexico and Atlantic coastlines.

*Photo by Mark Lewis / Getty Images*

**Map:** Sea-level rise is projected to affect 15 percent of the US Southeast land area significantly. Coupled with social vulnerability, the bayou parishes in Louisiana are at the highest risk.

## Community case study | Sea-level rise

Louisiana is disappearing. Or at least that's the conclusion of researchers at Louisiana State University, who in 2005 found that the state is experiencing the highest rate of coastal erosion in the US: about 100 yards of land, or one football field, every half hour. And for United Houma Nation—the state's largest American Indian group, with more than 17,000 members—the traditions and safety of their community are disappearing along with the coastline.

For centuries, the Houma have fished the interlaced bayous and inlets of southeastern Louisiana, and today many members earn a living as small-scale commercial fishermen. Recently, though, rising costs and smaller catches have made it harder for them to eke out a decent income. As sea levels rise, salt water creeps in to freshwater areas, further jeopardizing their fishing grounds. "It's impossible to earn a living through a traditional lifestyle anymore. My granddad and my dad would not encourage their grandsons to be fishers," said Principal Chief Brenda Dardar-Robichaux. "The waters are not the same."

Among the rapidly disappearing lands are natural defenses that once kept people safe: the coastal islands and marshlands that absorbed some of the energy from ocean storms. "Before, people could prepare," said Houma Nation member Patty Whitney. "They knew how to protect themselves from the furor of nature because nature itself provided protection."

Whitney works for Bayou Interfaith Shared Community Organizing, Inc., a local group that builds hurricane preparedness and assists people with storm recovery. Approximately 7,000 Houma were directly affected by Hurricane Katrina in 2005 and Hurricane Ike in 2008.

Leaders like Whitney and Dardar-Robichaux believe that education holds the key to the Houma's future, and are working to raise awareness about coastal erosion both inside and outside their community. "People need to be educated. Not just government, people in power, [but] people in communities like myself," said Dardar-Robichaux. "We need to start with our youth."

*Sources for this case study can be found on page 20.*

# Rural and urban communities

Across the Southeast, the four main risk factors associated with climate change (drought, flooding, hurricane force winds, and sea-level rise) are experienced in distinctly different ways in rural counties and urban centers. In combination with other variables that constitute the Social Vulnerability Index, the locations of these populations play a critical role in determining overall vulnerability.

## Rural counties

Southeastern rural counties are composed mostly of populations disadvantaged by poverty, race, ethnicity, age, and gender. The factors of social vulnerability found in rural counties are more homogenous and reflect clear indicators through socio-economic status in race, ethnicity, age, and gender. Combined with potential climate impacts, a picture emerges of areas of extreme risk that demand proactive attention. For example, Iberia, LA, has some of the highest hazard exposures—76.8 percent of land in a flood zone, 78.9 percent in the extreme drought zone, 56 percent in a sea-level rise zone, and all within a hurricane wind zone—and some of the highest elevated social vulnerability scores, governed largely by its growing Latino populations with young children, racial inequalities, and employment dependencies on extractive industries like fishing, oil, and gas. Given Iberia's propensity to climate disaster and high social vulnerability, most of the families there will be negatively affected if any one of the climate risks occurs. Local government early warning systems (if existent), face challenges in reaching all Latino families—some are undocumented and either may avoid government evacuations for fear of deportation, or may be unable to read emergency materials written in English.



## Urban communities

Unlike the more homogenized demographics of rural counties, densely populated urban communities contain polar extremes of wealth. In some urban coastal counties, social vulnerability levels are varied and often masked by markers of wealth, such as in Hilton Head, SC. But in Cameron County, TX, social vulnerabilities of almost every stripe are pronounced—a clear indicator that the county is more socially vulnerable than other, wealthier areas along the coast. In Miami-Dade County, FL, vulnerability is reflected in the prevalence of households headed by women earning low wages, and by the number of large communities of immigrants, many of whom live in relative poverty. In terms of hazard exposure, over half of the county lies within a flood zone, over 40 percent is in an extreme drought zone, 38 percent is at sea-level rise risk, and all of it is in a hurricane wind hazard zone. Yet, Miami is not widely seen as an area of high vulnerability because—like Hilton Head—people envision sky-rise hotels and condos, as spotted along South Beach. Still, areas like Little Haiti, home to many poor immigrant families, are at risk of losing property, health, and lives if a major hurricane strikes.



Farmer David Stelzel stands in his fields in Texas amid drought-damaged sorghum plants. In July 1998, Stelzel estimated that he lost about half of his normal harvest due to drought.

*Photo by Paul S. Howell | Getty Images*

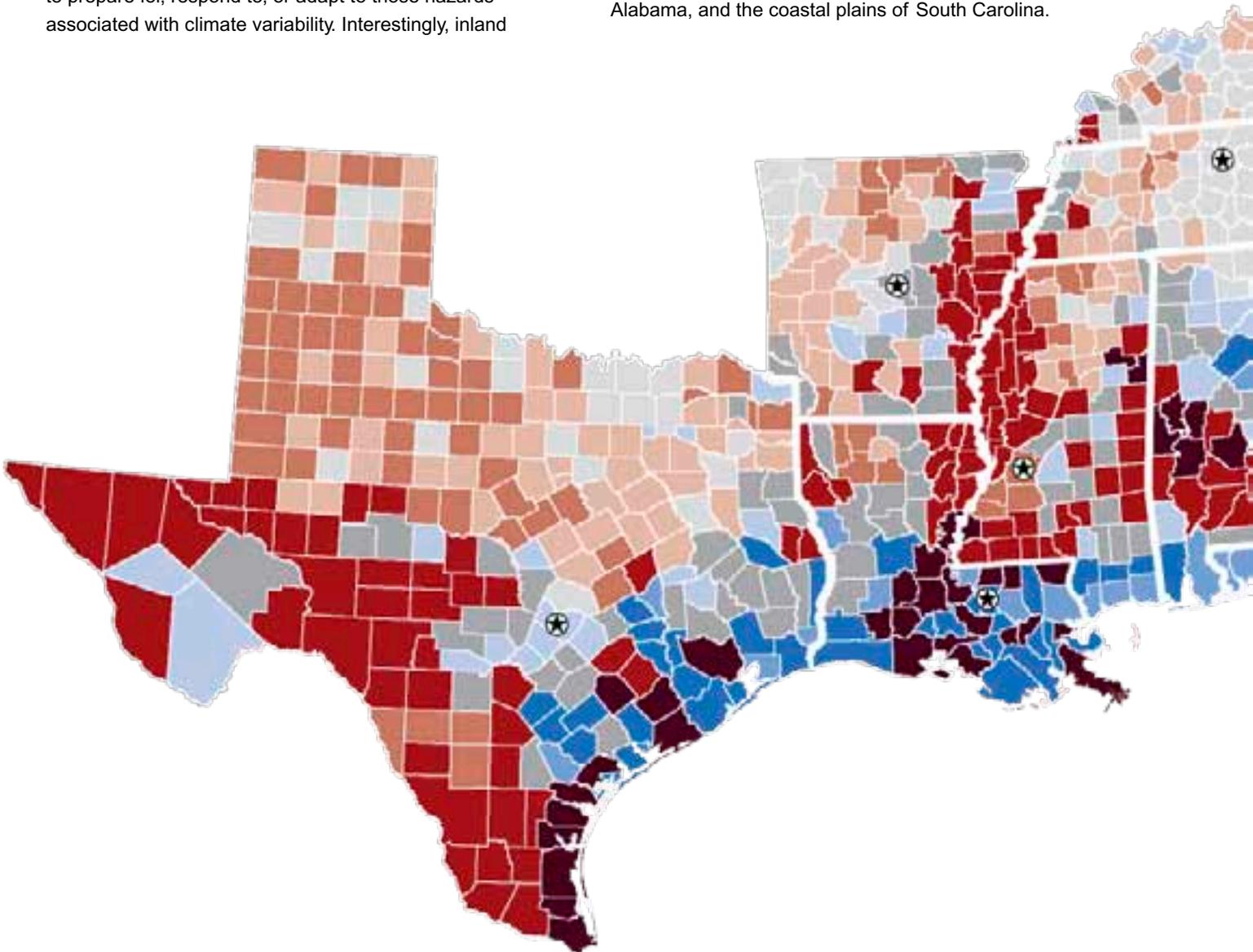
# Regional patterns

## Coastal communities

Facing compounded risk are coastal communities, which face elevated levels of exposure to climate variability regardless of their status as an urban or rural community. Across the region, from the southern tip of Texas, along the Gulf of Mexico to the southern tip of the Florida Keys and then northward from south Florida to the Delmarva Peninsula and Maryland's Eastern Shore, coastal communities exhibit an elevated risk level unlike their inland counterparts.

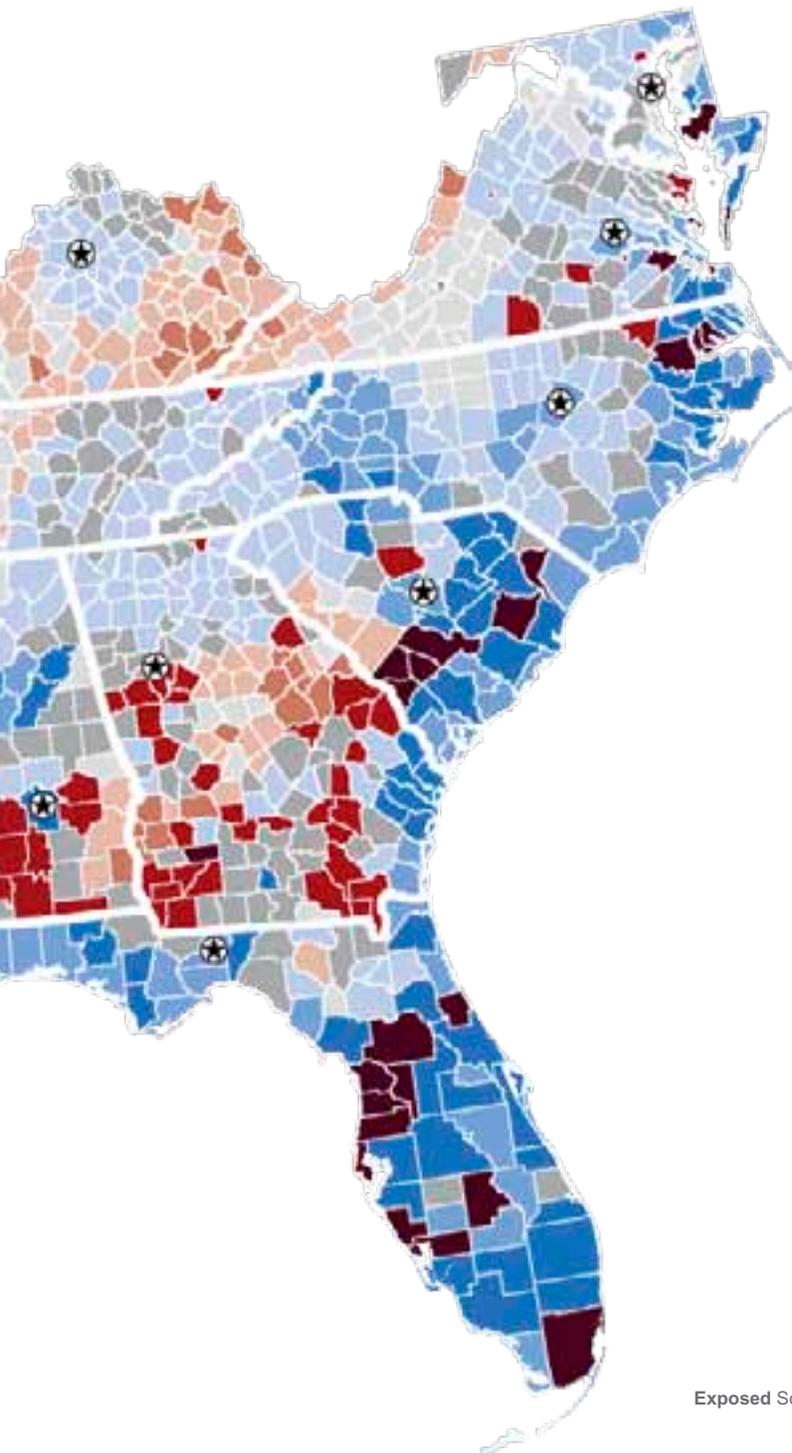
Despite the elevated levels of exposure to these hazards in the coastal counties, not all of them have the same capacity to prepare for, respond to, or adapt to those hazards associated with climate variability. Interestingly, inland

counties exhibit the highest levels of social vulnerability to hurricane force winds with the highest concentrations of vulnerability in inland Louisiana and Mississippi. Communities along the south Texas border are also highly vulnerable. Inland regions have higher vulnerability to hurricane winds because communities located directly on the coast tend to be wealthier and have the capacity to prepare for and respond to hurricane conditions. Coastal counties suffering from both high exposure and high social vulnerability include most of coastal south Texas, portions of south Louisiana in the Atchafalaya basin, western Florida north of Tampa, western Alabama, and the coastal plains of South Carolina.



## Texas

Although central and west Texas are both characterized as semiarid regions, they annually average more than 10 months in extreme drought. In Texas, elevated exposure to extreme drought combined with a high level of social vulnerability largely owing to ethnicity, poverty, young families, and immigrant populations produce the counties in the highest category.



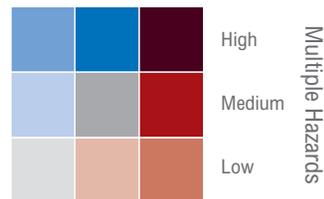
## The Mississippi Delta

Social vulnerability to flooding is concentrated in the lower Mississippi Valley, in southwestern Alabama, and in a few coastal counties in Texas, Florida, and Maryland. For example, the concentration of vulnerability in the Mississippi River Delta region is a product of high levels of social vulnerability and large percentages of land in what is commonly called the 100-year flood zone. For example, in Orleans Parish, 88 percent of the land area lies within this special flood hazard area. In combination with high levels of social vulnerability—race and gender, ethnicity (Hispanics), and special needs populations—this parish ranks among the most vulnerable in the nation. In Sharkey County, MS, 79 percent of the county lies within the 100-year flood zone. Coupled with equally high levels of social vulnerability, in this case attributed to race, gender, lack of wealth, and age, Sharkey County is also among the counties in the South most vulnerable to flood hazards.

## Social vulnerability to multiple hazards

### Social Vulnerability

Low Medium High



Though much of the US Southeast is at risk to climate hazards, social vulnerability risk factors such as race, gender, and age concentrate social vulnerability into three distinct areas: coastal communities, west Texas, and the Mississippi River Delta.

# Summary

The Social Vulnerability Index ... is a first step toward developing hazard reduction strategies and improving resilience for some of the nation's most disadvantaged areas.

Hurricanes, droughts, flooding, and sea-level rise have long posed significant threats to those living in at-risk areas. At the same time, policymakers, emergency management officials, and community leaders have known that there are geographic regions in the US that are particularly vulnerable to these events and that certain segments of the population are better able to respond and recover.

The Social Vulnerability Index combines this geographic and social vulnerability to provide a scientific basis for understanding the vulnerability of populations to climate change. It is a first step toward developing hazard reduction strategies and improving resilience for some of the nation's most disadvantaged areas.

## Recommendations

Your elected government officials need to hear from you. Vulnerable communities will suffer disproportionately from the impacts of climate change-related impacts and disasters. Here are ways that local, state, and national policymakers can take urgent action:

- >> Pass climate change legislation that reduces greenhouse gas emissions, and includes effective and well-resourced domestic and international adaptation programs, which build the resilience of local communities.
- >> Strengthen local, state, and regional disaster preparedness and response plans by identifying and prioritizing assistance to those communities least able to cope when disaster strikes.
- >> Promote community programs like coastal restoration projects, rebuilding projects that make homes and businesses more resilient to high winds and flooding, rural and urban water efficiency projects, and early warning programs that not only provide employment opportunities, but also help to prepare and evacuate vulnerable populations during intense storms.

A photograph showing three children walking away from the camera on a gravel path in a FEMA trailer park. The child on the left is wearing a light blue polo shirt and khaki shorts. The child in the middle is wearing a light blue long-sleeved shirt and khaki pants, carrying a large orange bag and a black bag. The child on the right is wearing a dark jacket and khaki shorts, carrying a large white bag. In the background, there are several white FEMA trailers and utility poles under a clear sky.

Children in Port Sulphur, LA, walk home to a FEMA trailer park after being dropped off by their school bus on May 22, 2008. Most federal trailer parks that housed families displaced by Hurricane Katrina closed later that month. Many people were left to search for scarce rental housing in the area.

*Photo by Mario Tama / Getty Images*

# Methodology, notes, and sources

## METHODOLOGY

The hazards of drought, hurricane force winds, and floods are mapped based on past data indicating trends. Flood hazard areas were calculated using geospatial data associated with FEMA's National Flood Risk Report (FEMA 2006). Hurricane winds were determined by first obtaining the storm tracks for all hurricanes during the past 30 years (1978-2007) that either made landfall or were located within 100 miles of the US mainland, from the historical hurricane track data archive (NOAA 2007). For drought, one standard measure for measuring the duration and intensity of long-term drought is the Palmer Drought Severity Index (PDSI or PDI). For our analysis, we used values of PDSI values of -4 or below to examine counties with extreme drought conditions. The PDSI monthly means were obtained online from the NOAA Earth Systems Research Laboratory's Physical Science Division from 1978-2007 for each climate division in the study area (NOAA 2009). Sea-level rise is mapped based on future climate change projections. Sea-level rise is a nonlinear impact associated with climate change, meaning that we cannot draw assumptions on future vulnerabilities based on historic data. We were able to identify specific hazard zones based on USGS digital elevation model data and combine that information with the most recent scientific information for sea-level rise in 2100 (recent numbers suggest that sea-level rise will be greater than the IPCC projections released in 2007.<sup>1</sup>)

## NOTES

1. Report, "Rural Poverty at a Glance." United States Department of Agriculture, Economic Research Service, July 2004.
2. A climate hazard is defined as a weather-related or naturally occurring event—droughts, floods, storms, and sea-level rise—that are predicted to worsen in specific geographic regions and sub-regions owing to global average temperature rise. In some cases, the effects of global temperature rise are linear as naturally occurring events in some regions intensify, such as Atlantic hurricanes. In other cases, these effects are nonlinear, meaning that new events occur in regions due to changes in the climatic system, such as sea-level rise.
3. Report, "Global Climate Change Impacts in the United States," United States Global Change Research Program, June 2009.

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### Sea-level rise case study

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**Cover:** Volunteer firefighter Richard Creque carries jugs of water to a flooded home near Nebraska, NC, three days after Hurricane Isabel swept through the area on September 19, 2003. Local firefighters like Creque were among those who patrolled the district when 911 emergency phone services failed after the storm.

*Photo by Dave Martin / AP Photo*

While least responsible for causing climate change, poor people bear the brunt of its impacts. As an international relief and development organization that creates lasting solutions to poverty, hunger, and injustice, Oxfam America is undertaking a campaign to create equitable solutions to the crisis. We are asking that the US cut greenhouse gas emissions and provide financial assistance so that the most vulnerable communities can adapt. To learn more about social vulnerability mapping and climate change, go to [www.oxfamamerica.org/adapt](http://www.oxfamamerica.org/adapt).

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