



Intersection of Health, Climate, & Resiliency

Jasmine Mah, Michaela Marincic, Jackie Dadakis

The Energy and Health Benefits of Weatherization Readiness Work

Jasmine Mah, ACEEE

November 21, 2024



The background of the slide is a photograph of a landscape featuring several high-voltage power line towers and their associated cables stretching across the frame. The scene is set against a sky with scattered clouds, and the foreground shows a dark, silhouetted horizon line with some trees and rolling hills. The overall color palette is muted, with a dark blue overlay.

About ACEEE:

The American Council for an Energy-Efficient Economy (ACEEE), is a nonprofit research organization that develops policies to reduce energy waste and combat climate change. Its independent analysis advances investments, programs, and behaviors that use energy more effectively and help build an equitable clean energy future.

Learn more at [aceee.org](https://www.aceee.org)



Introduction

ACEEE::



Weatherization: Win-Win for Energy & Health

- Weatherization = building upgrades that can simultaneously improve energy performance and indoor comfort
- Benefits
 - Better indoor air quality
 - Reduced exposure to extreme heat and cold
 - Reduced exposure to outdoor air pollution
 - Better resilience during storms and blackouts
 - Lower energy bills and healthcare costs



Barriers to Weatherization

- Homes with significant health & safety hazards cannot receive weatherization upgrades.
- Weatherization deferral = a home that is unable to participate in a weatherization program
- Weatherization deferrals primarily impact low-and-moderate income (LMI) households.

Green & Healthy Homes Initiative (GHHI) – Maryland Program

- Serves homes that would otherwise be deferred from weatherization
- Provides home repairs, weatherization, appliance electrification, and solar installation
- Improved health outcomes among residents with asthma
 - 12 months after retrofits, Composite Asthma Severity Index scores have dropped by 60%

Source: ACEEE (2024)



Photo credit: Brian O'Doherty

Google & Sol Systems Partnership

- Financial partnership to support three electric co-operatives and a community-based organization in the Carolinas
- Each organization received \$200,000 for conducting critical home repairs to help LMI homes enroll in weatherization programs.
- The partnership also funds community solar energy development to support local communities.



Source: The Sol Systems Team (2023)

Year 1 Estimated Collective Impact

	Roanoke Electric Cooperative	Santee Electric Cooperative	Aiken Electric Cooperative	Sustainability Institute of South Carolina
Total homes served	25	36	27	25
Average energy reduction per home	7,672 kWh/year (30%)	4,482 kWh/year (24%)	4,111 kWh/year (17%)	5,349 kWh/year (24%)
Total energy reduction	191,812 kWh/year	161,334 kWh/year	111,007 kWh/year	140,268 kWh/year
Average cost savings per home	\$844/year	\$560/year	\$545/year	\$729/year
Total savings for the investment term	\$669,536	\$468,409	\$433,606	\$531,128
GHG reduction per home	5.4 MT CO ₂ equivalent	3.2 MT CO ₂ equivalent	2.9 MT CO ₂ equivalent	4.0 MT CO ₂ equivalent
Total GHG reduction	136 MT CO ₂ equivalent	114 MT CO ₂ equivalent	78.7 MT CO ₂ equivalent	99.4 MT CO ₂ equivalent

ACEEE's Research on Weatherization Deferrals and Weatherization Readiness Measures

ACEEE::



Survey of Weatherization Grantees and Sub-Grantees

- ACEEE distributed online surveys to states (grantees) and weatherization agencies (sub-grantees) to assess:
 - Weatherization deferral rates
 - Common reasons for deferrals
 - Average cost of weatherization readiness repairs
 - Methods for tracking deferrals
- Results represented 4,200 audits in 3 states and 9,780 audits among 63 weatherization agencies.

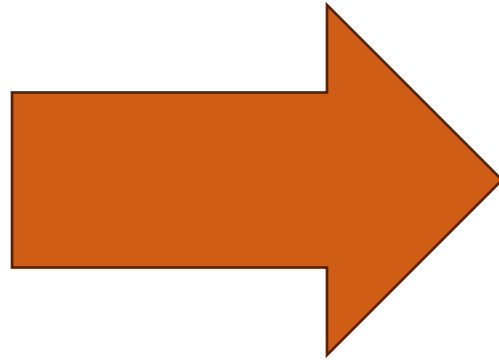
Median frequency and top 10 reasons for deferrals

- 45% - Roofing (leak repair or re-roof)
- 23% - Floor/floor framing damage
- 23% - Unsafe/inadequate electric service panel
- 15% - Foundation damage
- 15% - Pests
- 13% - Asbestos containing materials
- 11% - Unsafe wiring
- 10% - Leaking supply or drain/sewer lines
- 10% - Mold
- 10% - Standing water in crawlspace/basement; gutters/downspouts missing/compromised



Survey results informed energy modeling

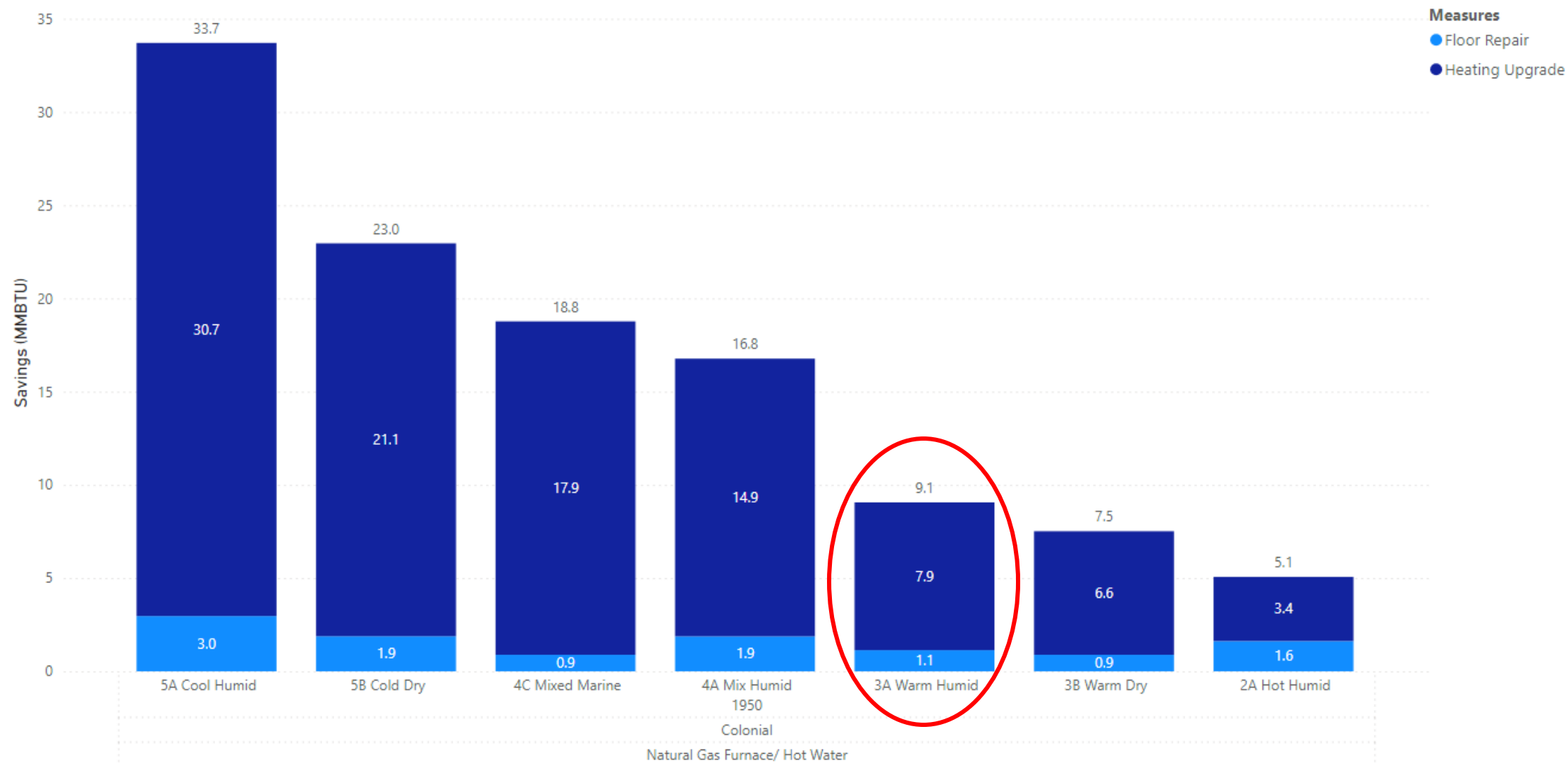
Survey



Energy modeling

Base cases (homes with pre-determined characteristics)
Climate zone data

End Use Savings



Source: Farrell et al. (2024)

Climate Zone 3A (Atlanta, GA)

- 2-story 1950s colonial home (1500 sq ft)
- Central heat pump for heating and cooling
- Weatherization-readiness measures
 - Roof replacement
 - Floor repair
 - Heat pump replacement

Annual energy savings: 13.1
MMBtus of energy (0.76 MTCO₂e)



Conclusion & Recommendations

- Weatherization readiness is an important but underutilized practice for reducing energy consumption and greenhouse gas emissions.
- Greater investment in weatherization readiness could help more low-income households experience health benefits from weatherization.
- Recommendations
 - Government/policymakers: increase funding for the Weatherization Readiness Fund (WRF) so that states can receive higher allocations
 - Weatherization providers: focus efforts on high-impact upgrades (namely heating/cooling system upgrades and roof and floor repair)

References

ACEEE (American Council for an Energy-Efficient Economy). 2024. "Leaders of the Pack 2024: Health." <https://www.aceee.org/leaders-pack-2024-health>

Farrell, Dan. 2024. "Quantifying the Benefits of Weatherization Readiness Work." Presentation at ACEEE's 2024 Summer Study in Buildings.

Farrell, Dan, Jasmine Mah, Mike Specian, and Reuven Sussman. 2024. "Estimating the Impacts of Weatherization-Readiness Programs." Washington, DC: ACEEE. (Yet to be published)

Sol Systems. 2024. "Impact Investment Report for Calendar Year 2023." Prepared for Google.

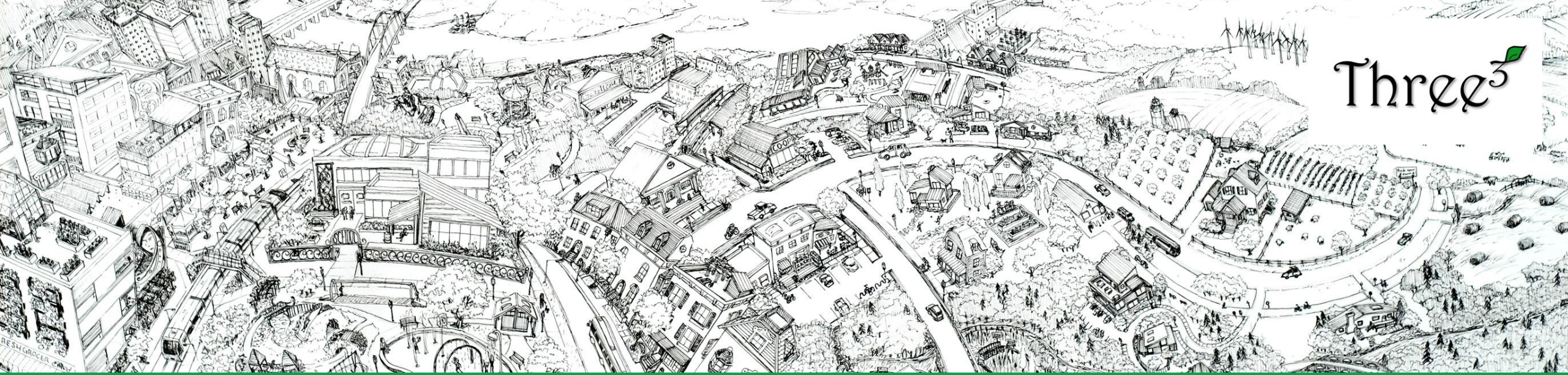
The Sol Systems Team. 2023. "Sol Systems and Google Announce Partnership to Invest in Solar Energy Projects and Community Organizations." *Sol Systems*, March 7. <https://www.solsystems.com/news/sol-systems-google-partnership/>

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ACEEE



Threex³

Benefits of Low-Income Weatherization for Health, Energy & Resilience

MICHAELA MARINCIC
SOUTHEAST ENERGY SUMMIT
21 NOVEMBER 2024

About Us



Three3 is a 501(c)3 research nonprofit dedicated to fostering equitable, sustainable futures.

We conduct innovative social science research and facilitate stakeholder workshops on complex social issues.

We are deeply embedded in community-driven initiatives that aim to advance transformative social outcomes for historically underserved individuals and populations.

OUR TEAM - THREE CUBED



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Key Terms

- **Weatherization (Wx)** – Installation of comprehensive energy efficiency measures
- **Weatherization Assistance Program (WAP)** – Federally funded weatherization program for low-income households
 - Weatherization work is *free* to participants
 - DOE provides grants to state weatherization programs
 - States provide grants to local weatherization programs
- Utility companies across the U.S. also administer weatherization programs.
- **Low-Income Home Energy Assistance Program (LIHEAP)** - U.S. Department of Health and Human Services program that provides emergency funds to low-income households that cannot afford their utility bills
 - States may use LIHEAP funding for home weatherization

How Does Weatherization Impact Health?

Weatherization Programs
Install Measures That:



Physically Change
Homes in Ways That:



Save Households
Money, and Then:

Directly Improve
Health, and Then:



Indirectly Improve
Health



Indirectly Save
Households Money

Commonly installed weatherization measures include:

- 1- air sealing;
- 2- insulation;
- 3- furnace, refrigerator, and water heater repair/replacement;
- 4- water heater adjustments; and,
- 5- furnace and dryer vent cleaning.

Common ways households save money include:

- 1- energy costs;
- 2- water costs; and,
- 3- reduced costs for utility disconnections and reconnections.

Common ways saving money improves health include:

- 1- increased ability to afford food and prescriptions; and,
- 2- reduced need for pregnant women to face heat or eat decisions.

Common physical changes include:

- 1- reduced allergens and pests;
- 2- improved thermal performance;
- 3- reduced mold and mildew; and
- 4- increased noise insulation.

Common health improvements include:

- 1- reduced asthma symptoms;
- 2- reduced thermal stress;
- 3- fewer colds and flu;
- 4- reduced poor mental health days; and,
- 5- reduced # days of poor rest/sleep.

Common ways that health improvements indirectly save money include:

- 1- reduced missed days of work from being sick or having a household member being sick (results in less lost income); and,
- 2- reduced out-of-pocket expenses incurred from illnesses.

Other thoughts:

- 1- households in better financial condition may be able to forego predatory loans, which further decreases financial strains; and,
- 2- improvements in health and finances may lead to improved mental health, which in turn may lead to further health improvements.

Additional Weatherization Impacts

Energy

- Reduced energy consumption
- Lowered energy costs
- Less demand on energy grid, including during peaks

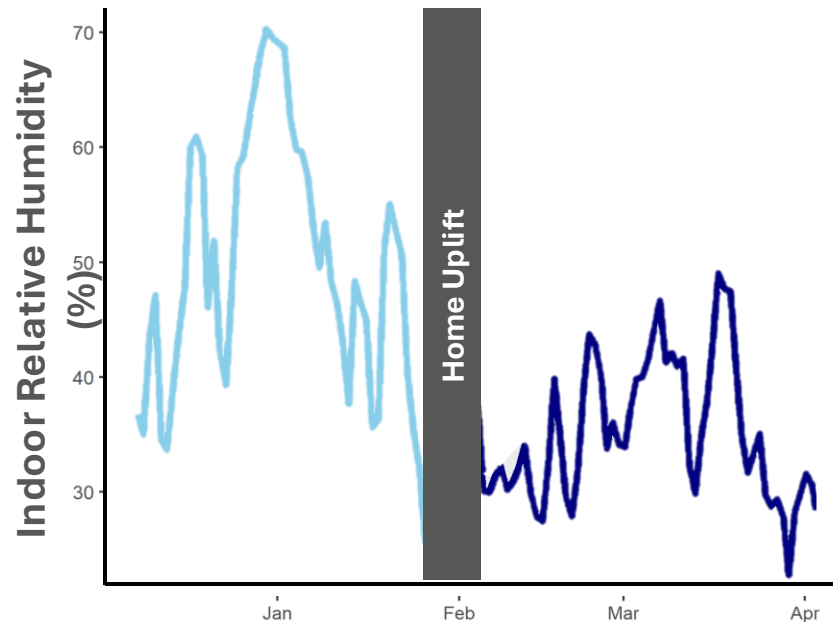
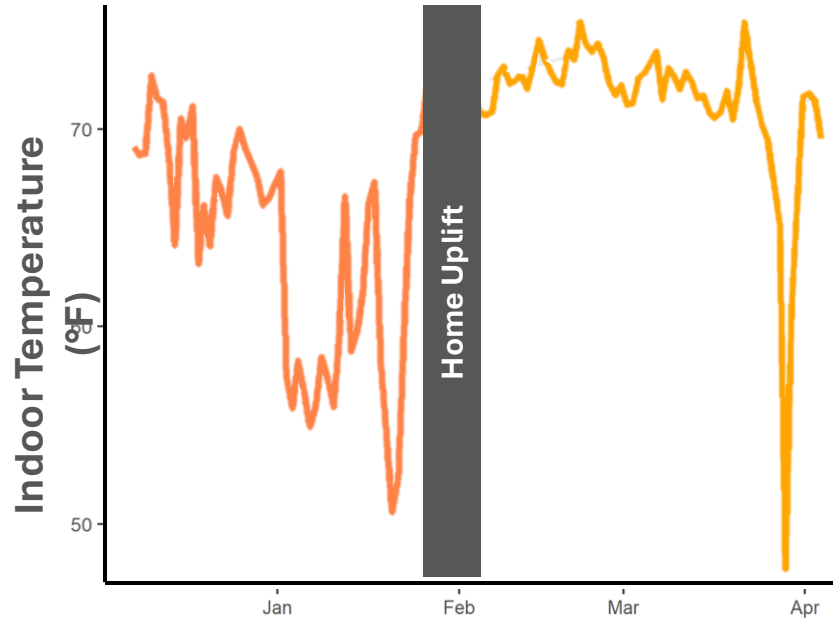
Society

- Reduced GHG emissions and other air pollutants
- Local job creation
- Lowered water consumption
- Increased property values

Household

- Improved comfort
- More affordable utility bills
- Fewer tradeoffs between buying food and paying utility bills
- Increased life satisfaction
- Fewer utility disconnections

Weatherization & Resilience

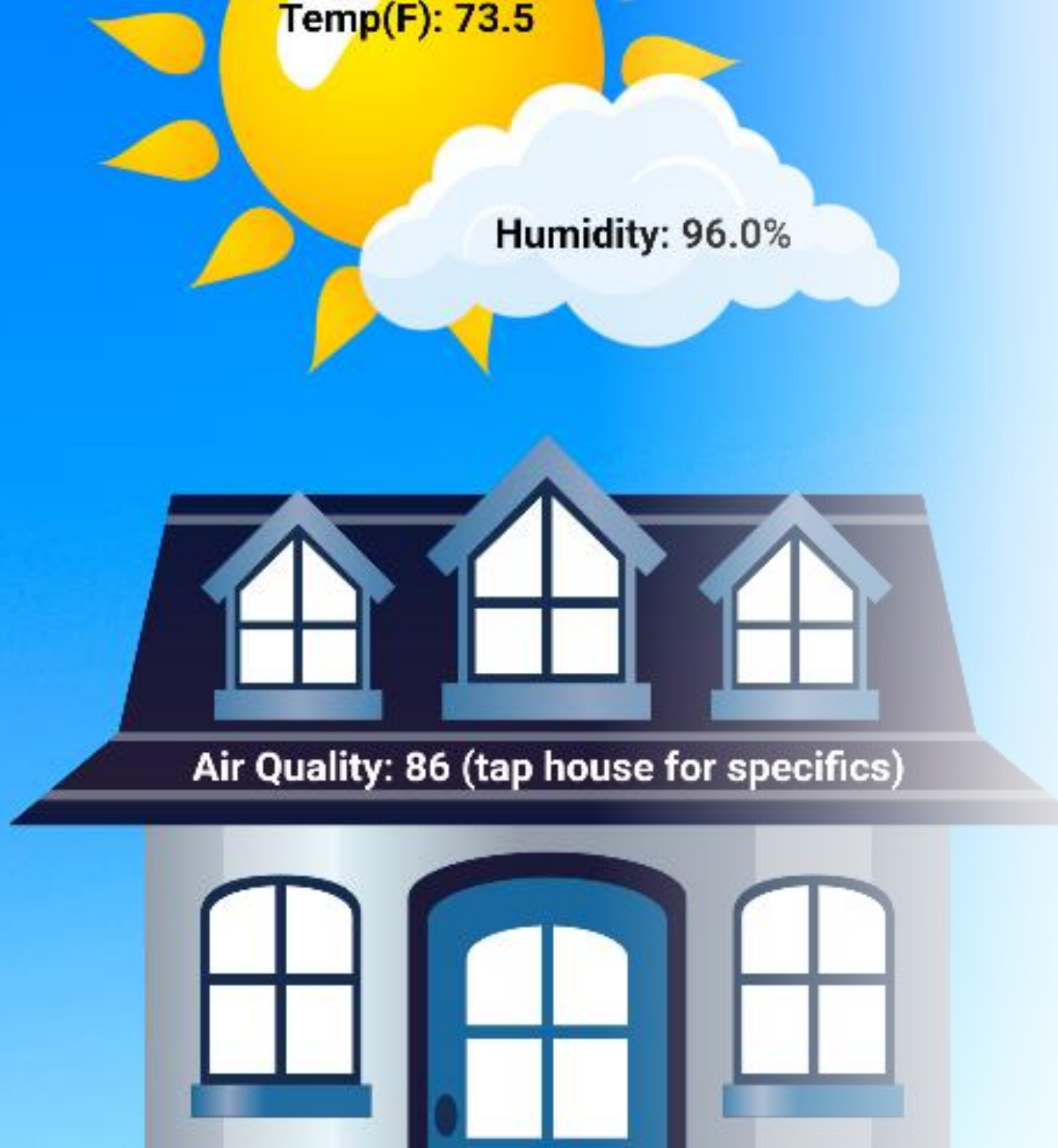


	Pre-Home Uplift	Post-Home Uplift
Average Indoor Temperature	65 °F	71 °F
Percent of time < 55 °F	10%	2%
Average Indoor RH	48%	35%



Funded by the TN Dept. of Environment and Conservation and
TVA

EASIER Alert System

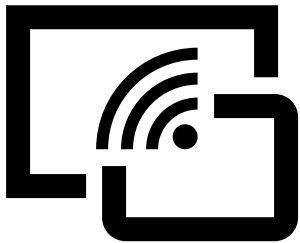
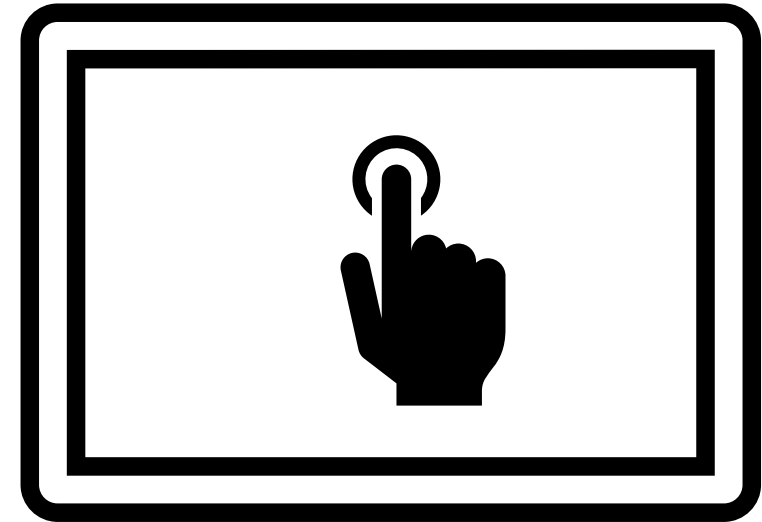


Purpose:

To alert elders in Equity and Environmental Justice (EEJ) communities about potentially health-threatening indoor conditions and connect them to their social network for support and assistance.

EASIER System Components

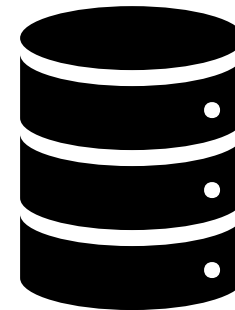
Tablet with User Interface



AWAIR IEQ sensor and
Ecobee smart thermostat



600-watt
back-up
battery



Alert rules
database



Routers and Internet
service by Verizon

Major Policy Challenges

Directly related to weatherization

- Small overall program funding
 - Boosted by Bipartisan Infrastructure Law (BIL)
- Limits on investments per home
- Deferrals re bad home conditions
- Limited funding for renewable energy measures
- Constraints to electrification
- Mixed incentives for landlords vs. tenants

Major Policy Challenges

Related to weatherization and healthcare sector

- Lack of awareness
- Lack of processes to refer patients' homes for weatherization
- Lack of health insurance reimbursement for home improvements
- Barriers to melding weatherization and healthy homes programs

Major Policy Challenges

Related to climate change

- Ignoring the co-benefits of weatherization when considering greenhouse gas emission reduction measures
- Fallacy of the take-back effect with respect to low-income weatherization

Louisiana Building Codes

Jackie Dadakis

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Adjunct Lecturer, Tulane MSRED Program

Technical Chair, Louisiana State Uniform
Code Construction Council



Green Coast Enterprises

- Real Estate Developer
 - Historic tax credit redevelopment
 - Affordable multifamily new construction
- Green Certifications
 - Zero Energy Ready Homes
 - Energy Star
 - Enterprise Green Communities
 - FORTIFIED
 - NGBS



Louisiana State Uniform Construction Code Council

- Created as an independent board by the legislature in 2007
- Adopts a uniform statewide minimum/maximum code
- Must adopt and amend to most current IRC, IBC, IECC, IPC, IMC and NEC within 5 years of publication
- Board members are appointed to 4 year terms by the Governor, confirmed by the Senate



Louisiana Energy Code Transition Committee

- Act 635 passed Louisiana House and Senate unanimously in 2022 session
 - Established a 15 member transition commission tasked to adopt and amend 2021 IECC for residential and commercial
 - **Moved commercial enforcement to local Building Offices**
 - Required adoption on July 1, 2023
 - Energy Code now follows future ICode review cycles



Review Committees 2024

- International Building Code / International Existing Building Code
- International Residential Code
- International Plumbing Code / International Mechanical Code / International Fuel Gas Code
- National Electrical Code
- **International Energy Conservation Code**

Pushed to the breaking point, coastal Louisiana fears insurance rates are killing their towns

BY SAM KARLIN | Staff writer Oct 3, 2024 12 min to read



Upper Little Caillou School was razed after Hurricane Ida. Students now get on buses and travel north, to Houma, for school.

Photo by Chris Granger | The Times Picayune



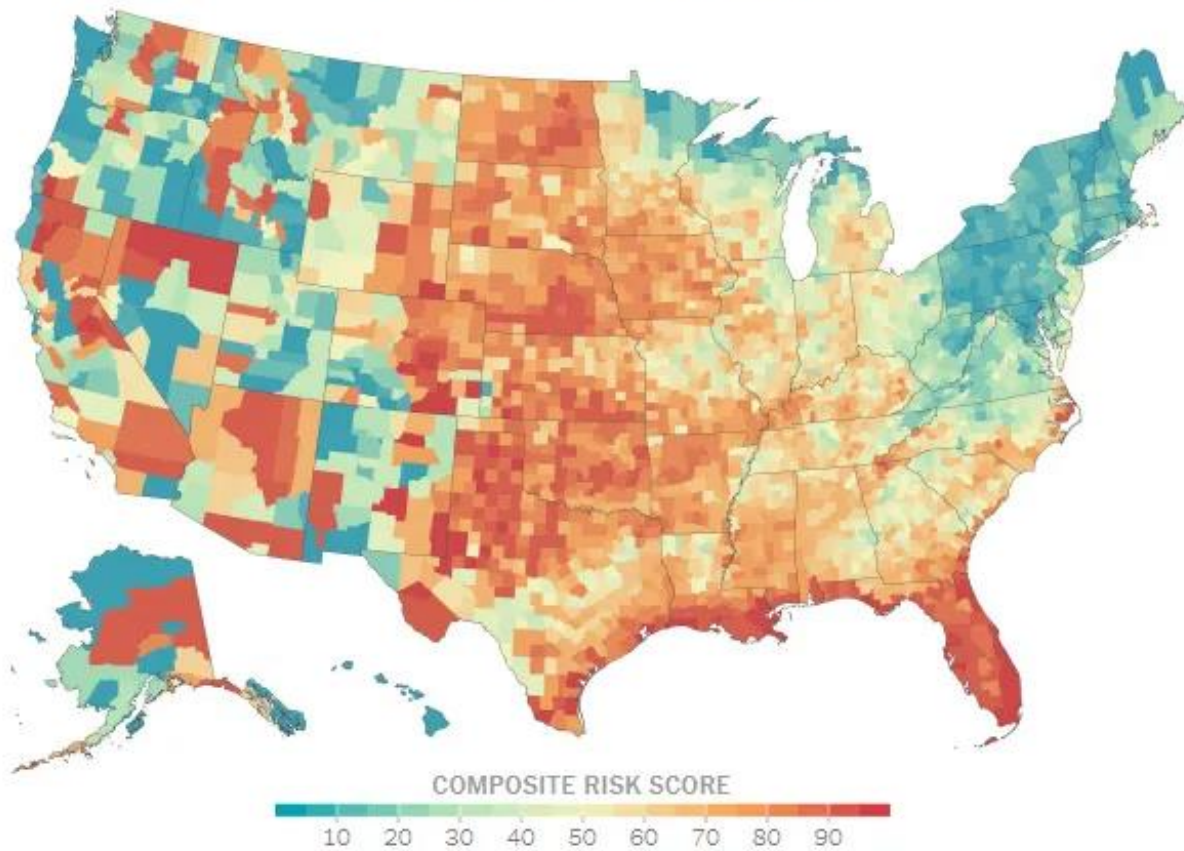
CHAUVIN — The signs of exodus are everywhere along Little Caillou Road as it winds for miles past bait shops and sugar cane fields, following the curves of the bayou.

Empty homes with remnant strips of blue roof tarp fluttering in the wind, ivy climbing the siding. Shuttered banks and storefronts. A razed school that's now a vacant lot.

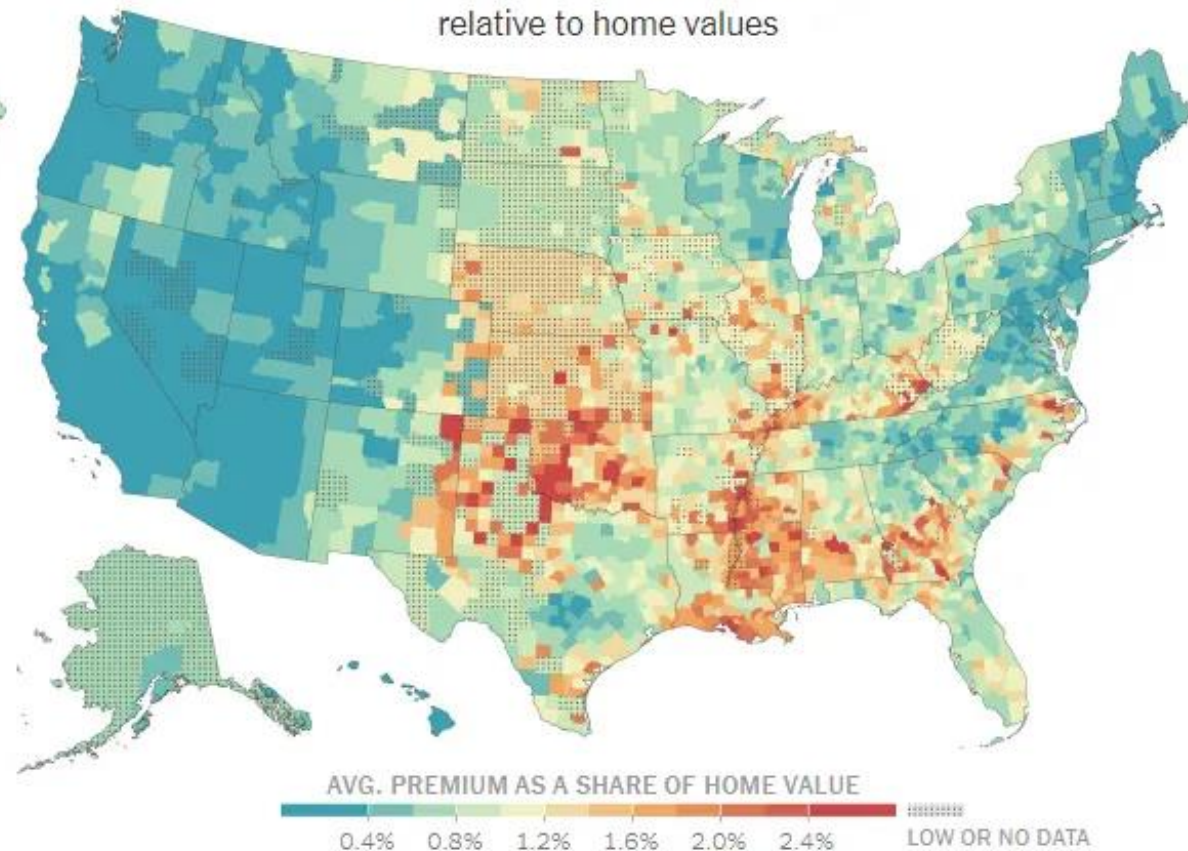
Hurricane Ida devastated this stretch, but the bayou communities have bounced back before. Now, there's another force hollowing them out.

"It's not going to be hurricanes that run people out of here," Dirk Guidry said. "It's going to be the insurance rates."

Where properties are **most at risk**



Where homeowners **pay the most** relative to home values

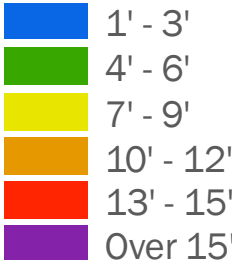


Sources: Keys and Mulder, National Bureau of Economic Research (2024); Zillow; FEMA; First Street Foundation. - Note: "Average premium as a share of home value" compares median home insurance premium in 2023 to Zillow's typical home value estimate in each county. State average shown in counties with few or no observations.

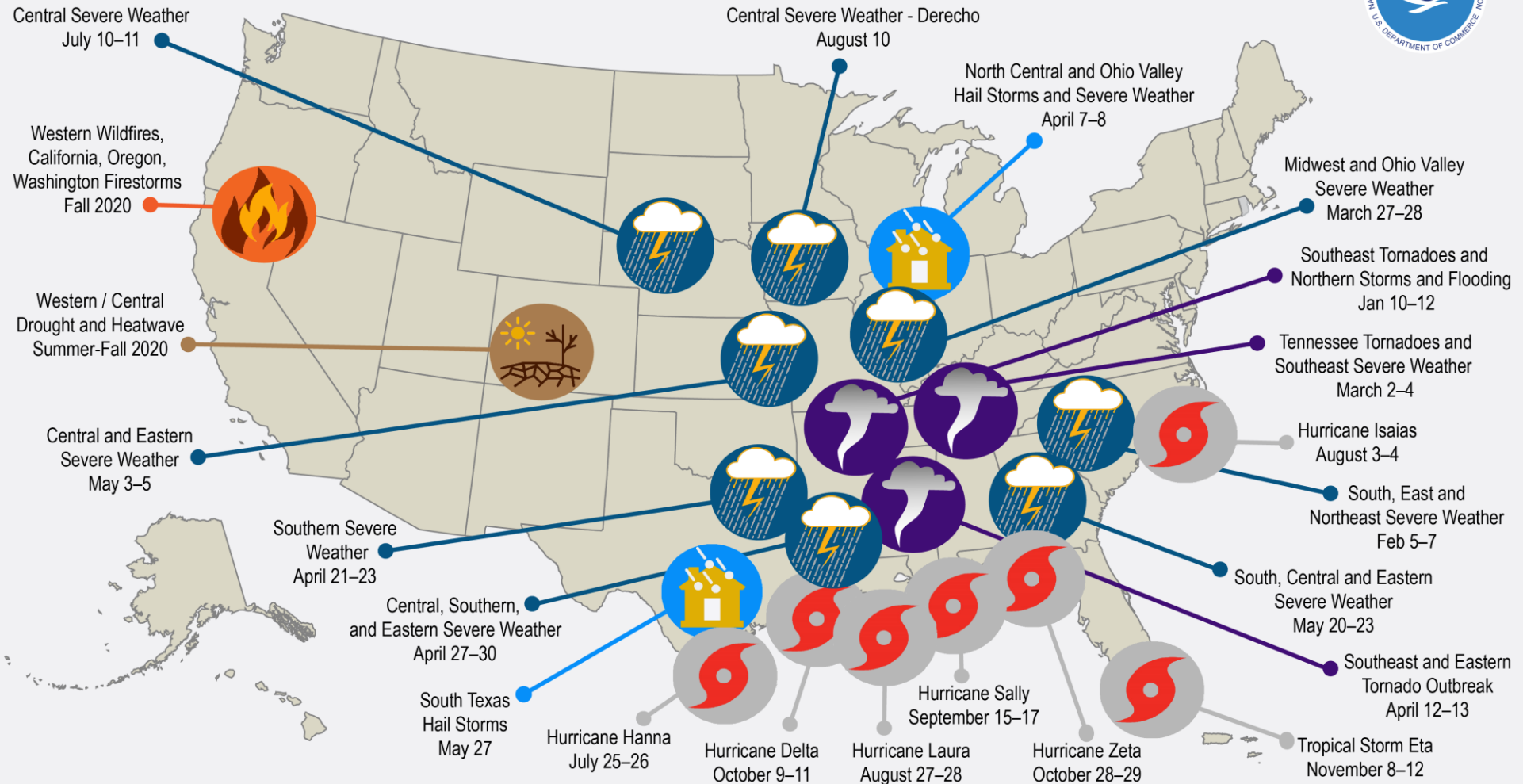
Source: The New York Times, July 2024



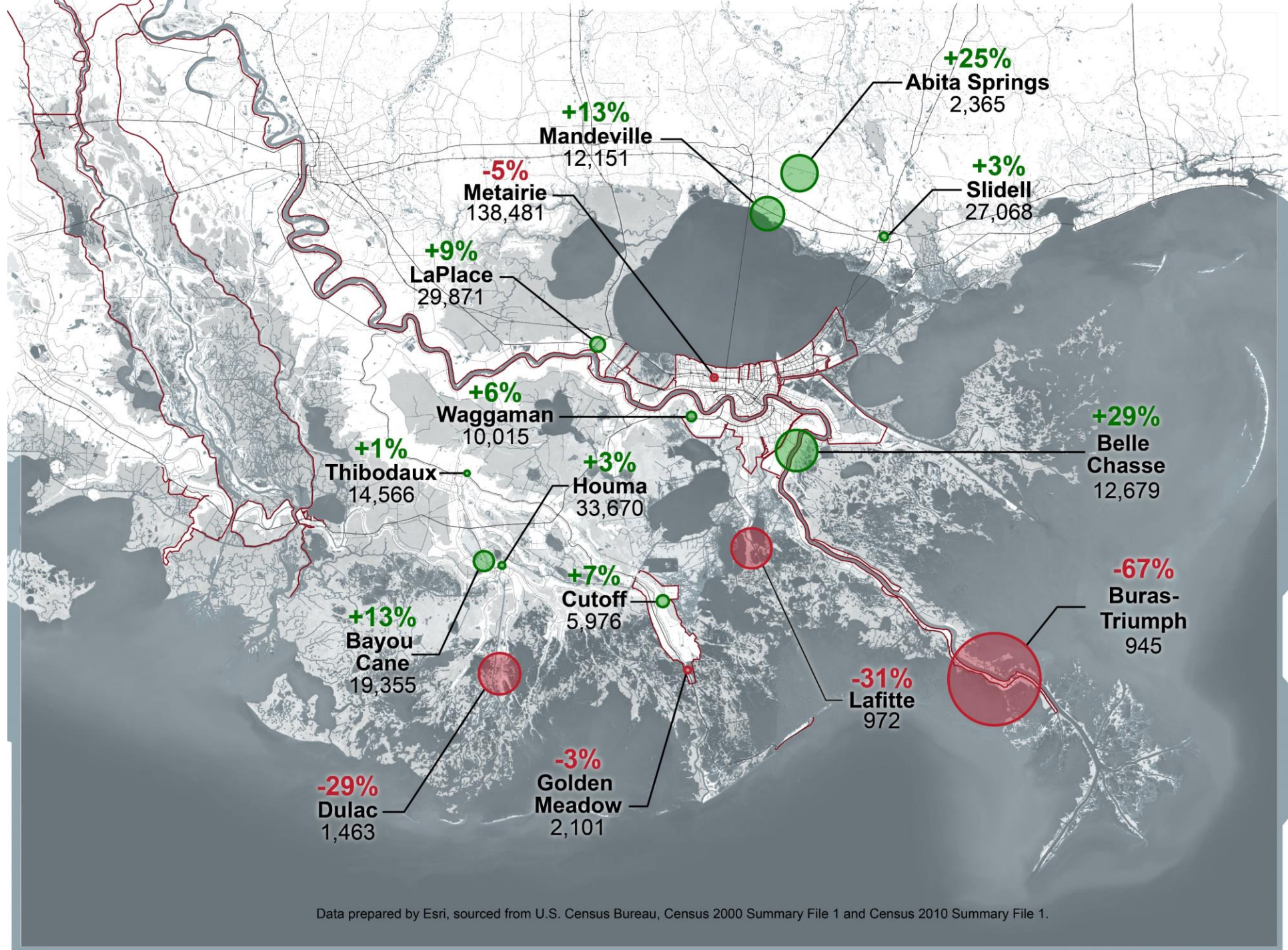
HIGH / YEAR 50 / 100-YEAR FLOOD DEPTHS



U.S. 2020 Billion-Dollar Weather and Climate Disasters



*This map denotes the approximate location for each of the **22 separate billion-dollar weather and climate disasters** that impacted the United States during 2020.*



Building Codes in the spotlight

After D.R. Horton suit, Youngsville tackles building codes; state expected to adopt changes

BY MEGAN WYATT | Staff writer May 15, 2022 3 min to read



Advocate staff photo by BRAD BOWIE — A row of homes in various states of completion is seen Tuesday afternoon at the Sugar Ridge development in Youngsville.

f x e s i

Youngsville adopted stricter residential building codes last week in response to a homeowner lawsuit against D.R. Horton that alleges the company knowingly constructed houses that couldn't withstand Louisiana's humidity.

The new construction requirements, approved unanimously Thursday by the Youngsville City Council, are also expected to be adopted at a state level next week.

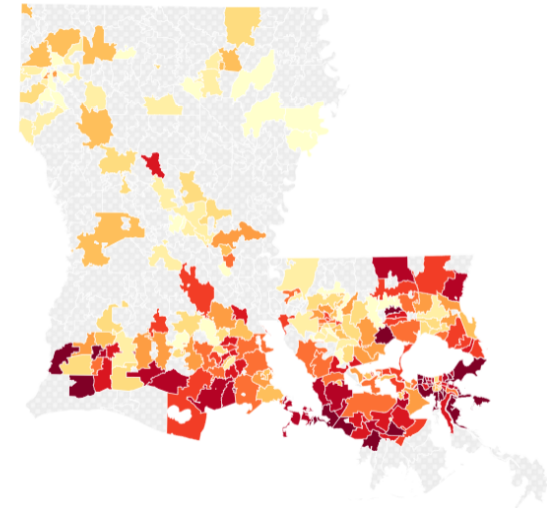
"I just want to thank the team," Councilmember Ken Stansbury said during Thursday's meeting. "I know this was a big concern for some of our residents."

Youngsville's new residential construction codes require thicker plywood for exterior walls, require that every home undergo HVAC testing witnessed by a city inspector and require attics to withstand a certain amount of weight.

4WWL Louisiana Citizens insurance rates by ZIP in 2022

We analyzed more than 9,700 policies from Louisiana Citizens Property Insurance Corporation that have 2% hurricane deductibles and \$2,500 All Other Perils (AOP) deductibles. The map shows the average rate by ZIP Code for insuring \$1,000 in Dwelling coverage. In other words, a rate of \$25 per 1,000 would cost \$2,500 to insure \$100,000, and \$5,000 to insure \$200,000 and so on. Hover over the map or search by ZIP code to see the rate.

Avg Premium per \$1,000

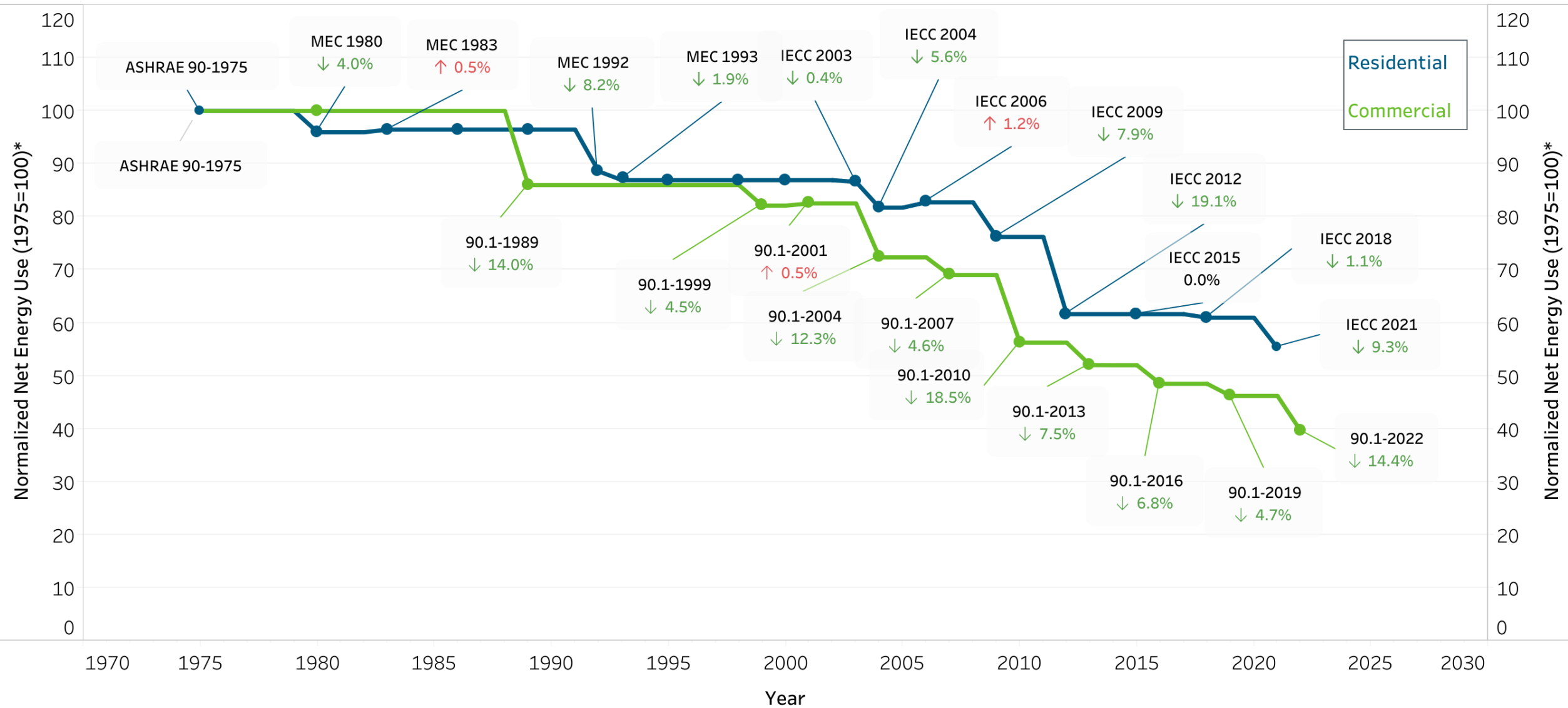


- Adopted amended 2021 IECC on July 1, 2023
 - Reduce lifetime operating costs of a home by 25%
- Adopted the ICC 2021 for residential and commercial structures
 - Above code amendment to require ring shank nails in wind zone 3
- Adopted ASCE-24 as a minimum of 1ft+ BFE in flood zones
 - Otherwise known as Freeboard!



Code Adoption Process

Estimated Improvement in Residential & Commercial Energy Codes (1975 - 2022)



*Net energy use includes the contribution of renewable energy generation

Impact of Louisiana Amendments

Table 1. Individual Consumer Impact of Combined Amendments

Metric	Compared to the Amended 2021 IECC
Life-cycle cost savings of the 2021 IECC	\$696
Net annual consumer cash flow in year 1 of the 2021 IECC	\$21
Annual (year 0) energy cost savings of the 2021 IECC (\$)	\$97
Annual energy cost savings of the 2021 IECC (%)	5.5%

Draft Analysis by PNNL of Louisiana 2021 IECC Amendments

Change in “fixed” monthly cost for new home in Zone A

New 2000 sf home with estimated construction cost of \$210,000 (\$105/sf)

Freeboard (ft.)	Monthly NFIP Premium Savings*	Freeboard Monthly Cost**	Fixed Monthly Savings	Fixed Annual Savings
0 (BFE)	\$0	\$0	\$0	\$0
+1'	\$80	\$20	\$60	\$720
+2'	\$110	\$45	\$65	\$780
+3'	\$120	\$70	\$50	\$600
+4'	\$125	\$90	\$35	\$420

*Calculated using 2021 NFIP Flood Insurance Manual. \$210,000 for building coverage and \$100,000 contents coverage, with deductible of \$2,000 for both structure and contents, assumes CRS Class 7.

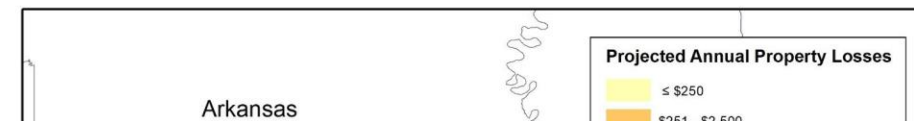
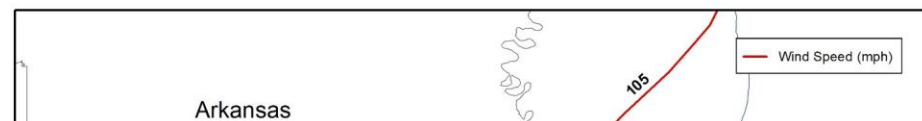
**Increase in new home 30-year loan mortgage payment calculated as 2.3% of the home price per foot elevation with fixed rate of 3.75%: \$4,830 per foot of freeboard.

- Through NFIP premium savings, homeowners save “real money” every month.
- Cost estimates are on the high side (closed foundation)
- Does not yet consider RR 2.0 – however, each 1' above ground reduces base premium by ~10%

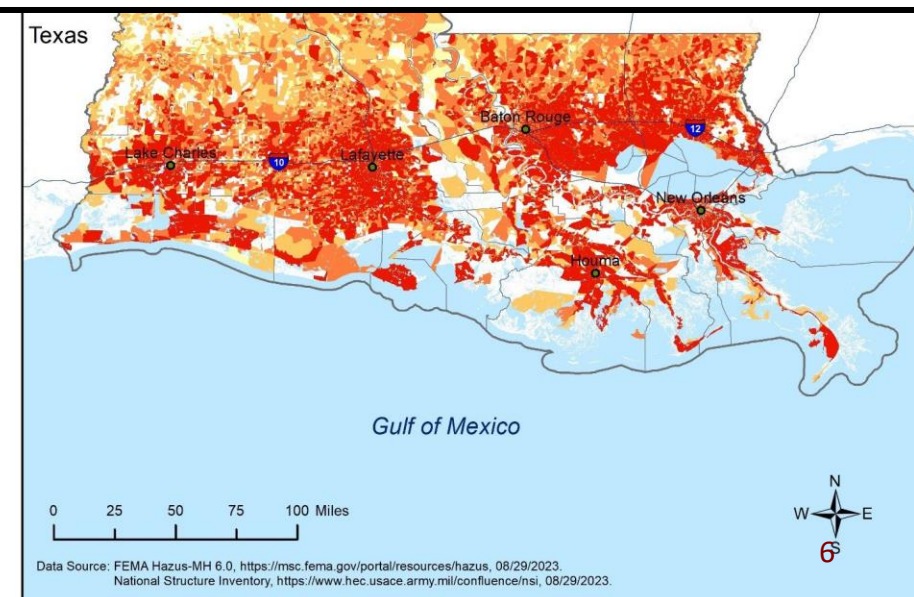
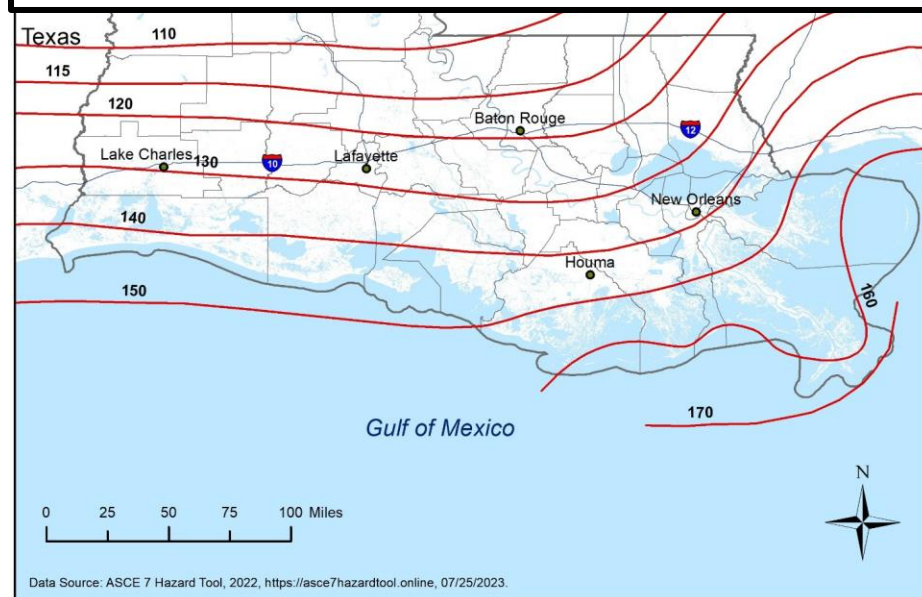
700-Year 3-Second Peak Gust
Wind Speeds in Louisiana,
2022



Projected Annual Property Losses
from Wind by Census Block,
2050



Single Family Home Wind Loss:
\$560 million per year



FORTIFIED Roof												
Wind speed	105	110	115	>115	120	130	140	150	160	170	180	200
Detail	High Wind			Hurricane								
Roof Members (Rafters)	Roof member spacing maximum 24" o.c.											
Roof Deck and Attachment	Roof sheathing thickness minimum 15/32"											
	Roof deck nailing pattern maximum 4" o.c.											
	Roof nail minimum RSR5-01; 0.113" dia. X 2-3/8"											
Minimum design uplift pressure on the sheathing	80 psf			110 psf								
Sealed Roof Deck	From within using spray foam: 1.5" to 3" fillet of 2-part spray-applied closed cell polyurethane foam adhesive at all joints between sheathing & at all intersections between rood sheathing & rood framing members, and at all valleys.											
	Flashing tape at all panel seams full adhered with no wrinkles or voids using roller. Material option 1: 4" wide ASTM D1970 compliant self-adhering polymer- modified bitumen flashing tape Material option 2: 3 - 3/4" wide AAMA 711-13 LEVEL 3 (for exposer up to 80°C/176°F) compliant self-adhering flashing tape											
	ASTM D226 Type II #30 OR ASTM D4869 Type III OR Type IV #30 underlayment. (For asphalt shingle roof covers, ASTM D6757 underlayment is also acceptable)											
	Weave underlayment across valleys. Double lap underlayment across ridges. (Unless there is a continuous ridge vent) Lap underlayment with minimum 6" leg "turned up" at wall interactions. Lap wall weather barrier over turned-up roof underlayment.											
	Self-adhered membrane- Optional for asphalt shingles: Apply #15 ASTM D226 Type I underlayment as bond break held back 8" from roof											

2021 IRC/ LSUCCC	Ultimate Wind Speed (mph) from ASCE 7 Hazard Tool, Risk Category II										
Wind Speed	105	110	115	120	130	140	150	160	170	180	200
Detail	Wind Zones 130 mph and less					Wind Zones greater than 130mph					
Roof Members (Rafters)	Spacing maximum 24" o.c.										
Roof Deck and Attachment	3/8"					7/16"	15/32"	19/32"			
	6" o.c. at edges and intermediate supports					4" o.c. at edges and intermediate supports					
	8d common nail (2 1/2" × 0.131")					RSRS-01 nail (ring shank) (2 3/8" × 0.113")					
Sealed Roof Deck	1. Underlayment materials required to comply with ASTM D226 Type I or II, D4896 Type I, II, III, or IV, or D6757 OR					1. Underlayment materials required to comply with ASTM D226 Type II, or D4869 Type III or IV OR					
	2. Self-adhering polymer-modified bitumen underlayment (ASTM D1970) OR										
	3. Minimum 4-inch-wide strip of self-adhering polymer-modified bitumen membrane (ASTM D1970) applied over all joints in the roof decking.										
	Single underlayment Apply 36-inch-wide sheets of underlayment, overlapping successive sheets at 2 inches.					Double underlayment Apply 36-inch-wide sheets of underlayment, overlapping successive sheets at 19 inches.					
	19 inch strip of underlayment felt parallel to and starting at the eaves.										

Created by Dr. Carol Friedland at the LSU Ag Center

Bringing Down Our \$560 Million Annual Loss

- Sealed Roof Deck (2021 code) = \$100 million
- Roof Nailing (8d @ 6 in./6 in.; 2021 code) = \$100 million
- Ring Shank Nails (>130 mph, LSUCCC 2023) = \$?? million
- Ring Shank Nails (<130 mph) = \$?? million

Recognition of Louisiana Codes

IBHS 2024 Rating the State

Rating the States 2024

#5. Louisiana - *Most Improved*

Louisiana is one of the two **most improved** states in the 2024 edition of *Rating the States*. The state gained 9 points in this edition compared to the last, raising its total score from an 82 to a 91. In recent years the state has faced an onslaught of landfalling hurricanes beginning with Hurricane Laura in August 2020. Between 2020 and 2021, five hurricanes made landfall in the state. The latest was Hurricane Ida in August 2021. The damage caused by these storms put considerable strain on the state and its private insurance market. In 2023, Louisiana launched a grant program to help fund FORTIFIED Roof installations for homeowners (see inset).

BUILDING CODE ADOPTION

Louisiana has updated its code to the 2021 IRC after operating on the 2015 IRC for the last two editions of *Rating the States*. The state uniformly enforces the code. In 2008, it became the latest state to adopt and put in place a uniform system of enforcement of a statewide building code.

FEMA 2024 Building Code Adoption Tracking

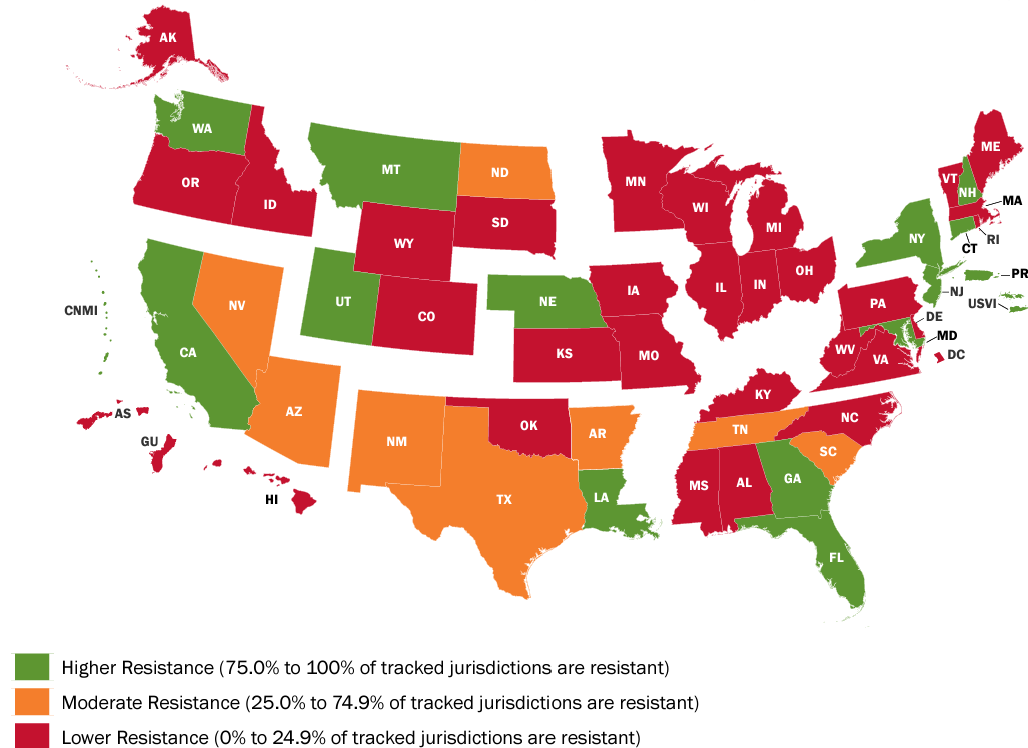


Figure 2. Overview of BCAT Resistance Ranges Grouped by FEMA Region



What's Next

- Resilient and Efficient Code (RECI) Award from DOE
 - Initial 18 month focus on workforce development and a baseline study of building code enforcement
- Get ResCheck and ComCheck working for the IECC!
- New board appointments to LSUCCC
- Start the I-Codes 2024 Review in Summer of 2025
- Workforce, Workforce, Workforce!
- Fortified Task Force – how far above ICC code will we go

Thank You!

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