

Forging Connections

The American Institute of Architects
National Resilience Initiative
ANNUAL REPORT 2016



Architects
Foundation



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Message from the Architects Foundation President



Just as I sat down to write this brief introduction, the media reported a tornado had struck Hattiesburg and nearby Petal, Mississippi. The images of destruction—the shattered homes and businesses and the lives lost—were heartbreaking, but, unfortunately, not unfamiliar. We see it every time disaster strikes.

We also see, mercifully, the almost instant response. Past experience has taught us to put in place an effective infrastructure for disaster response: hospitals, trained emergency personnel, communications networks, and often (though not often enough) safe places in which to take shelter.

As moved as I am by this outpouring of compassion and professional expertise, why can't we be as organized and focused in lessening, perhaps even preventing, the harm caused by natural and human-made disasters? Why can't the bricks, glass, and steel that rain down on the victims of disaster be instead a first line of defense?

As destructive as these are, communities are also challenged by the lack of fresh, wholesome food, viable strategies to combat a changing climate, and affordability. These, too, benefit from design-thinking.

Toward this end, the American Institute of Architects (AIA) and the Association of Collegiate Schools of Architecture (ACSA) are engaged as partners in groundbreaking research. This research is providing the resources and experience to students and licensed architects to collaborate with decision makers and the public to design resilient communities.

This latest report by the Architects Foundation is a document that inspires hope. It shows the ongoing work of the National Resilience Initiative is shifting the focus in America's communities from response and recovery to resilience and adaptation. The message within its pages is that the suffering and loss experienced by communities like Hattiesburg and Petal need not be inevitable. Read and be inspired. We can and are making a difference.



Jeff Potter, FAIA
President
Architects Foundation



Volunteers with the University of Mississippi's Gulf Coast Community Design Center work with local residents to prepare a new community garden.

Introduction

UNITED FOR A MORE RESILIENT FUTURE

The National Resilience Initiative (NRI) is a joint program of the American Institute of Architects and the Architects Foundation, with partners including the Rockefeller Foundation's 100 Resilient Cities, the Clinton Global Initiative, the Association for Collegiate Schools of Architecture and Public Architecture. This nationwide initiative unites six university-led architecture studios to develop new designs, approaches, and policies that bolster resilience in the built environment.

Resilience concerns continue to grow in the national consciousness, due in large part to our expanding understanding that many disasters and disturbances are no longer isolated once-in-a-lifetime events, but part of a longer ongoing pattern already set in motion. A new mindset has emerged to accommodate a spectrum of social, environmental, and technological change, while taking into account the people, landscape or economies at stake.

The NRI stands at the cusp of this shift in conventional wisdom, preparing not only for natural disasters like hurricanes, earthquakes and floods, but also for the many weaknesses and threats that impact individual communities. Tapping the interdisciplinary nature of architecture, this design initiative can offer solutions that consider all the complex needs and vulnerabilities of a given region.

Resilience is achieved when systems remain adaptable and functioning when faced with major disruptions. With skills drawn from architectural practice, the NRI employs creative systems thinking to create sustainable communities that allow people and the planet to prosper.

At its core, the NRI believes in the power of professional architects and academics to affect meaningful change as they bring together design expertise with emerging research. It

is this type of partnership, working in conjunction with affiliates at community groups and other local nonprofits, that produced the innovative resilient projects profiled in this annual report. Cooperative, multilateral efforts like these are the future of resilience and will lead to many more design solutions in the years and decades to come.

NATIONAL RESILIENCE INITIATIVE THROUGH THE DECADE

- SEPT 2013: National Resilience Initiative is launched following a Clinton Global Initiative commitment to Architects Foundation.
- MAY 2015: First design studio at New Jersey Institute of Technology is announced at AIA National Convention in Chicago.
- AUG 2015: Studios at Mississippi State University and the University of Arkansas join the NRI.
- NOV 2015: First annual report highlights NRI studio projects.
- MARCH 2016: California Polytechnic State University, San Luis Obispo, Hampton University, and the University of Minnesota join the NRI to complete the studio network.
- AUG 2016: All six university studios meet in Washington, D.C.
- MARCH 2017: Second NRI annual report released.
- 2017 AND BEYOND: NRI further integrates its partnerships with the AIA and other affiliated community and design groups.



The University of Arkansas Community Design Center is planning a senior community that focuses not only on accessibility, but on the social needs of residents as well.

Overview

QUALITIES OF RESILIENCE

The American Institute of Architects drafted its Qualities of Resilience to prepare architects, clients, and the public for ever-changing circumstances, variables, and environmental conditions. NRI designers use these standards to prioritize the unique needs of their clients and contribute to the social, economic, and environmental resilience of communities.

AIA Resilience Qualities

ADAPTABLE

Design to accommodate changing environmental and social conditions using data and research for the full service life of a building project.

REGENERATIVE

Reduce demand on fossil fuels and infrastructure, regenerate natural resources, and improve air quality.

REDUNDANT

Integrate duplicative support systems and reduce other negative impacts should a disruption occur.

FLEXIBLE

Position infrastructure and buildings to be adaptive to continually changing needs, both social and environmental.

RECOGNIZES INHERENT INTERDEPENDENCIES

Utilize a systems approach to address the building, site, and community holistically.

PRIDE OF PLACE

Create a space that provides social, environmental, and economic benefits to the community year round.

PREPARED

Building social capital with staff, occupants, and neighbors improves social resilience. Implement redundancy in routine systems and supplies. Strive for self-sufficient individuals, communities, and buildings.

DESIGNED FOR A FULL LIFE CYCLE

Balance first costs and long-term value of the intended service life in the decision-making process for total value.

AIA Resilient Design Attributes

ADDRESSES RISKS

A vulnerability assessment informs the design process. Staff and occupants are trained and guided by an emergency plan.

SMART SITE SELECTION

Some locations are safer or more problematic than others. A resilient building in a non-resilient community is not fully resilient.

OF LOCAL PLACE

Design strategies address localized risks and opportunities.

STRIVES FOR SELF-SUFFICIENCY

Individuals, buildings, and communities meet their needs without institutionalized systems.

SAFE AND SECURE

Provides for physical protection and mental comfort from acute shocks and daily stresses.

DURABLE AND ACCESSIBLE

Can withstand the impacts of identified hazards while remaining physically functional and socially approachable.

MINIMIZES NEGATIVE IMPACTS

Design strategies successfully mitigate risk without compromising the integrity of dependent systems.

MAINTAINABLE/SERVICEABLE

Design provides for maintenance access and regular improvements to building systems and envelope.

LOW CARBON

Systems, materials, and methods limit greenhouse emissions.

MAXIMIZES DAYLIGHTING

Optimizes natural light without compromising thermal comfort or harsh glare and provides access and views to green space.

USES QUALITY MATERIALS

Materials contribute to a healthy environment and are long-lasting and are made of rapidly renewable resources.

CRADLE TO CRADLE

Materials, systems, and products are part of a closed-loop system that does not produce any waste.

Mapping Resilience

A NETWORK OF SHARED
KNOWLEDGE, COMMUNITY
CONNECTIONS, AND
DESIGN EXPERTISE

UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA
Center for Sustainable Building

**CALIFORNIA POLYTECHNIC
STATE UNIVERSITY, SAN LUIS OBISPO**
SAN LUIS OBISPO, CALIFORNIA
Resilient Communities Research Institute



**UNIVERSITY OF
FAYETTEVILLE, A**
Community Design



Research

NEW JERSEY INSTITUTE OF TECHNOLOGY
NEWARK, NEW JERSEY
Center for Resilient-Design

HAMPTON UNIVERSITY
HAMPTON, VIRGINIA
Coastal Community Design Collaborative

ARKANSAS
ARKANSAS
n Center

MISSISSIPPI STATE UNIVERSITY
BILOXI, MISSISSIPPI
Gulf Coast Community Design Studio



Poly Canyon Village housing complex on the campus of California Polytechnic State University, San Luis Obispo. (Rob Bulmahn/Flickr Creative Commons)

California Polytechnic State University, San Luis Obispo

RESILIENT COMMUNITIES RESEARCH INSTITUTE

Founded by the College of Architecture and Environmental Design at California Polytechnic State University, San Luis Obispo, the Resilient Communities Research Institute (RCRI) is an applied research unit devoted to advancing the application of knowledge and practice that improves the quality and safety of the built environment. A 2016 newcomer to the National Resilience Initiative, the RCRI serves as a catalyst for effective research partnerships, tackling real-world issues that directly impact students and faculty while helping to create the next generation of leaders in solutions-based design.

“What’s unique about California is that we encompass various types of resiliency needs,” Cal Poly architecture professor Margot McDonald, AIA, explains about the university’s broad range of resilience work. “This includes design for wildfire recovery, climate adaptation planning, and the deficit of water in terms of

drought conditions. It’s an expansive set of parameters that we’re dealing with.” Taking these closely intertwined shocks and stresses into account, she and her colleagues crafted an NRI project exploring resilience in their own backyard.

“We had this idea of using the campus as a living laboratory,” says McDonald about Cal Poly’s Campus Resiliency Index, a newly-created set of standards helping to better prepare large universities. Using the 400,000-student California State University system as a starting point, the project aims to amass varied and far-reaching resilience data that can be used by campuses nationwide.

As a member of the NRI, Cal Poly and the RCRI target four areas—sustainable communities, innovative technology, interdisciplinary education and global engagement—each focused on engaging various voices to confront an ever-increasing array of resilience issues.

“We had this idea of using the campus as a living laboratory.”
– Margot McDonald, AIA



San Luis Obispo,
California

CASE STUDY | California Polytechnic State University, San Luis Obispo

Campus Resiliency Index

COMPLETION DATE

Ongoing

COLLABORATORS

MEP consultant, structural engineer, planner, emergency services manager, and sustainability coordinator

PROJECT TYPE

Programming, assessment, facilities planning, and metrics

BUILDING TYPE(S)

Higher education

GEOGRAPHIC REGION

West

DENSITY

Urban and suburban

ENVIRONMENT/ECOLOGY

Coastal and interior (riverine)

NATURAL HAZARDS

Flooding, earthquake, wildfire, drought, and extreme heat

COMMUNITY ISSUES

Environmental degradation, pollution, and potable water scarcity

AIA RESILIENCE QUALITIES

Adaptable, prepared, and recognizes interdependencies

AIA RESILIENT DESIGN ATTRIBUTES

Addresses risks, strives for self-sufficiency, and safe and secure

How does a university determine its own resiliency? In partnership with the global architecture and engineering firm Arup, the Resilient Communities Research Institute at California Polytechnic State University, San Luis Obispo created a set of metrics to assess resiliency and adaptation on education campuses.

The Campus Resiliency Index (CaRI) identifies a university's naturally-occurring and human-made stressors, gaging the strength of preparative actions for potential shocks. The CaRI model takes a holistic approach, using four main categories representative of a campus system: health and wellbeing, governance and leadership, infrastructure and environment, and education and business.

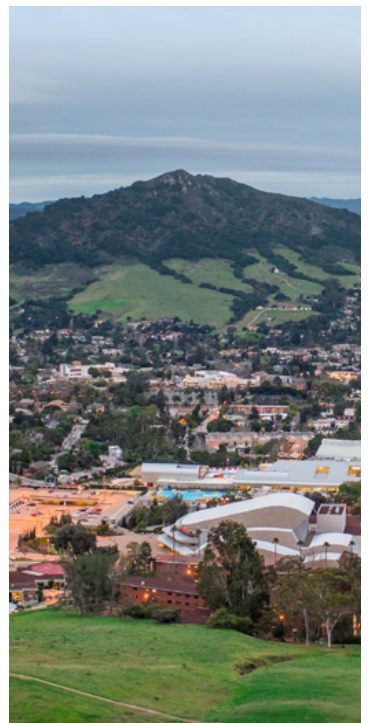
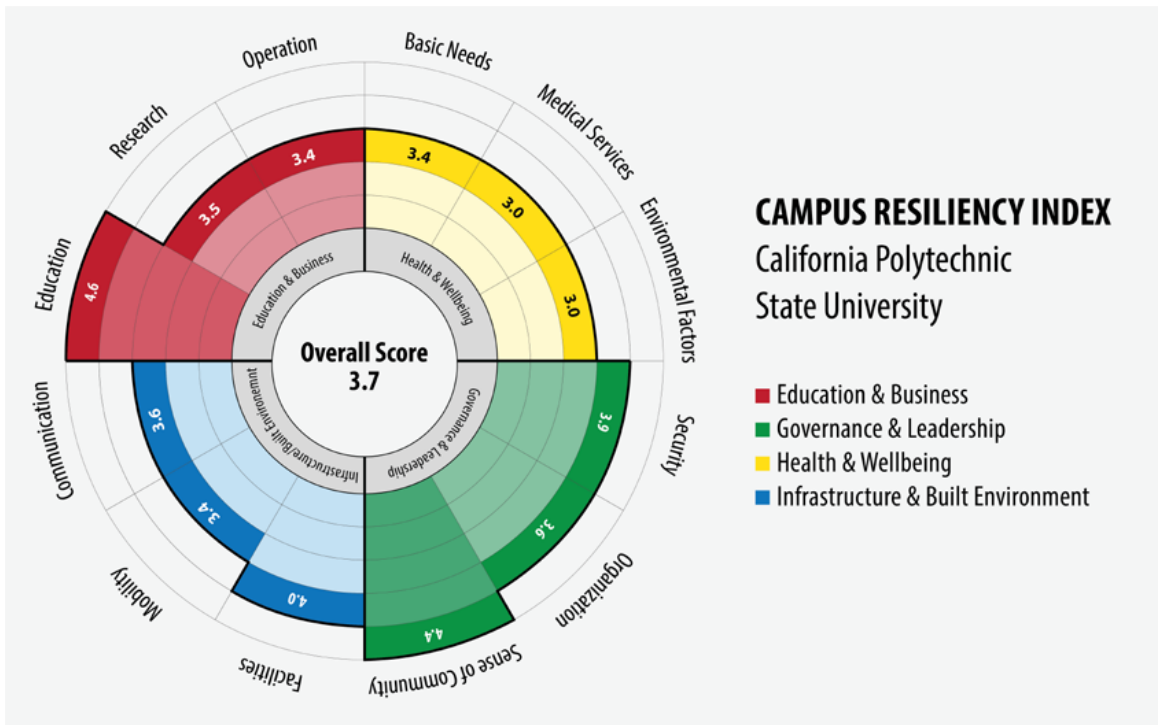
Understanding the highly-localized nature of shocks and stresses, the index measures an institution's relative performance over time rather than a campus-to-campus comparison. This work views the campus as a complex system,

assesses its own unique resilience issues, and provides information to manage the system through disturbances at various scales.

Using an Arup-devised urban resiliency framework, the CaRI currently focuses on 52 qualitative indicators, collecting data via interviews with campus personnel and document review. A master list of "key" resource people holding similar positions on each campus (e.g., facilities manager, IT officer, police chief) provides a common basis for acquiring indicator information.

An initial trial of seven California State University campuses (ranging from 7,000 to 40,000 students) was conducted in fall 2016 as part of the course Mitigation Planning and Design: Towards Resilient Communities, taught by city and regional planning professor William Siembieda. Results will inform a second trial that refines the scoring system and clarifies inherent and adaptive resilience campus capacities.

OPPOSITE | Top: Based on CaRI metrics, Cal Poly currently scores 3.7 of 5 on overall resilience. Bottom left: Cal Poly students Jacob Hovland, landscape architecture; Daniela Koller, city planning; and Nicholas Kong, landscape architecture, compiled initial CaRI data. Bottom right: Cal Poly's complex and multifaceted landscape provides an ideal starting point for the statewide study. (Images provided by California Polytechnic State University, San Luis Obispo; bottom right photograph by Jean Paul Molyneux.)





Hampton University students designed a public park in the historic neighborhood of Chesterfield Heights that will mitigate the impacts of sea level rise.

Hampton University

COASTAL COMMUNITY DESIGN COLLABORATIVE

Having established one of the nation's first design programs addressing sea level rise in 2014, Hampton University's Department of Architecture is developing bold new neighborhood-based solutions for climate change effects along the Atlantic shore. Joining the National Resilience Initiative in 2016, the department and its Coastal Community Design Collaborative (CCDC) continues its mission on the national stage, sharing strategies with organizations and nonprofits from coast to coast.

A partnership with Old Dominion University's Department of Civil and Environmental Engineering, the CCDC is rooted in a process of community engagement, primarily focusing on urban neighborhoods and districts. Emphasis is placed on low-impact strategies as students, designers and researchers devise efforts to keep buildings and communities in place long into the next century.

The CCDC's first project studied adaptation strategies for a lower- to moderate-income African American riverfront community, which adopted several of the collaborative's resilience planning methods. The project was further developed in a 2016 sea level rise symposium, Dutch Dialogues Virginia, and received a \$115 million dollar implementation grant from the U.S. Department of Housing and Urban Development.

Rooted in an active collaborative process, CCDC places community engagement at the forefront with students regularly venturing beyond the walls of the studio. Hampton University's resilience efforts join forces with policy makers, area professionals, and other state universities, helping architecture and engineering students develop the special skills required for successful future design collaborations.

**Community engagement
remains at the forefront, as
students venture beyond the
walls of the studio.**



Norfolk, Virginia

CASE STUDY | Hampton University

Tidewater Rising Resiliency Design Challenge

COMPLETION DATE
2016

COLLABORATORS
Architecture and civil engineering students, ecologists, and community stakeholders

PROJECT TYPE
Planning, concept/schematic design, community facilitation, and research

BUILDING TYPE(S)
Non-construction (research)

GEOGRAPHIC REGION
Southeast

DENSITY
Urban, suburban, and exurban

ENVIRONMENT/ECOLOGY
Coastal

NATURAL HAZARDS
Flooding

COMMUNITY ISSUES
Affordable housing and high insurance costs

AIA RESILIENCE QUALITIES
Adaptable, flexible, recognizes inherent interdependencies, pride of place, and prepared

AIA RESILIENT DESIGN ATTRIBUTES
Of local place, strives for self-sufficiency, minimizes negative impacts, and safe and secure

Southeastern Virginia, home of Hampton University's Coastal Community Design Collaborative, experiences one of the highest rates of sea level rise along the U.S. Atlantic coast, with a predicted increase of between four and six feet during the next century. Yet, as most of the region has seen only the earliest stages of this flooding trend, few communities have established long-term resilience strategies, particularly in lower- and middle-income neighborhoods.

To bring these issues to the general public, the CCDC partnered with local community groups on the Tidewater Rising Resiliency Design Challenge. The project explored increasing resilience factors in Norfolk's historic Chesterfield Heights district, a working-class African-American community located on an eroding riverfront shoreline.

CCDC student researchers collected data firsthand, conducting site visits, interviewing residents, meeting with

local civic groups, and witnessing extreme rain and flooding events whenever possible. Early design work explored immediate mitigation issues and the possibilities of elevating existing houses before turning to design solutions that would both preserve and enhance the neighborhood's unique character.

In a final report, the team offered a constellation of interconnected resilience solutions: a living shoreline, pervious pavers, cisterns under the street and in residential basements, and a detailed bioretention plan. Flooding models project this low impact design scheme could reduce as much as 90 percent of the inundation residents typically face during the most potent of storms.

The CCDC hopes the designs and its community engagement frameworks can serve as models for coastal neighborhoods and towns throughout the region and along the Atlantic coastline.

OPPOSITE | Top: Residential basement cisterns store and control water during heavy storms. Middle: Brick pavers in Chesterfield Heights allow flood waters to seep into drains and cisterns under streets. Bottom: Artificial bioswales hold flood waters, protecting homes and streets as sea level rise continues to challenge the community. (Images provided by Hampton University.)





Volunteers help plant a public garden in Gulfport, Mississippi as part of a healthy communities initiative led by the Gulf Coast Community Design Studio.

Mississippi State University

GULF COAST COMMUNITY DESIGN CENTER

A member of the National Resilience Initiative since 2015, the Gulf Coast Community Design Studio (GCCDS) is a professional service and outreach program of Mississippi State University's College of Architecture, Art and Design. Established in Biloxi following the devastation of Hurricane Katrina, GCCDS provides architectural design services, landscape and planning assistance, educational opportunities and research to organizations and communities along the Mississippi Gulf Coast.

GCCDS works through close, pragmatic partnerships with local organizations and communities in and beyond the three Mississippi's coastal counties, putting professional expertise to work in order to shape vibrant and resilient Gulf Coast communities.

As part of its efforts to find innovative ways to advance conversations on resilience and sustainable

development, every Friday GCCDS opens its Biloxi studio doors for the "Friday Morning Serial"—a free, weekly public event that brings a different speaker and topic to the attendees through a short presentation and group discussion. Speakers are drawn from diverse backgrounds and provide specialized insight. Topics vary from ecological restoration and urban planning and policy to Mississippi artisanal foods and the local film industry.

More than a decade since its founding, the GCCDS mission remains centered upon providing professional assistance that increases the capacity of local communities and organizations to address issues of housing, public space, and neighborhood development. The studio also continues to expand design education by providing opportunities for students and interns to explore community-based design, design-build, and sustainability.

GCCDS puts professional expertise to work in order to shape vibrant and resilient Gulf Coast communities.



CASE STUDY | Mississippi State University

Healthy Communities Initiative

COMPLETION DATE

Ongoing

COLLABORATORS

Landscape architects, ecologists, planners, healthcare professionals, and community stakeholders

PROJECT TYPE

Planning and community facilitation

BUILDING TYPE(S)

Non-construction (community initiative)

GEOGRAPHIC REGION

Southeast

DENSITY

Urban and suburban

ENVIRONMENT/ECOLOGY

Coastal

NATURAL HAZARDS

Flooding

COMMUNITY ISSUES

Environmental degradation, food scarcity, affordable housing, economic insecurity

AIA RESILIENCE QUALITIES

Recognizes inherent interdependencies and prepared

AIA RESILIENT DESIGN ATTRIBUTES

Of local place, strives for self-sufficiency, safe and secure, and minimizes negative impacts

With funding from Louisiana Public Health Institute, Mississippi State University and the Gulf Coast Community Design Studio launched the Gulf Coast Community ExCHANGE, an initiative that allows communities to share knowledge and resources to improve health and quality of life across southern Mississippi.

With input from hundreds of organization leaders and more than 2,000 citizens from under-represented populations, the ExCHANGE maintains an online public portal of health-related data and demographics. An active and ever-evolving database, ExCHANGE staffers regularly update information and remain in close contact to the communities they serve.

The project addresses public health at the intersection of community development, using technology and cross-sector teams to create a broad view of the health issues facing Gulf Coast citizens. The ExCHANGE

initiative brings together designers, planners, ecologists, community organizers, law enforcement, and health care professionals on a monthly basis to engage community conversations around the correlation between place and health. This sharing of knowledge across sectors helps identify infrastructural or social factors that might be affecting the community's overall resilience.

The online platform organizes health data around seven topic areas: housing, environment, transportation and land-use, food systems, health and wellness, education, and economic and workforce development. Not only can database users learn about the relative health of their own neighborhoods, but they also can access information on current and future healthy community projects, such as safe and affordable housing efforts and programs to improve public outdoor spaces.

OPPOSITE | Top left: Elementary students in Gulfport, Mississippi plan a schoolyard garden sponsored by ExCHANGE. Top right: Herbs are potted for a community gardening initiative. Bottom: Students attend an ExCHANGE workforce development course on electrical work. (Images provided by the Gulf Coast Community Design Studio.)





Southeastern
U.S. coastlines

CASE STUDY | Mississippi State University

Mitigation Lessons: Wind and Flood Research

COMPLETION DATE
2015

COLLABORATORS
Planners and professionals in affordable housing, resilience, construction, and insurance

PROJECT TYPE
Planning, building and architecture, construction, education, policy, and research

BUILDING TYPE(S)
Non-construction project, culminating in a written report

GEOGRAPHIC REGION
Southeast

DENSITY
Urban, suburban, exurban, and rural

ENVIRONMENT/ECOLOGY
Coastal

NATURAL HAZARDS
Flooding, high winds, hurricanes, and sea level rise

COMMUNITY ISSUES
High insurance premiums

AIA RESILIENCE QUALITIES
Adaptable, redundant and prepared

AIA RESILIENT DESIGN ATTRIBUTES
Strives for self-sufficiency, durable and accessible, and minimizes negative impacts

Funded by Oxfam America, the Mitigation Lessons report evaluates seven homeowner assistance programs aimed at mitigating wind and flood risks along the Mississippi Gulf Coast, with some additional details on other parts of the southern Atlantic and Gulf Coasts.

Responses to wind and flood risks are rapidly evolving, and repeated losses and increased insurance rates throughout the Southeast are only fueling the need for more research. The changes in wind risk management are encouraging and are leading to innovation. Changes in flood risk management, meanwhile, are sparking community concern.

This report looks at the two issues—wind and flooding—separately. By evaluating best practices of existing mitigation programs, state policy makers and community leaders can make more informed decisions on obtaining funding and designing their own mitigation and resilience efforts.

The research evaluated seven mitigation programs that have been applied in the past decade throughout the South. The programs were selected for their effectiveness and funding source types.

Lessons learned from these programs led to four recommendations to guide future mitigation programs. The report strongly suggests the following:

- a uniform wind mitigation standard
- federal funding focused on mitigation, rather than recovery
- assistance for lower-income households
- perpetual funding for efficient mitigation programs

Recommendations were presented to a group of community stakeholders and have led to the formation of a coalition of organizations to advance wind and flood mitigation efforts along the southern Atlantic and Gulf Coasts.

OPPOSITE | Top images: Volunteers help rebuild a flood-prone residential neighborhood in East Biloxi, Mississippi. (Images provided by the Gulf Coast Community Design Studio.) Bottom: Gulf Coast counties, like these in southern Mississippi, face imminent flooding risks in the next century, alongside rising insurance costs. (Map prepared by the Federal Emergency Management Agency.)



Special Flood Hazard Areas

 A and V Zones - 100 Year Floodplain





Designed by NJIT's Center for Resilient Design, the Garden State Ecohub in Ewing, New Jersey transforms former industrial sites into lush "carbon factories."

New Jersey Institute of Technology

CENTER FOR RESILIENT DESIGN

The New Jersey Institute of Technology established its Center for Resilient Design (CRD) in 2013 to inform and implement resilient rebuilding efforts following Hurricane Sandy.


Through applied research, field testing and community outreach, the CRD provides residents, business owners, design professionals and government officials with actionable ready-to-build designs and expertise for areas tackling increased problems with flooding and storm surges as well as the social and economic issues that surface after a natural or human-made disaster.

The inaugural member of the National Resilience Initiative—helping to launch AIA’s nationwide program in 2014—NJIT and the CRD believe the question for many towns is not whether to rebuild, but how to rebuild. With NJIT’s extensive institutional knowledge and a significant cadre of current and future architects and

engineers seeking opportunities to apply resilient solutions, the CRD helps New Jersey prepare for shocks and stresses months, years, and decades away.

NJIT is providing leadership on architectural design and resilient solutions, potentially creating new markets and opportunities for enhanced economic development in New Jersey, and ideas to be exported throughout the country and around the world.

NJIT believes that the question for many towns after a disaster is not whether to rebuild, but how to rebuild.



Trenton and Perth
Amboy, New Jersey

CASE STUDY | New Jersey Institute of Technology

Infrastructure Planning and Resilience

COMPLETION DATE
2016

COLLABORATORS
Architecture and planning
students

PROJECT TYPE
Planning, site, building,
programming, concept,
education, community
facilitation, and research

BUILDING TYPE(S)
Multi-family residential, office,
recreational, transportation,
and historic structures

GEOGRAPHIC REGION
Northeast

DENSITY
Urban

ENVIRONMENT/ECOLOGY
Coast and interior (riverine)

NATURAL HAZARDS
Flooding, hurricane, storm
surges, and sea level rise

COMMUNITY ISSUES
Aging population

**AIA RESILIENCE
QUALITIES**
Adaptable, regenerative,
and flexible

**AIA RESILIENT
DESIGN ATTRIBUTES**
Smart site selection, of local
place, safe and secure, and
maximizes daylighting

In late 2015, the NJIT Center for Resilient Design collaborated with the New Jersey Urban Mayors Association, AIA New Jersey, and others to launch the inaugural New Jersey Urban Mayors Academy on Resilient Design. Held at Thomas Edison State University, the gathering enabled mayors from across the state to share challenges and opportunities with design experts to help create new approaches to make cities more resilient and sustainable.

Building on the results of the Academy, NJIT planning students investigated infrastructure systems in Trenton and Perth Amboy through the lens of resilient design. Case studies were compiled in a final report detailing key findings and recommendations for mayors, their staff, and others interested in how infrastructure can catalyze change and resilient development.

Densely-populated waterfront cities, Trenton and Perth Amboy face challenges with flooding and

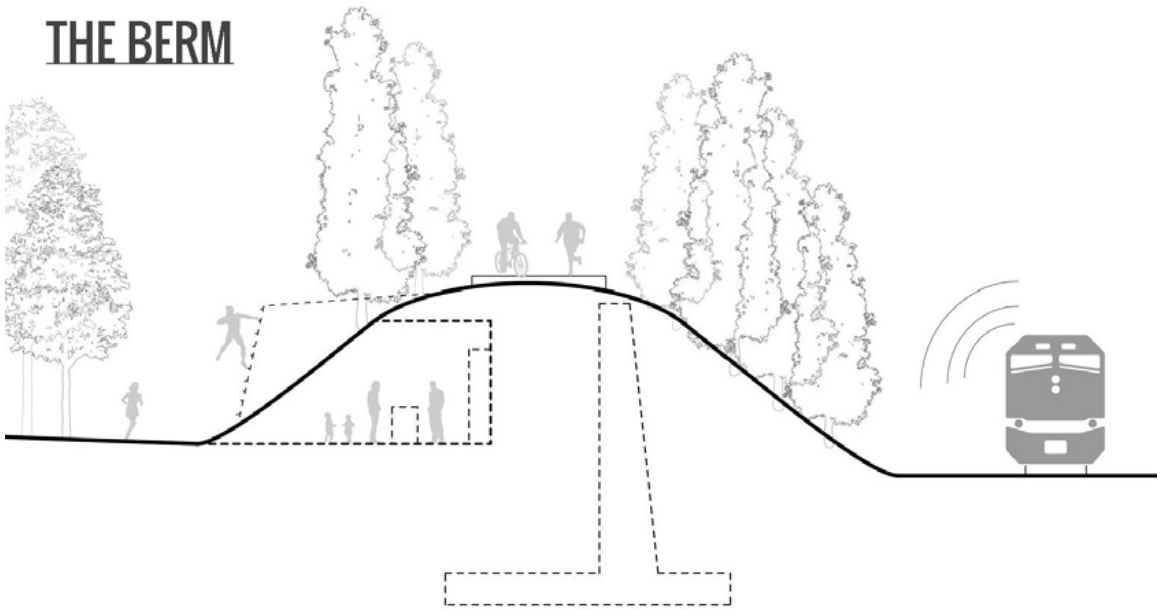
storm surges among other climate-change issues. Both are highly-urbanized industrial cities with aging infrastructure and have experienced economic decline, environmental injustice, and a changing social fabric.

As is the case in all cities, resilience is not solely about limiting exposure or decreasing vulnerability, but about ensuring that communities can thrive in the face of hardship, remain stable in the short term, and strive for future prosperity. Careful planning investments can mitigate immediate risks while also improving sustainability, sparking long-term economic development, and supporting a higher quality of living.

NJIT's final report encouraged city leaders to look beyond traditional notions infrastructure, offering design solutions aimed at transportation and public space that manage existing flooding issues, while supporting economic development and an increase to much needed community amenities.

OPPOSITE | Top and bottom left: A berm topped with a running/biking path protects a Perth Amboy park from the noise of adjacent train tracks and provides secondary flood protection. Bottom right: Plans for a new creekside park will feature a new wildlife preserve, sports areas, an amphitheater, and a flood mitigation system. (Images provided by NJIT Center for Resilient Design.)

THE BERM





For their Third Place Ecologies project, University of Arkansas designers blend public and private space to create a socially-engaged senior community.

University of Arkansas

COMMUNITY DESIGN CENTER

Launched in 1995 by the Fay Jones School of Architecture and Design, the University of Arkansas Community Design Center (UACDC) has grown from a local outreach program to become a leader in responsible, resilient projects nationwide. Operating from a repurposed commercial bank in the heart of downtown Fayetteville, the center today employs a full-time design and planning team who offers services to communities and organizations from coast to coast.

A member of the National Resilience Initiative since 2015, UACDC positions itself as a type of architectural “teaching hospital,” with staff providing additional educational services as practicing design professors and for the community at large. The center focuses on cross-disciplinary collaborations, gathering viewpoints not only from architecture and urban planning circles, but from experts in ecology, health care, and the arts.

To address the challenges facing our 21st-century built environment, UACDC has developed eight place-making models for public-interest design, including transit-oriented development, low impact development, context-sensitive street design, agricultural urbanism, and smart growth urbanism.

“This initiative has the potential to do for design what public health as a vector of innovation did for the medical profession,” says UACDC director Stephen Luoni.

“The NRI is a tremendously important step toward building the frameworks and influence that will amplify the design professions’ value to the public.”

“[The NRI] has the potential to do for design what public health as a vector of innovation did for the medical profession.”



Vilonia, Arkansas

CASE STUDY | University of Arkansas

Reinventing Vilonia

COMPLETION DATE

Planning completed in 2015

COLLABORATORS

Economists, planners and code specialists

PROJECT TYPE

Planning, site/landscape, schematic design, community facilitation, and research

BUILDING TYPE(S)

Single- and multi-family residential, office, retail, food services, civic, spiritual, recreational and infrastructure

GEOGRAPHIC REGION

Southeast/Great Plains

DENSITY

Rural small town

ENVIRONMENT/ECOLOGY

Interior (non-riverine)

NATURAL HAZARDS

Flooding, hail, and tornadoes

COMMUNITY ISSUES

Sprawling infrastructure

AIA RESILIENCE QUALITIES

Flexible, recognizes inherent interdependencies, and prepared

AIA RESILIENT DESIGN ATTRIBUTES

Addresses risks, smart site selection, of local place, and safe and secure

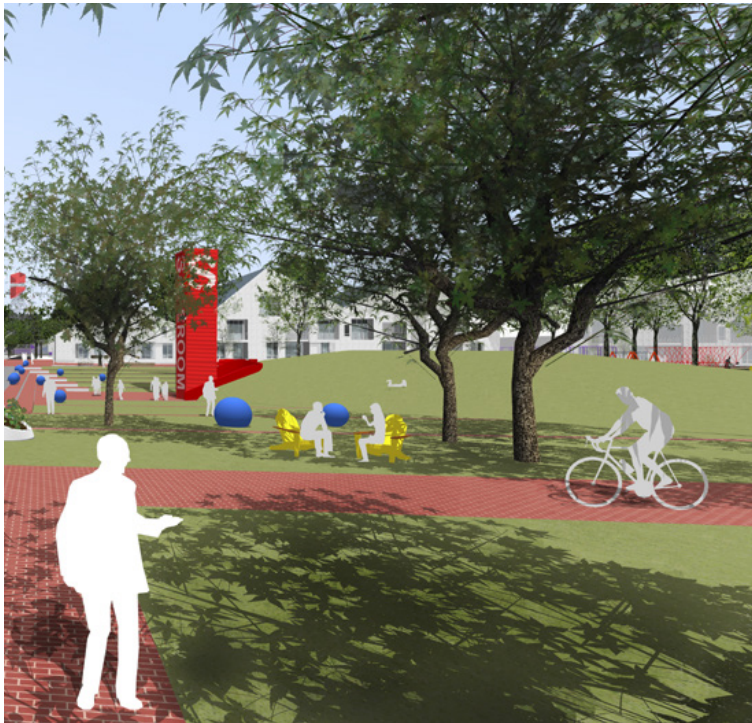
With 40 recorded tornadoes in the span of 50 years, Vilonia, Arkansas faces an ever-shrinking retail base as shops and national chains leave the small downtown due to negative safety perceptions. As Vilonia (population 4,226) mourns the loss of 11 lives from a catastrophic 2014 tornado, the University of Arkansas Community Design Center has conceived a downtown rebuilding plan that highlights community resilience beyond simple recovery.

In the last 15 years, tornadoes have set new records for frequency, devastation, and wind speed. Today, meteorologists maintain that the only safe refuge is below ground. While extremely valuable for an individual residence, underground safe areas pose a challenge for open public spaces like Vilonia's town center, presenting major congestion hazards and leaving most motorists stranded in traffic.

Dubbed the Reinvention Plan, the UACDC project begins with the urbanization of safety—a strategy to “utilize” the underground safe room as a municipal planning format transferable to middle America's tornado alleys. This safescape seeds a new town center that provides urban options in a place with high social capital and few constraints from traditional urban planning models.

The Reinvention Plan combines safe room infrastructure with a park system throughout a new town loop where residents and visitors alike are within a five-minute walk of an underground safe room. Using a modulated system of shipping containers customized to each site, safe rooms also function as wayfinding landmarks: community “hearths” that organize a set of public spaces like parks, squares, trails, and neighborhood greens across the community.

OPPOSITE | Top left and bottom: UACDC's Reinvention Plan for Vilonia centers on a busy pedestrian-friendly town center, which features underground safe areas within a five-minute walk for residents and visitors. Top right: Low-cost metal housing surrounds a well-marked neighborhood safe room. (Images provided by the University of Arkansas Community Design Center.)





Freeman, ★
South Dakota

CASE STUDY | University of Arkansas

Third Place Ecologies: Housing Fabrics for Aging

COMPLETION DATE

Planning completed in 2016

COLLABORATORS

Interior designer and gerontologist

PROJECT TYPE

Planning, landscaping, building and architecture, programming, concept and schematic design, policy, and research

BUILDING TYPE(S)

Single-family residential, multi-family residential, and a detailed published report

GEOGRAPHIC REGION

Great Plains

DENSITY

Rural small town

ENVIRONMENT/ECOLOGY

Interior (non-riverine)

NATURAL HAZARDS

Winter storms and blizzards

COMMUNITY RESILIENCE

Aging population

AIA RESILIENCE

QUALITIES

Redundant, flexible, and recognizes inherent interdependencies

AIA RESILIENT

DESIGN ATTRIBUTES

Of local place, strives for self-sufficiency, and safe and secure

By 2030, 79 million baby boomers will have turned 65 at a rate of 10,000 per day. While more than 85 percent will age in place, a broad range of challenges and opportunities will compel this cohort to embrace more cooperative structures of living, given their explosive increase in single-person households.

Currently, the nation's housing stock and neighborhoods are ill-equipped to serve the common mobility, access, and social needs of seniors. Many who now age in place, particularly in rural areas, often experience greater social isolation and loss of purpose than residents of nursing homes.

Sponsored by the National Endowment for the Arts, UACDC's Third Place Ecologies is a housing master plan study for the small town of Freeman, South Dakota. The project reworks components of the familiar single-family home to promote new levels of connectivity in neighborhoods once resistant to sharing. Once separate individual

porches are extended to serve multiple units as hyper-porches; garage galleries hybridize car parking to become neighborhood workspaces, and patio areas come alive as live-work venues. Third Place Ecologies revitalizes a neighborhood through return of the informal.

Regional populations in South Dakota and other largely rural states are consolidating around communities that offer the most services. Due to its schools and medical services, populations young and old are moving to small towns like Freeman, where the average age is close to 50 compared to a statewide average of 36. The graying of Freeman calls for a master plan that facilitates aging in the community as a solution to a lack of professional caregivers and family members to care for rapidly growing senior populations. Third Place Ecologies provides planning solutions for any demographic seeking cooperative structures of living using familiar single-family housing products.

OPPOSITE | Top left: For Third Place Ecologies, bedrooms maintain a view of public spaces with access to porches. Top right: Streets and public space are merged, eliminating curbs and slowing traffic. Bottom: Shaded outdoor rooms and porches offer informal meeting places at a low building cost. (Images provided by the University of Arkansas Community Design Center.)





An aging rail bridge crosses the Kettle River in Sandstone, Minnesota—subject of a detailed resilience report led by the University of Minnesota’s Center for Sustainable Building Research. (Paul VanDerWerf/Flickr Creative Commons)

University of Minnesota

CENTER FOR SUSTAINABLE BUILDING RESEARCH

Joining the National Resilience Initiative in 2016, the University of Minnesota's Center for Sustainable Building Research (CSBR) has launched a number of high-profile community and sustainability projects in recent years, helping to establish it as the Midwest's leading voice on resilience.

Through student design studios and partnerships with local firms, CSBR seeks to take architecture practice directly into the surrounding community, helping to forge a collaborative network that connects the best in academic, professional, and community-engaged design practices. The center develops projects to confront the grand challenges of our time, including climate change, disaster mitigation and the pressing need to not only imagine resilient futures, but to implement them.

The Upper Midwest has become no stranger to the 21st-century shocks

and stresses. Northern Minnesota and North Dakota have seen record flooding in the Red River Valley, the Great Lakes watershed faces increased depletion, and economic disparities continue to thwart community resilience throughout the region. The issues, which all subsequent generations will have to confront, will remain central to the CSBR and its mission.

The center has taken a variety of approaches, recognizing that resilience is not only the ability to bounce back after a disruption in the system, but a push to provide more productive, empathetic, equitable, and regenerative systems to address need in our communities. The CSBR will continue to drive forward new approaches and methods—from direct design assistance to policy, processes, and programming in the service of making existing systems more resilient.

**Forging a network that
connects the best in academic,
professional, and community-
engaged design practices**



Sandstone,
Minnesota

CASE STUDY | University of Minnesota

City of Sandstone: Roadmap to the Future

COMPLETION DATE

2016

COLLABORATORS

Architects, landscape architects, ecologist, local residents, city administrators, and architecture students

PROJECT TYPE

Research

BUILDING TYPE(S)

Non-construction project and detailed report

GEOGRAPHIC REGION

Upper Midwest

DENSITY

Rural

ENVIRONMENT/ECOLOGY

Interior (riverine)

NATURAL HAZARDS

Flooding, hail, tornadoes, blizzards and winter storms, earthquakes, and power outages

COMMUNITY ISSUES

Environmental degradation

AIA RESILIENCE QUALITIES

Regenerative, pride of place, and prepared

AIA RESILIENT DESIGN ATTRIBUTES

Addresses risks, smart site selection, of local place, and strives for self-sufficiency

Led by the Center for Sustainable Building Research, this research resilience project brought together local citizens and leaders to envision possibilities of a sustainable future for the small west central Minnesota town of Sandstone. Keeping in mind area's many current environmental and cultural assets, the overall goal was to create a master plan for a place of resilience, from social, environmental and an economic perspectives, in which to live, work, and play.

The project aimed to create a detailed roadmap for Sandstone to establish a synergy between existing natural, cultural and environmental assets. Through a series of community workshops, project leaders met with key organizations to devise a set of recommendations and potential projects to be built by the local partners.

While there was no large scale design, the project's primary underlying philosophy was inspired

by regenerative design—an approach that sees the human world and the natural world as intimate cohabitants. Core to this relationship and process are two essential stories, the 'story of place' and the 'story of people' who inhabit it.

In other words, Sandstone's history, social and cultural character, and its environmental setting are central to understanding its story and how it will evolve in the future. As such, the project considered the following: the region's natural sandstone, the presence of the Kettle River, a large timber industry, its days as a booming railroad community, and its current reputation as a recreational area.

Ultimately, project leaders recommended embracing the already established recreation economy by creating a recognizable Sandstone brand that builds upon its history while promoting the area's natural beauty and unique cultural institutions.

OPPOSITE | Top left and middle: University of Minnesota teams meet with Sandstone citizens during a community workshop. Top right: Project drawing highlights a new multifunctional and pedestrian-friendly downtown. Bottom: Buildings and parcels, shown in brown, are flagged for possible improvement or redevelopment. (Images provided by the University of Minnesota.)



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