RESILIENCE THROUGH CHANGE: PRINCIPLES IN ORGANIZATIONAL PLANNING & DESIGN

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RESILIENCE THROUGH CHANGE: PRINCIPLES IN ORGANIZATIONAL PLANNING & DESIGN

Sumegha is an architect at the Perkins+Will Atlanta office with 12+ years of experience education projects ranging from K-12 to Higher Education projects including student life, academic and housing projects as well as the particular needs medical and health science buildings. Her work supports agile learning environments through thoughtful planning and technical design that enables technology and enhances learning and collaboration. Sumegha is part of the global Perkins + Will Resilience lab which focuses on researching, developing and adapting strategies to increase the resilience of our buildings and our communities.
Resilient Design
Building + Communities that can survive, recover, grow and thrive when facing acute shock events or long-term stressors, through a combination of diversity, foresight and the capacity for self-organized and learning.
WHY RESILIENT DESIGN

▲ INCREASED OCCURRENCE /

of extreme natural events, acute events and on-going chronic issues.

▲ INCREASED AWARENESS OF AND DEMAND /

for resilient solutions by residents, business owners, and leaders at all levels in areas recently affected by acute events and those most likely to be affected in the future.
THE COST FACTOR

U.S. 2017 Billion-Dollar Weather and Climate Disasters

North Dakota, South Dakota, and Montana Drought
Spring–Fall 2017

Western Wildfires
Summer–Fall 2017

California Flooding
February 8–22

Colorado Hail Storm and Central Severe Weather
May 8–11

Minnesota Hail Storm and Upper Midwest Severe Weather
June 9–16

Midwest Tornado Outbreak
March 6–8

Central/Southeast Tornado Outbreak
February 28–March 1

Missouri and Arkansas Flooding and Central Severe Weather
April 25–May 7

Southeast Freeze
March 14–16

Southern Tornado Outbreak and Western Storms
January 20–22

Midwest Severe Weather
June 27–29

South/Southeast Severe Weather
March 26–28

Hurricane Harvey
August 25–31

Hurricane Irma
September 6–12

Hurricane Maria
September 19–21

This map denotes the approximate location for each of the 15 billion-dollar weather and climate disasters that have impacted the United States January through September of 2017, a record pace.
THE COST FACTOR

Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)
RESILIENCY PROCESS:
3 QUESTIONS TO CHANGE WORLDVIEWS
1. What are the climate projections in your project location?
2. What are its vulnerabilities as a result of those projections?
3. How does your design solution address those vulnerabilities?
WHAT IS RESILIENCY PLANNING?
PLANNING PROCESS

Information Gathering
PLANNING PROCESS

Identify Vulnerabilities

Shocks and Stressors workshop
PLANNING PROCESS

Identify Patterns
PLANNING PROCESS

Establish Proof

SEE Exercise outcomes
PLANNING PROCESS

Implementation
THREE STEPS...

1. Sourced from Rockefeller Foundation NDRC Academies

2. 

3. Sourced from Rockefeller Foundation NDRC Academies
RESILIENCY TOOLKIT

1. SHOCKS AND STRESSORS
TRADITIONAL ISSUES ON CAMPUS
Think before, between, and beyond…

- Campus police patrol and control operations.
- Shelter in place provision.
- CCTV & swipe-cards.
- Recycling programs.
- Flooding and surface water damage.
- Deferred maintenance.
**PROJECT SCHEDULE**

<table>
<thead>
<tr>
<th>PLANNING PHASE</th>
<th>2016</th>
<th>2017</th>
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<tbody>
<tr>
<td></td>
<td>DEC</td>
<td>JAN</td>
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<td>1. INITIATE</td>
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<td>2. DISCOVER</td>
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<td>3. BIG IDEAS</td>
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<td>4. DEVELOP</td>
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<td>5. REFINE</td>
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</table>

- Preparation (Dec 19 - Feb 6)
- Feb 6 - Mar 20
- Mar 20 - May 16
- May 16 - Jul 31
- Jul 31 - Oct 9

〇️ = Symposium (On-campus Workshop / Project Meetings / Presentations)

(DATE) = Target work phase dates (note: dates are approximate and work phases will have some overlap)

〇️ = Resiliency Workshop

〢️ = Design Team Internal Charrette
UNDERSTANDING CHALLENGES

**CHRONIC STRESSORS**
Lingering impacts from repeated exposure to social, environmental, and economic problems.

**ACUTE SHOCKS**
Quick impacts from extreme social, environmental, and economic events.
**CHRONIC STRESSORS**

Lingering impacts from repeated exposure to social, environmental, and economic problems.

**SOCIAL**
- Disease
- Low education
- Language barrier
- Limited diversity

**ECONOMIC**
- Insufficient Operating Funds
- Lack of Endowment
- Unemployment

**ENVIRONMENTAL**
- Air pollution
- Coastal erosion
- Drought
- Water scarcity
ACUTE SHOCKS /
Quick impacts from extreme social, environmental, and economic events

SOCIAL
- Bias crime
- Civil unrest
- Terrorism
- Infrastructure failure
- Fuel supply disruption

ECONOMIC /
- Loss of Donor Support
- Cyber attack
- Business closure
- Zero-out budget decision by legislature

ENVIRONMENTAL /
- Extreme rainfall
- Severe storm
- Fire
- Snow/blizzard
- Severe ice storm
Hazard
Shock or Stressor
STORM WATER

• Torrential rainfall on August 15, 2017, caused flooding on the Tech campus as well in areas around Russellville.

• A total of 2.78 inches fell in the early morning, predominately in the 5:30 a.m. – 7 a.m. time period.

East Entrance to Campus at O Street and Arkansas Ave.
• Target completion of an accessible circulation backbone of paths on campus

• Combine with removal of parking within campus core

• Include storm water management techniques ensuring accessibility during flood events
ORGANIZE

Evacuation Routes

TYPICAL CAMPUS PATH

SURFACE WATER FLOOD
RESILIENCY TOOLKIT

2. VULNERABILITY ASSESSMENTS
RISKS =

Hazard
Shock or Stressor

×

Consequence
Exposure or Vulnerabilities
Six shock and stressor groups were identified as potentially being most critical to the ATU campus locations.

- Stormwater Management
- Limited Transportation
- Infrastructure Failure
- Drought
- Civil Unrest
- Storm Preparedness
S-E-E MATRIX EXERCISE

SOCIAL

ECONOMIC

ENVIRONMENTAL
RESILIENCY TOOLKIT
3. STAKEHOLDER ENGAGEMENT
STAKEHOLDER IDENTIFICATION
Who?
Values
Interest
Influence

What?
Message

How?
Stage to Engage
Outreach Plan
Communications
Feedback
Integration
Resiliency is about continuing to work to solve complicated problems which will require:

Continued discussion necessary with:
- The Highways Department
- City of Russellville
- Corps of Engineers

Evaluation of every project to understand how it can contribute to reducing flood risk
RESILIENCY TOOLKIT

BENEFIT: COST ANALYSIS
1/ What are the Social, environmental, and economic projections in your project location?
Population of Arkansas (Projected and Estimated) (2010 to 2020)

Data Sources
Projections: University of Arkansas-Little Rock, Institute for Economic Advancement
Estimates: U.S. Census Bureau, American Community Survey, 1-year Estimates

Population Projection
+13% since 2010

Population Estimate
+2% since 2010
ECONOMIC DEVELOPMENT

https://datausa.io/profile/geo/russellville-ar/
RESILIENCE PRINCIPLES

Diversity / Designing with complementary perspectives enriches outcomes.

Redundancy / Designing for robustness reduces the likelihood of failures.

Nested Scales / Designing with an understanding of the relationships across scales enables greater leverage.

Adaptive Capacity / Designing with the assumption of innate change minimizes disruptions and encourages longer-term viability.

Foresight / Designing with broad interests and over longer timeframes enables understanding of trends and anticipation of risks.

Self-Organization / Designing that encourages the development of interconnections between environments and their occupants leads to stronger overall systems.
DICKENSON COUNTY OVERVIEW

- 334 Square Miles
- Population: 15,000
- 45 Residents Per Square Mile
- 21% Population Living in Poverty
- Poorest County in Virginia (134 Out of 134)
- Unemployment rate 9.2%
  National rate 5.2%
- Recent Job Growth -4.33%
  National Rate 1.59%
UNIFIED CAMPUS PLAN
3 Schools in 1
**RESILIENCE PRINCIPLES**

**Redundancy** / Designing for robustness reduces the likelihood of failures.

**Foresight** / Designing with broad interests and over longer timeframes enables understanding of trends and anticipation of risks.

**Nested Scales** / Designing with an understanding of the relationships across scales enables greater leverage.

Redundant infrastructure systems that serve the community in time of need.

Assess and anticipate risks of natural disasters and responding appropriately. Understanding the job market and providing specific marketable skills.

Develop a facility that serves students and teachers but the larger community as well, both in times of need and in times of community events.
RIDGEOVIEW PROJECT APPROACH

- Emergency Power System
- Built on High Ground
- Emergency Shelter
- Centralized Career Education
- Co-Located Middle School
CURRICULUM PLANNING
Embedded Career Programs

- Auto Mechanics
- Auto Body
- Welding
- Carpentry
- Masonry
- Cosmetology
- Graphic Design
- Drafting
- Culinary Arts
- Health Science
- Nursing
- Computer Science
CAREER READINESS
**TRADITIONAL PARADIGM:**

- **Instructor**
  - Sage on the stage
  - I teach, you learn
  - Actor

- **Student**
  - Subordinate
  - Empty vessel / Sponge
  - One in a group
  - Renewable Resource

- **Technology**
  - Tool

- **Libraries**
  - Stacks / books

**FUTURE PARADIGM:**

- **Instructor**
  - Guide by the side
  - We create knowledge together
  - Director

- **Student**
  - Colleague
  - Co-creator of content
  - Member of team
  - Targeted sale

- **Technology**
  - Enabler

- **Libraries**
  - Media Centers/ Starbucks / smart phones
“65% OF TODAY’S GRADE SCHOOL KIDS WILL END UP AT JOBS THAT HAVEN’T BEEN INVENTED YET.”

United States Department of Labor: Futurework - Trends and Challenges for Work in the 21st Century
## Design that Facilitates Resilient Learning

<table>
<thead>
<tr>
<th>Connectivity / Spaces That Share</th>
<th>Flexibility / Spaces That Transform</th>
<th>Creativity / Spaces That Inspire</th>
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</thead>
<tbody>
<tr>
<td>Student Centered Learning</td>
<td>Authentic + Differentiated Learning</td>
<td>Student Connectivity + Engagement</td>
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<tr>
<td>Collaboration</td>
<td>Furniture for Multiple Learning Styles</td>
<td>Real World Readiness</td>
</tr>
<tr>
<td>Small Learning Clusters</td>
<td>Facility Flexibility</td>
<td>Technology + Mobility</td>
</tr>
<tr>
<td>Transparency + Safety</td>
<td>Sustainability + Wellness</td>
<td>School Culture + Brand</td>
</tr>
<tr>
<td>Space That Perform</td>
<td>Diversity in Learning</td>
<td>Outdoor Learning</td>
</tr>
</tbody>
</table>

*Images of icons and symbols are included for each category.*
CLEMSON, SOUTH CAROLINA

- Lack of Cohesion & Collaboration
- Aging Infrastructure
- Shifting Macroeconomic Trends
- Lack of business partnerships
- Rural Location

SOCIAL
- Infrastructure failure

ECONOMIC
- Business closure

ENVIRONMENTAL
PLANNING PROCESS

• Extensive, well-planned process, with significant faculty involvement

• Potential uses

  – Classrooms
  – Creative Inquiry (undergraduate research)
  – Research and special projects
  – Academic resource areas
  – Simulation space for advanced analytics
  – Industry connections
INDUSTRY PARTNER NEEDS AND RESPONSES

• Graduates Who Have Ideas And Know How To Sell Ideas
• Cross-disciplinary Expertise
• Communication Skills
• Basic Financial Skills
• Teamwork
• Global Experience
• Ability To Be Life-long Learners
New facility must support

**RESILIENT EDUCATION TRENDS**

What are the critical skills our undergraduate students need?

- Technical depth in a particular field
- Creativity and innovation
- Entrepreneurial outlook
- Communication skills
- Ability to work well as a member of a diverse team
- Global knowledge and experience
- Commitment to lifelong learning
RE-ENVISIONING THE CAMPUS CORE

Research Office  Innovation Center  Library  Academic Success Center
SPACE CATEGORY:

• CORE SPACE + SUPPORT 6,395 NSF
  (LOBBY, CAFÉ, ACADEMIC RESOURCE, CONCIERGE)

• FLEX SPACE + SUPPORT 28,877 NSF
  (MEETING RMS, CLASSROOMS, VISUALIZATION, PROJECT ROOMS, LABS)

• OFFICE SPACE + SUPPORT 6,920 NSF
  (ADMIN, ACADEMIC, INDUSTRY)

• BUILDING SUPPORT 2,250 NSF
  (LOADING, WASTE, RECYCLING, STORAGE)

• ROOF TERRACE 5,228 NSF
  (EVENTS, OUTDOOR SEATING)

TOTAL NET SQ. FT. ~50,050 NSF
TOTAL GROSS SQ. FT. ~77,000 GSF
AUDIOVISUAL AND INFORMATION TECHNOLOGY

- 73 spaces with AV
- 4372 pieces of hardware  
  – 354 types  
  – 65 different vendors
- 191 large-screen, high-resolution, touch monitors
- 3D displays
- 12 video walls  
  – 8’x 5’ to 32’ x 9’
- 4 networks  
  – 2 x 10G → 2+ x 100G
- 3D laser projection in auditorium - 13’ x 8’ screen
- Videoconferencing
- Lecture capture in classrooms and studios
- Collaboration software  
  – Solstice  
  – Bluejeans  
  – Bluescape
RESILIENCY TOOLKIT

REFERENCE-ABLE BY GOVERNMENTS

CITED IN “STANDARDS AND FINANCE TO SUPPORT COMMUNITY RESILIENCE” BY OMB

PRECEDES LEED 2016 PILOT CREDITS
RELi RESILIENCY ACTION KIT

3 PART KIT
C3livingdesign.org / RELi

▲ ACTION LIST
Summary / 60+ Actions

▲ PROJECT TALLY
Tracking / Excel Spreadsheet

▲ CREDIT CATALOG / On-Line Reference Brief
Comprehensive / 200+ Actions and How-To-Use
**RELi REFERENCED ACTIONS**

**Unique RELi Prerequisites / Credits**
Hazard Preparedness, Social Cohesion, Regional Economics

**ANSI Integrative Process Standard** (MTS Developed)
**Integrative Living Design Planning Process** (University of Minnesota)

**Red Cross** Ready Rating Program for disaster preparedness
**FEMA 141 Guide**: Emergency Management Guide for Business + Industry
**U.S. Small Business Administration** + Prepare My Business.Org

**Fortified** for Safer Business Standard V1.0
**Urban Green** Building Resiliency Task Force, June 2013 Proposals (NYC)
**EPA Vulnerable Zone Indicator System** + EnviroFacts
**Nuclear Regulatory Commission** / Academy Of Sciences

**Envision** Sustainable Infrastructure Rating System V2.0
**Center for Active Design**
**Sustainable Sites** Rating System V2
**LEED V4 and V2009 / NC, ND + Schools**
**Energy Star / 2030 Palette**
RESILIENCY TOOLKIT
CLIMATE MODELING
Meet the Challenges of a Changing Climate

Find resources and a framework to understand and address climate issues that impact people and their communities.

1. Identify the Problem
2. Determine Vulnerabilities
3. Investigate Options
4. Evaluate Risks & Costs
5. Take Action
RESILIENCY OUTCOMES + OPPORTUNITIES

PLANNING PRINCIPLES:

- Mobility + clarity
- Gateways + community connections
- Clustering + collaboration
- Health and wellbeing of occupants and use
- Insurance premiums
- Business continuity
- Mitigating certain climate events
- Less reparation after an event
- Reducing pollution and waste
- Energy independence
THANK YOU. QUESTIONS?

Contact:

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