

# Community Resilience Through Integration of Robust Built Environment with Business Mindset

**Moderator:** 

Stephen Cauffman Presenters: Stephen Cauffman Terri McAllister Kent Yu Elizabeth Bradford

# Session Agenda (10:00am – 11:00 am)



- 1. The Role of Business in Community Resilience and Recovery
  - Stephen Cauffman, Foresight Consulting
- 2. NIST Community Resilience Planning Guide
  - Terri McAllister, National Institute of Standards and Technology
- 3. Oregon Resilience Plan and Implementation Update
  - Kent Yu, SEFT Consulting Group
- 4. Business & Community Resilience
  - Elizabeth Bradford, Michael Baker International
- 5. Audience Q+A



# The Role of Business in Community Resilience and Recovery

Stephen Cauffman

Foresight Consulting LLC

## **Defining Resilience**

- Resilience is defined as: "The ability to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover quickly from disruptions." (NIST, 2016)
- The key elements that make up a community and contribute to resilience are:
  - Buildings and infrastructure
  - Social systems
  - Economic systems
  - Natural environment
- Using restoration of tax base as a goal, a prioritized action plan can be developed to guide investments and actions that lead to resilient outcomes
- Business plays a central role in the planning process

# Why Focus on Tax Base

- The tax base funds:
  - Public safety services
  - Utilities and infrastructure
  - Schools and health services
  - Other government services

Community Services Funded by Tax Base (Source: ICMA, U.S. Census Bureau)



# **Contributors to Tax Base**



Revenue Source	Small Towns	Mid-Size Cities	Large Cities
Property Taxes	60-85%	40-60%	30-50%
Sales Taxes	0-10%	10-25%	15-30%
Business Taxes/Licenses	1-5%	5-10%	10-20%
Utility Taxes/Franchise Fees	2-5%	5-10%	5-10%
Hotel Occupancy Taxes	0%	1-5%	5-15%
Vehicle Related Fees	1-3%	1-3%	1-5%
Special Assessments/Districts	0-2%	1-3%	1-3%

- Property taxes are largest contributor to tax base and restoring tax base is critical to successful recovery following disruption
- Keeping people in place and contributing to tax base will require access to employment (income), safe housing, access to essential goods and services
- Business is central to meeting recovery objectives

## **Role of Business**

- Employment and income generation
- Regional/national/global economic links
- Source of essential goods and services for the community
- "Third spaces" places where people gather, build social connections, exchange knowledge and information

## Importance of Restarting the Local Economy

- Prevent displacement of residents
- Restore or maintain property values
- Avoid economic collapse 40-60% of small businesses fail to reopen after major disasters (Source SBA, FEMA)
- Even among businesses that do reopen, 25% fail within one year
- Availability of financing and the time needed for approval can be a barrier
- Lack of business interruption insurance can create a gap in financial recovery

### Small Business Cash Reserves (Buffer Days) Source: JPMorgan Chase Institute



## **Case Study: New Orleans Post-Katrina**

- Factors that slowed recovery:
  - Severe infrastructure damage delayed reopening
  - Bureaucratic bottlenecks in aid and loans
  - Mass displacement shrank local markets
  - Zoning changes and regulatory uncertainty
  - Disproportionate impact of small/minority owned businesses
- New industry growth
  - Widespread damage created a "blank slate"
  - Influx of entrepreneurs and outside capital
  - Rise of creative, tech, and food industries
  - Cultural revival attracted tourism and new residents
  - Anchor institutions, local universities and hospitals helped attract investment in healthcare and biosciences

## **Reflection: The Importance of Resilience Planning**

- The experience of New Orleans post-Katrina illustrates:
  - Without a proactive, comprehensive recovery vision, recovery becomes reactive and market-driven
  - New industries emerged, but legacy businesses and vulnerable populations often bore the costs
  - Delay, fragmentation and inequity in recovery highlight the need for:
    - Pre-disaster economic and resilience planning
    - Inclusive engagement of local businesses and communities
    - Clear recovery objectives that balance innovation with equity
- Lesson: Strong pre-disaster planning sets the stage for faster, fairer, and more resilient recovery outcomes

## **Case Study: Joplin, MO Tornado Recovery**

- Pre-disaster planning
- No comprehensive recovery framework existed before the tornado
- The Citizens Advisory Recovery Team (CART) quickly formed post-disaster to set recovery objectives
- Business Reopen Rate and Success Factors
  - Approximately 90% of businesses reopened within 2 years
  - Key factors
    - Strong local leadership and coordination
    - Fast-tracked permitting and waived fees
    - Access to capital (CDBG-DR, public-private partnerships)
    - Strong community support and insurance coverage
- Temporary facilities:
  - Schools reopened within 55 days using temporary structures
  - Popup medical clinics and mobile health units
  - Popup retail and food trucks
  - Modular churches and nonprofit service hubs

## **Reflection: Lessons from Joplin's Recovery**

- Joplin had no pre-disaster long-term recovery plan but quickly mobilized community-led planning
- Unified vision and clear objectives allowed effective alignment of resources
- High business survival rate driven by supportive policies, funding, and community loyalty
- Flexible use of temporary facilities (schools, clinics, businesses) preserved community stability
- Lesson: Strong local leadership, inclusive engagement, and swift adaptive action can overcome the absence of pre-existing recovery plans and deliver resilient outcomes

## **Conclusion - Linking Back to Resilience**

- Business continuity is key to social and economic recovery
- Resilience planning ensures faster, more equitable outcomes
- Business resilience is central to achieving resilient outcomes at the community level





# NIST Community Resilience Planning Guide

Terri McAllister, PhD, PE, Dist.M.ASCE May 21, 2025

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May 21, 2025

Resilience

*Resilience* is the ability to *prepare for* and *adapt to* changing conditions and to *withstand* and *recover rapidly* from disruptions. (NIST, NASEM)

Resilience is a comprehensive concept that:

- Includes traditional prescriptive design to minimize risks (damage, life safety)
- Adds functional recovery (services, intended use) through performance-based design to minimize direct and indirect consequences





# **Resilience for Communities**



*Community resilience* goals address how a community *recovers its functions* in a specified timeframe.

*Goals* vary for urban, suburban, and rural communities.

https://www.nist.gov/community-resilience

- Community resilience requires a systems approach.
- Social needs and functions should drive the performance goals of buildings and physical infrastructure.



# **Community Resilience Planning Guide**



### Key Parameters

- **Community goals** to align all plans
- **Data** to inform interconnected models

Performance
 assessments – current
 and future – based on
 proposed policies

 Metrics to measure status and changes over time



# **CRPG Hazards**

### Define community hazards and levels.

A better understanding of a community's performance in terms of hazards and levels can be found by using three levels for each prevailing hazard:

- **Routine events** are more frequent but should cause minimal damage and no loss of community functions.
- Design events are specified in building codes and used to design the built environment. When the built environment meets current codes, there should be minimal damage or loss of community functions.

**Extreme events** are defined in building codes for some hazards; they may cause extensive damage. Extreme events are evaluated to determine if critical functions will be available after a hazard event.



## Natural Hazards ASCE 7 Standard

- Flood
- Wind
- Earthquake
- Tsunami
- Rain, Snow, Ice

### Future Considerations

- Temperature
- Sea Level
- Precipitation
- Wildfire
- Drought
- Wind

# **Linking Built and Social Systems**





**Building Innovation Conference 2025** 20

# **Time to Recover Function**





Functionality measures how well a building or system operates, delivers required services, or meets its intended purpose.

### Time to recovery of function

measures how long it takes a building or infrastructure system to provide services after failure/damage.

FEMA P-2090/NIST SP-1254



# **Performance Goals for Functional Recovery**

### **Summary Performance Goals Matrix**

	Design Hazard Performance								
Summary Resilience Table	Phase 1: Short-Term			Phase 2: Intermediate			Phase 3: Long-Term		
	Days		Weeks		Months				
	0	1	1-3	1-4	4-8	8-12	4	4-24	24+
		Critical I	Facilities						
Buildings	90%							X	
Transportation		90%	Х						
Energy		90%	Х						
Water			90%		Х				
Wastewater				90%				Х	
Communication	90%			Х					
		Emergenc	y Housing	J					
Buildings				90%					Х
Transportation			90%	Х					
Energy			90%	Х					
Water			90%		Х				
Wastewater				90%				Х	
Communication				90%	Х				
	Но	using/Nei	ighborhoo	ods					
Buildings						90%			Х
Transportation			0.00/	v					

### Green Box - 90% Functionality Goal

### Blue Box -Anticipated Performance

The difference informs prioritization of critical projects



### https://in-core.org/

http://resilience.colostate.edu



NIST Financial Assistance Awards Number: 70NANB15H044 & 70NANB20H008

## **Based on an Integrated Community Model**

### Buildings...

Resilience







**Physical** infrastructure



IN <mark>- CORE</mark>

NIST





### Social (households, institutions)

Investment

vestmen

Impor

# **Community and Business Resilience**



- Develop performance goals that include functional recovery
- Assess current and future exposure and interdependencies
- Identify primary risks and hazards
- Evaluate potential solutions for new and existing infrastructure
- Prioritize investments
  - Infrastructure vulnerabilities
  - Social and community consequences

**Tyndall AFB, FL** NOAA photo

### Hurricane Michael, 2018







# Oregon Resilience Plan and Implementation

Kent Yu, PhD, PE, SE SEFT Consulting Group

# **Cascadia Subduction Zone**





# **Oregon House Resolution 3**





76th OREGON LEGISLATIVE ASSEMBLY--2011 Regular Session

## Enrolled House Resolution 3

Sponsored by Representative BOONE; Representatives COWAN, KRIEGER, ROBLAN, WITT, Senators COURTNEY, JOHNSON, KRUSE, VERGER, WHITSETT

Directs Oregon Seismic Safety Policy Advisory Commission (OSSPAC) to "lead and coordinate preparation of an Oregon Resilience Plan that . . . makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia (megathrust) earthquake and tsunami."

Focuses on physical infrastructure

# **Oregon Resilience Plan**





50-year Comprehensive Plan

**Cascadia Earthquake Scenario** Business/Workforce Continuity **Coastal Communities Critical & Essential Buildings** □ Transportation **Energy** □ Information and Communication Water & Wastewater

(Download it from <a href="http://www.oregon.gov/OMD/OEM/osspac/docs/Oregon\_Resilience\_Plan\_Final.pdf">http://www.oregon.gov/OMD/OEM/osspac/docs/Oregon\_Resilience\_Plan\_Final.pdf</a>)

# **Business and Workforce Continuity**

 Business can only tolerate two to four weeks of disruption of essential services



# Target States of Recovery for the Built Environment



Phase Time Frame

Short-Term Hours to days

**Focus of Attention** 

Secure, Rescue, Stabilize, Clear Routes

EOC's,

Hospitals,

Police and Fire Stations,

**Emergency Shelters** 

(Animal Shelters)

Lifeline Infrastructure to provide services to this group of buildings





## Target States of Recovery for the Built Environment



PhaseTime FrameIntermediateWeeks to Months

Essential County/City Services

Residential Housing,

Schools/Daycare Centers,

Community retail centers,

Financial and Banks

Buildings – "safe and useable during repair" Lifeline infrastructure provide services to this group of buildings Focus of Attention

Restore neighborhoods – Meet social needs





# Target States of Recovery for the Built Environment



PhaseTime FrameLong-TermMonths to yearsrecoveryImage: Second se

Industrial Buildings Commercial buildings Historic buildings **Focus of Attention** 

### Long term social & economic



Building -"Safe and usable after repair" "Safe but not repairable" Complete 100% reconstruction of lifeline infrastructure within less than 3 years

# Significant Resilience Gaps

Critical Services		Zone	Est Ree	imated Average covery Time
Electricity		Valley	1 tc	o 3 months
Drinking Water		Valley	6 m	onths to 1 year
Sewer		Valley	1 t	o 3 years +
Top-priority highways restoration)	(partial	Valley	6 to	0 12 months
Critical Building Category	Zone	Estimated Average Recovery Time	9	Resilience Target
Healthcare Facilities	Valley	18 months		Immediate
Police and Fire Stations	Valley	2 to 4 months		Immediate
Emergency Shelters	Valley	18 months		72 hours
K-8	Valley	18 months		30 days
High Schools	Valley	18 months		30 days

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# **Resilience Progress in Oregon**



- 1. State Chief Resilience Officer
- 2. Healthcare
  - Oregon Coastal Hospital Resilience Project
  - Hospitals in Portland Metro Area
- 3. Continuity of Government
  - Oregon Treasury Building
  - Oregon State Capitol
  - Central Oregon Ready Response
     Resilient
  - City of Portland Emergency
     Communications Center

- 4. Police and Fire Stations
- 5. Schools/Emergency Shelters
  - Beaverton and Lake Oswego
     School Districts
  - Seaside School District



# **Resilience Progress in Oregon**



- 1. Transportation
  - Aviation (Oregon Dept of Aviation, Port of Portland)
  - Roads and Bridges (ODOT and various counties)
- 2. Energy
  - Electric Power (BPA, PGE, Central Lincoln)
  - Liquid Fuel (2022 Senate Bill 1567)
- 3. Water
  - Cities and districts in Portland Metro (PWB, TVWD, JWC, and more)
  - Salem, Corvallis, and EWEB
  - Astoria, Seaside, and Warrenton (Coastal Region)

- 4. Wastewater
  - Portland Metro Area (Portland BES, CWS, Gresham, and more)
  - MWMC





# Business & Community Resilience

Elizabeth J. Bradford, MS, ENV SP VP, National Resilience Lead Michael Baker International

# **Resilience Defined**



**Resilience.** The ability to anticipate, prepare for, and adapt to changing conditions; and withstand, respond to, and recover rapidly from disruptions.



## Managing Risk

Both Communities and Businesses Seek to Understand and Manage Risk & Impact

Acute Shocks	Chronic Stressors
Extreme Weather	Aging Population
Earthquakes	Environmental Degradation
Wildfires	Sea Level Rise
Health Epidemics	Drought & Water Shortage
Flooding	Species Extinction
Blizzards	Aging Infrastructure
Terrorism and Civil Hazards	Population Shifts
Infrastructure Failure & Collapse	Global Warming
Subsidence & Liquefaction	Increased Pollution
Chemical Spills & Biohazards	Food Availability
Supply Chain Disruptions	Overtaxed/Inefficient Infrastructure
Cyberthreats	Financial Shortages

Communities and Businesses must quantify, qualify, minimize, mitigate, and offset risks and their impacts, across:

- Systems:
  - Built & Natural
  - Economic & Financial
  - Social & Political
- Project Phases:
  - Planning
  - Design
  - Procurement
  - Construction & Commissioning
  - Operations & Maintenance
  - Decommissioning



Minimize &

Mitigate

Offset

**Quantify &** 

Qualify

## **Our Approach**

Our Resilience Approach Encompasses Our Business and Our Projects

## **Resilient Business**

- **Our People.** We provide our people with fulfilling careers where they attain personal and professional satisfaction.
- Our Services. We make a demonstrable difference in the communities in which we live and serve.
- **Our Strategy.** We continuously innovate and deliver outstanding service to our clients.

### **Project Delivery** a sparenness RESPONS **Pre-Disaster** Emergency Management DISASTER MANAGEMENT Risk Infrastructure & Services Assessment & Planning Restoration **HIGATION**

Reconstruction

## **Building Business Resilience**

Expanding and Defining Capabilities to Position for Growth

### **2025 ENR RANKINGS**



- **27** Top 500 Design Firms **18** Top 100 Pure Designers
- **5** Bridges\*
- 6 Dams & Reservoirs\*
- 13 Transportation
- **15** Water Supply
- **16** Construction Management\*
- 16 Highways\*
- 18 Airports\*
- 21 Mass Transit & Rail\*
- \* 2024 ranking; 2025 not yet reported.









Rail / Transit





Architecture



Aviation









Bridges/Structures

Highway

Survey / Mapping



Land Development

Construction

Services

#### **Technology Solutions** / Cybersecurity







Traffic / ITS

Water Resources













Design-Build



Planning

Public Outreach

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## **Building Business Resilience**

Expanding and Defining Capabilities to Position for Growth



# Realigning Organization to Position for Growth Markets

### STRATEGICALLY COLLABORATING VIA THREE OPERATING VERTICALS



# Building Business Resilience



Resilient Rebuild: Installation of the Future

### Project Background

- Hurricane Michael (2018) damaged 484 out of 693 buildings requiring 120 new facilities, and restoration of 260 buildings.
- Rebuild will provide enhanced warfighter quality of life, while addressing a broad range of future risks.
- BIM model will integrate rebuild across zones
- Team conducting cybersecurity review for Installation Resilience Operations Center (IROC).

### Communities Should:

- Reimagine and rebuild for the future, integrating technology advancements and cybersecurity.
- *Remove silos for a comprehensive rebuild effort.*



**Tyndall Planning and Design Integrator** US Army Corps of Engineers, Tyndall Air Force Base, Panama City, FL

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Reconstructio

Critical Infrastructure: Energy Security

### **Project Background**

- State required an initial statewide energy plan.
- Evaluated energy generation, distribution and transmission for across state.
- Team recommended actions that pave the way to a more affordable energy future.

### Communities Should:

- Work with state, utilities, and local stakeholders to assess critical infrastructure.
- Include a broad range of threats.
- Develop action plan to address risks, prioritize projects, and identify funding mechanisms.



States and a state of the state

Pre-Disaste Activities

Risk

Alaska Energy Security Task Force Report Alaska Energy Authority, Statewide, Alaska

Extreme Weather Response: Eastern Kentucky Bridge Flood Response

### Project Background

- Caused by drought followed by heavy rain.
- 1,100 bridges across seven counties required inspection.
- Existing bridge inspection teams mobilized.
- Followed by design for 11 bridge replacements.

### Communities Should:

- Ensure they have they have flexible contracts in place before disaster strikes.
- Ensure that all critical infrastructure is covered.



**Eastern Kentucky Bridge Flood Response** Kentucky Transportation Cabinet (KYTC)

Emergency Managemen

> nfrastructure & Services

Natural & Manmade Event Recovery: Wildfires

### Project Background

- 8,100 individual fires across ~4.5 million acres.
- California's Napa, Sonoma, Mendocino, Lake, Solano, Yuba and Yolo counties.
- Recovery required a wide range of environmental services.
- Smart Sheets and GIS were used to expedite cleanup.
- Dashboards were developed to track progress.

### Communities Should:

- Remember recovery requires an environmental team to address biological and cultural resources, water quality, historic property compliance and other factors.
- Leverage technology to improve efficiency, and document & track progress.



Inland Fire Wildfire Recovery The California Department of Resources Recycling and Recovery

nfrastructure & Services

Reconstructio

Assessments, Planning & Adaptation: Continuous Improvements

### **Project Background**

- Conducted Sea Level Rise Vulnerability Assessment.
- Developed Sea Level Rise and Climate Change Adaption Plan.
- Completed Avalon Harbor Emergency Seawall Repairs.
- Updated Coastal Hazards Section of Local Coastal Program.

### Communities Should:

- Conduct comprehensive risk and vulnerability assessments.
- Develop adaptation plans and conduct project prioritization.
- Crosswalk projects to funding mechanisms.



Pre-Disaste Activities

**Coastal Climate Change Adaptation** City of Avalon, California





Communities, businesses and people should:

- Consider the full range of risks.
- Evaluate potential impacts to support staff and businesses needed to support rebuild.
- Develop robust multi-hazard strategies.
- Secure flexible and broad contracting mechanisms, including technology support.
- Track trends and build connections to eliminate silos.
- Identify your part in the solution.
- Then, remember that no plan survives first contact.
- We must be flexible and nimble to allow for easy pivoting in response to events.





# **Audience + Panel Discussion**