

# **Convergence:** Coming Together to Advance Hazards and Disaster Research

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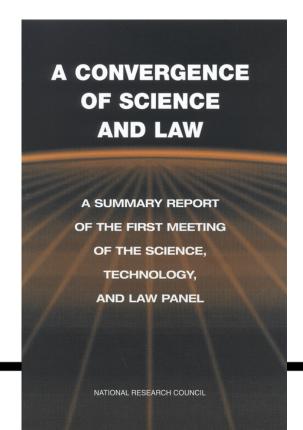


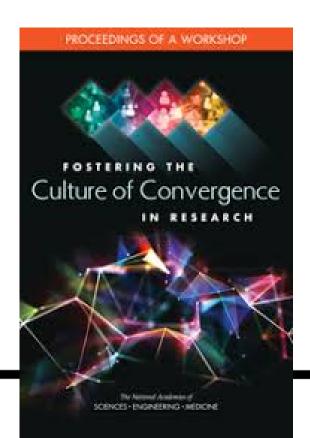


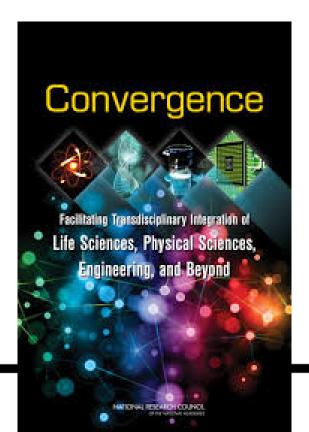


# What is convergence?

















#### What is convergence research?

convergence involves teams working together in novel ways—crossing disciplinary and organizational boundaries—to solve vexing social, environmental, and technical challenges



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convergence involves **teams** working together in novel ways—crossing disciplinary and organizational boundaries—to **solve** vexing social, environmental, and technical **challenges** 

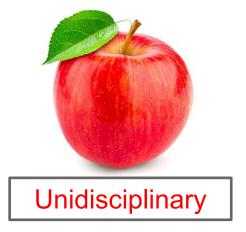






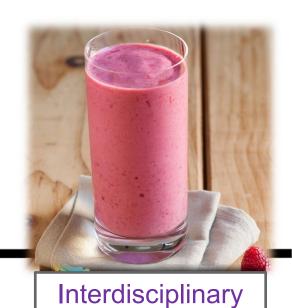


# How is convergence research different than other forms of research?



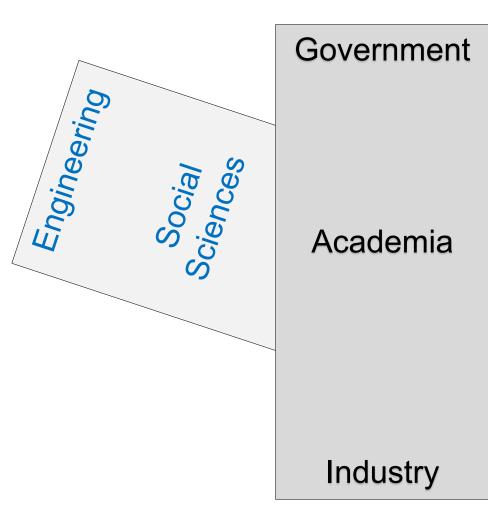


Multidisciplinary



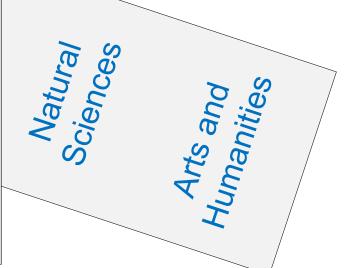
Transdisciplinary

Convergence builds upon principles of interdisciplinary research and relies on webs of partnerships.

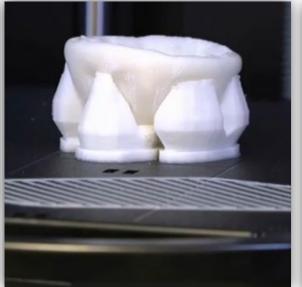


**Convergence Principles** 

- Start with a complex problem that requires interdisciplinary collaboration
- Work toward applications and solutions







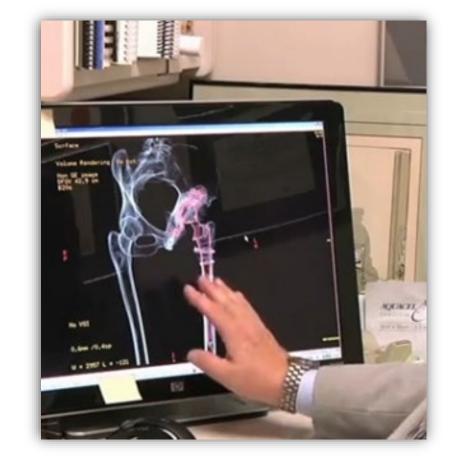




# Convergence in Action

Diagnose the Problem





Convergence inaction



Convergence *in*action

> Diagnose the **Problem**



Diagnose the Problem and Find the Cure

### Convergence in Action



# What is the problem we are trying to solve as a hazards and disaster research community?

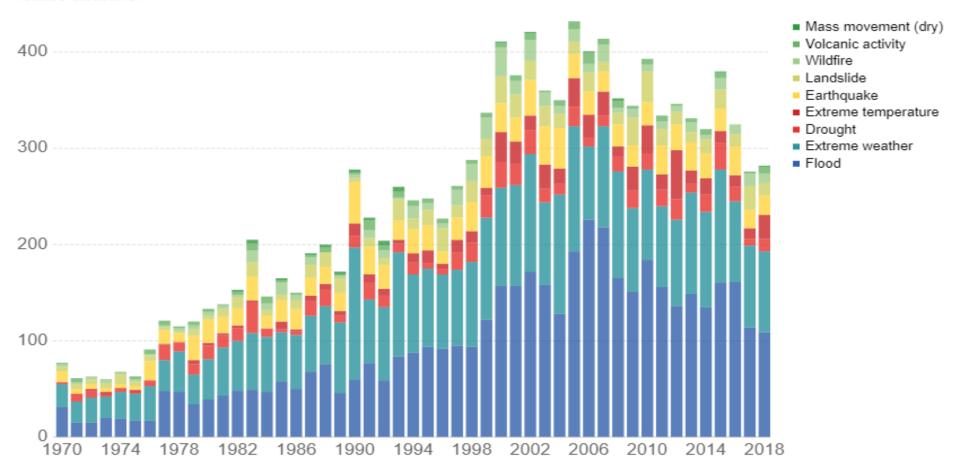


## What is the problem we are trying to solve as a hazards and disaster research community?

#### Global reported natural disasters by type

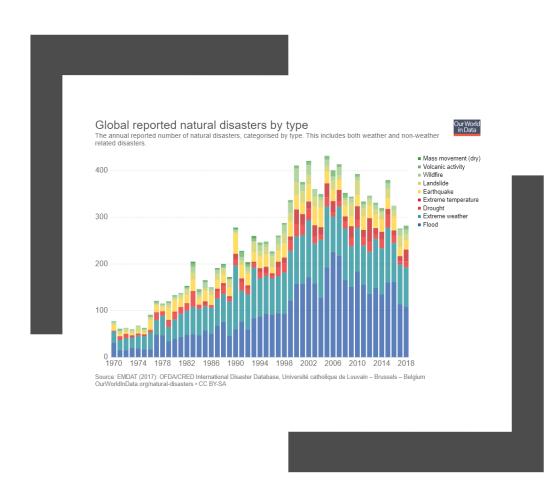


The annual reported number of natural disasters, categorised by type. This includes both weather and non-weather related disasters.



Source: EMDAT (2017): OFDA/CRED International Disaster Database, Université catholique de Louvain – Brussels – Belgium OurWorldInData.org/natural-disasters • CC BY-SA

#### What is driving rising disaster losses?



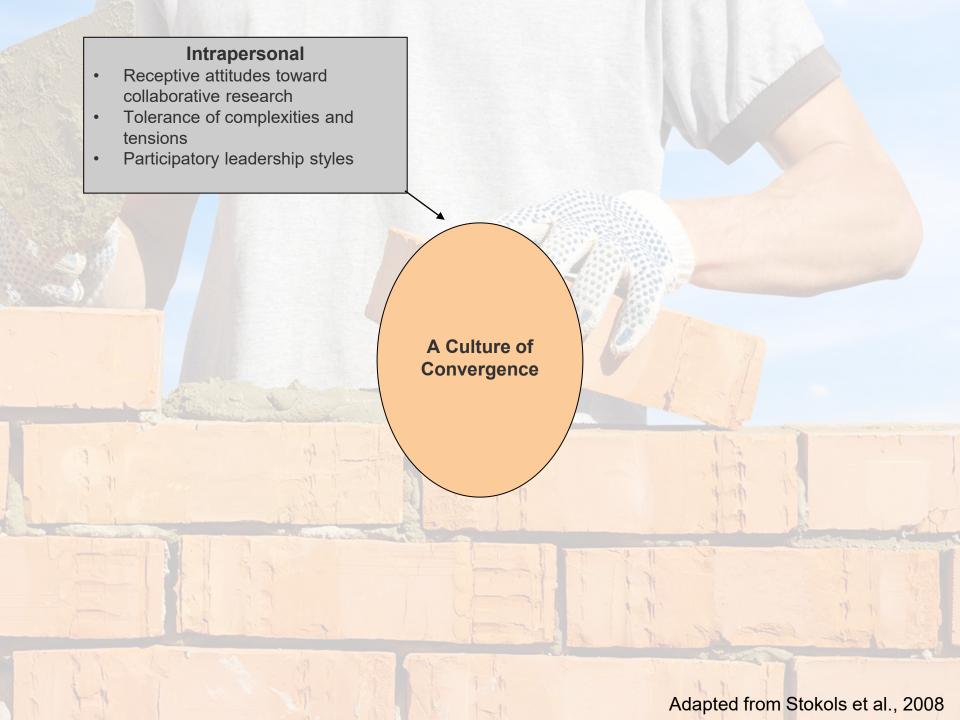
- ✓ Population growth
- ✓ Population dynamics
- ✓ Unsustainable development
- ✓ Poor land use planning
- Aging and decaying infrastructure
- ✓ Poorly designed infrastructure
- ✓ Lack of building code adoption / enforcement
- ✓ Social and economic inequality
- ✓ Political intractability
- ✓ Corruption
- ✓ Focus on emergency response rather than mitigation and adaptation
- ✓ Climate change
- **√** +++++++++++++++++

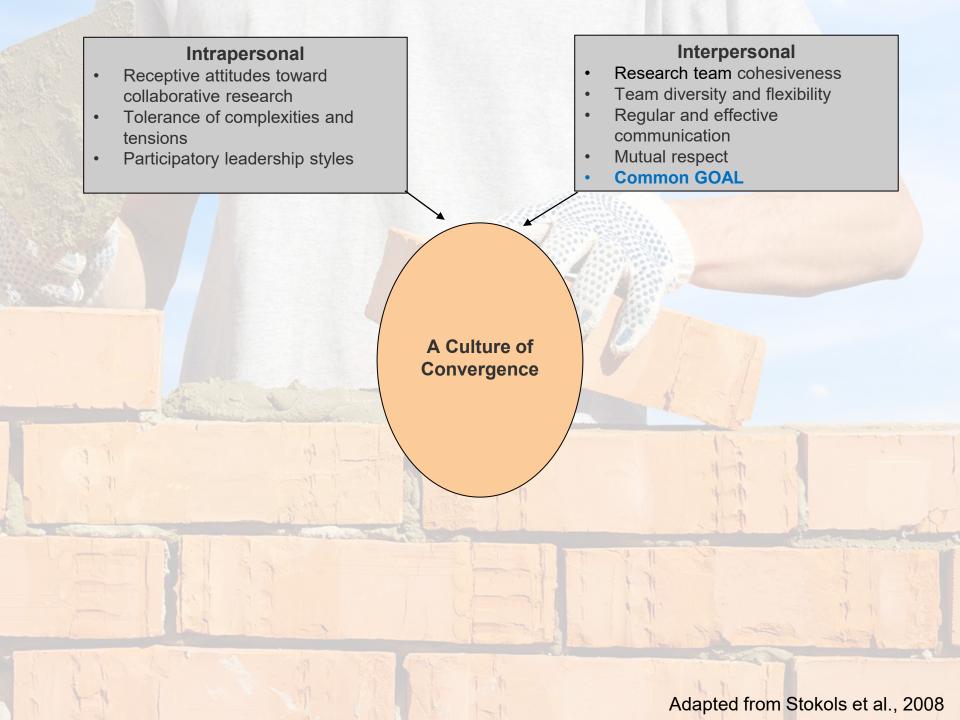


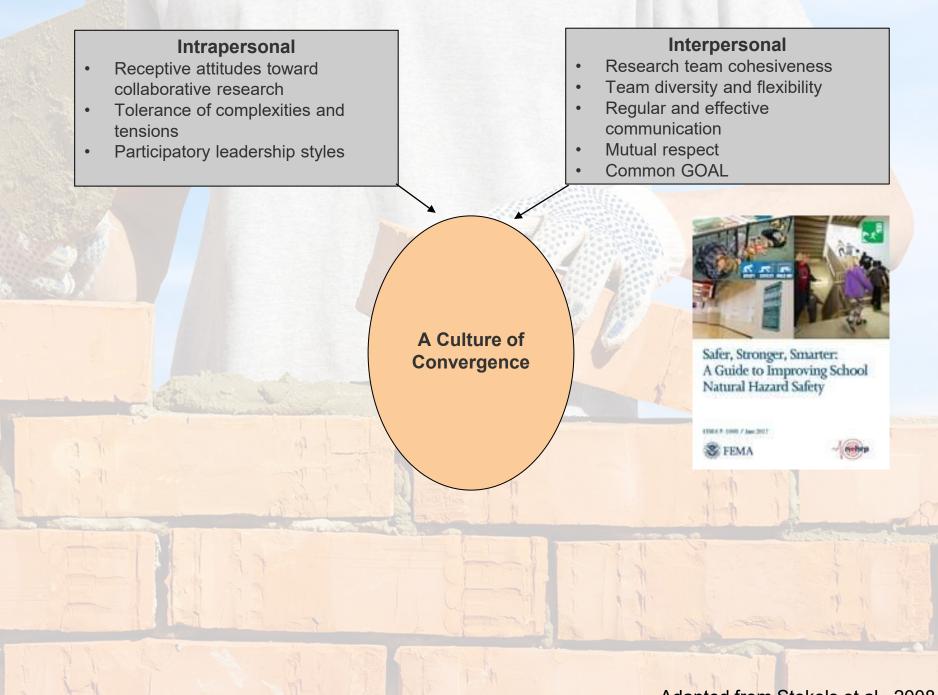
The rising challenges we face require a cultural shift toward convergence

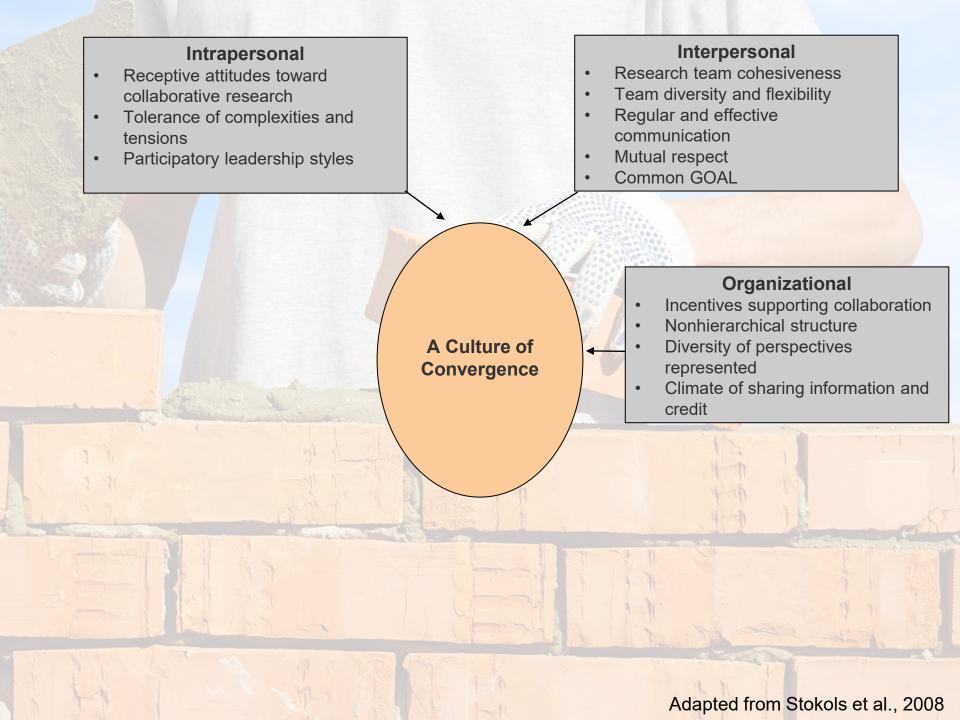


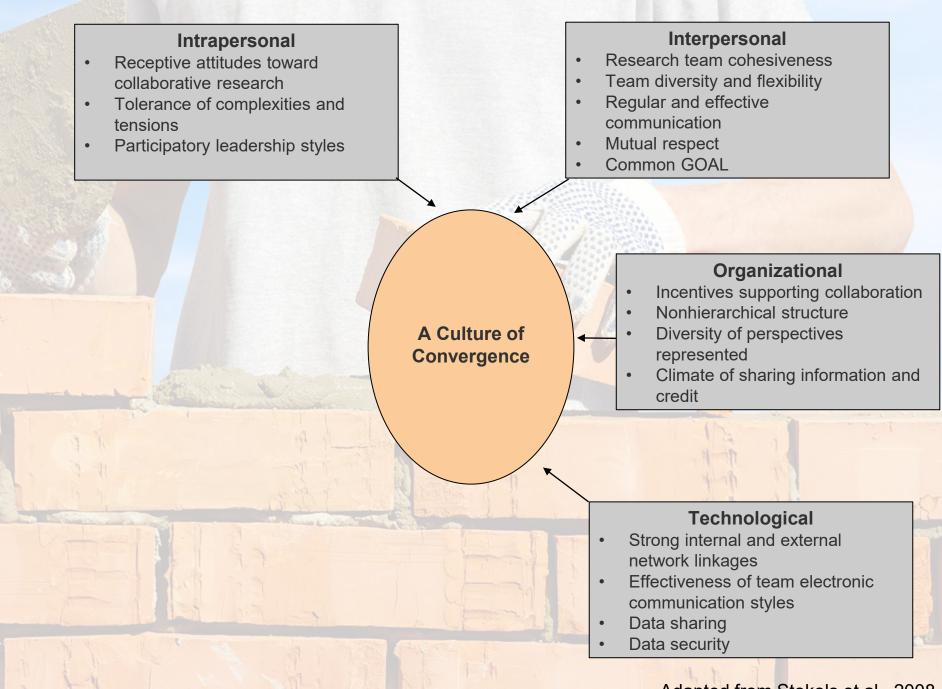








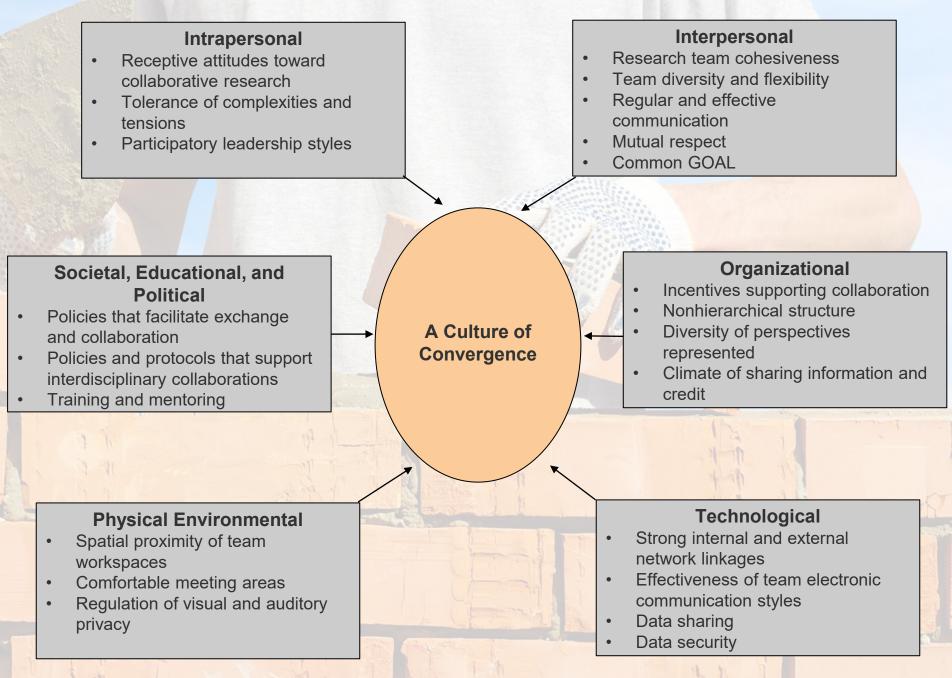




Adapted from Stokols et al., 2008

#### Interpersonal Intrapersonal Research team cohesiveness Receptive attitudes toward Team diversity and flexibility collaborative research Regular and effective Tolerance of complexities and communication tensions Mutual respect Participatory leadership styles Common GOAL **Organizational** Incentives supporting collaboration Nonhierarchical structure **A Culture of** Diversity of perspectives represented Convergence Climate of sharing information and credit **Technological Physical Environmental** Strong internal and external Spatial proximity of team network linkages workspaces Effectiveness of team electronic Comfortable meeting areas communication styles Regulation of visual and auditory Data sharing privacy Data security

Adapted from Stokols et al., 2008



Adapted from Stokols et al., 2008



National coordination on convergence is needed to support the infrastructure to solve emerging problems that transcend traditional boundaries. Stakeholders across the ecosystem of convergence ... should collaborate to build awareness of the role of convergence in advancing science and technology and stimulating innovation for the benefit of society (p. 13, National Academy of Sciences, 2014).







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Extreme

**E**vents

Reconnaissance

**Networks** 



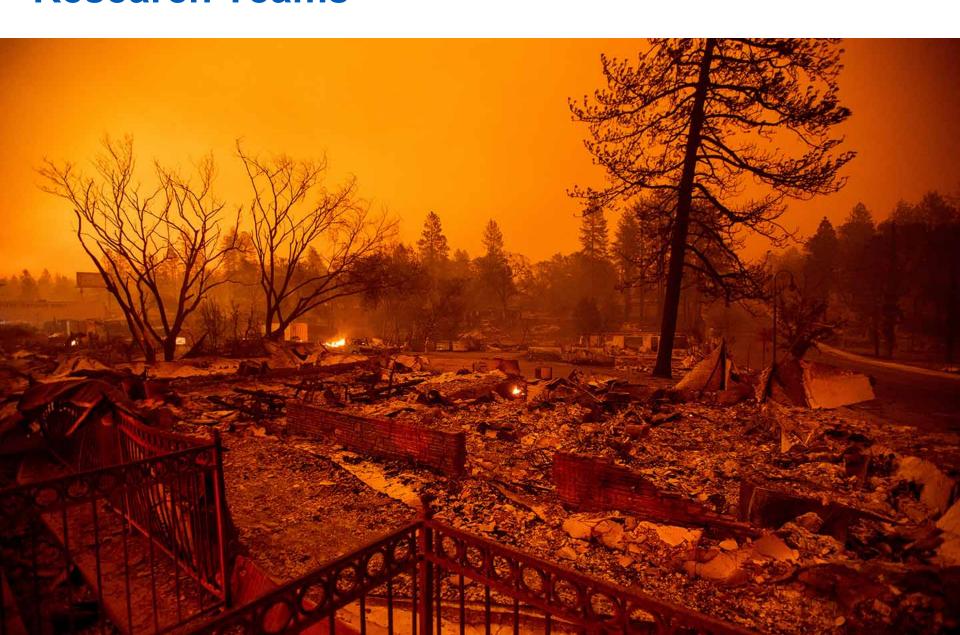














## **Identify and Coordinate Researchers and Research Teams**



























### **Training Module Overview**

This Training Module focuses on social vulnerability to hazards and disasters, with an emphasis on population groups that have been identified in the literature as especially at risk to the adverse effects of extreme events.



Module Content

By the end of this module, you should be able to:

### Lesson 1: Background

- 1. Define social vulnerability;
- 2. Understand the conditions and drivers that influence social vulnerability to hazards and disasters in the United States;
- Identify potentially vulnerable groups and recognize the physical, psychological, and social factors that may amplify their vulnerability to hazards and disasters:

### Lesson 2: Methodological Approaches

- 1. Explain the primary methodological approaches to studying social vulnerability;
- 2. Underscore the importance of the ethical conduct of research;

### Lesson 3: Knowledge to Action

- 1. Recognize how studying potentially vulnerable populations improves hazards and disaster practice and policy;
- Understand how research on vulnerable populations can positively improve outcomes for individuals and can enhance community resilience:

#### Lesson 4: Future Directions

- 1. Recognize future directions for social vulnerability research; and
- 2. Learn about additional resources that support hazards and disasters research on vulnerable populations.

#### Quiz

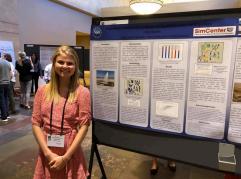
At the close of the module, you will have the opportunity to take a 10-question quiz. If you get 8 out of 10 questions correct, you will receive a certificate of completion for this module.

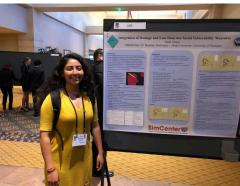


#### Module Home

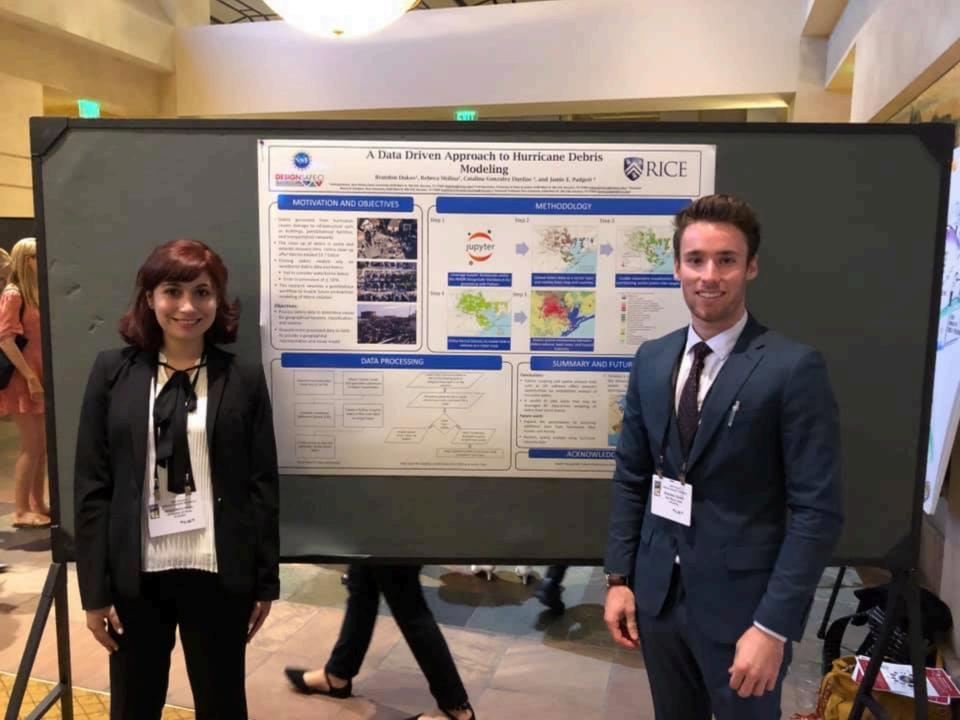
- PRE-MODULE ASSESSMENT
- BACKGROUND
- Defining Social Vulnerability
- Understanding Conditions and Drivers of Social Vulnerability to Disasters
- Vulnerable Populations
- Knowledge Check
- METHODOLOGICAL APPROACHES TO STUDYING SOCIAL VULNERABILITY
  - Qualitative Approaches
  - Quantitative Approaches
- Mixed Methods Approaches
- Secondary Data Approaches
- Ethical Considerations for Vulnerable Populations Research
- Knowledge Check
- INFORMING POLICY AND PRACTICE
- Allocating Resources
- Informing Messaging and Communications
- Advancing Training and Development
- Developing Policies to Safeguard
   Vulnerable Populations
- Improving Disaster Outcomes Among Vulnerable Populations
- Knowledge Check
- FUTURE DIRECTIONS FOR RESEARCH
- 10 Recommendations for Future Social Vulnerability Research
- POST-MODULE ASSESSMENT
- SOCIAL VULNERABILITY AND DISASTERS















Disaster Mental Health

Cultural Competence in Hazards and Disaster Research

Conducting Emotionally Challenging Research

IRB Procedures for Hazards and Disaster Researchers Broader Ethical
Considerations for
Hazards and Disaster
Researchers

Social Science
Methods and
Approaches for
Hazards and Disaster
Research

Interdisciplinary
Methods and
Approaches for
Hazards and Disaster
Research

Forming
Interdisciplinary
Teams for Hazards
and Disaster
Research

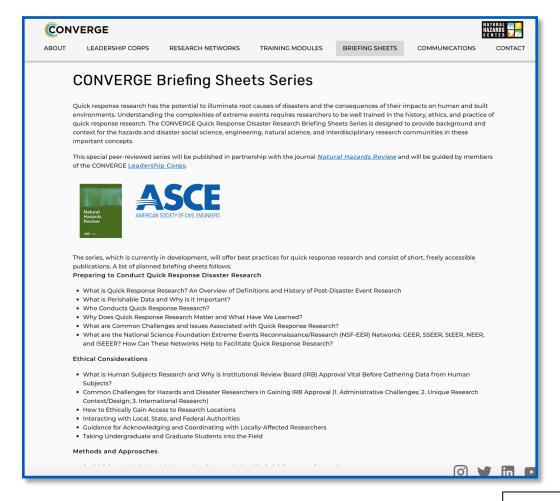




Publishing Disaster
Data, Data Collection
Protocols, and
Research Instruments

Public Disaster
Science: Best
Practices for Sharing
Research

# Provide Best Practice Guidance for the Ethical Conduct of Extreme Events Research







# Establish and Support the SSEER and ISEEER Networks











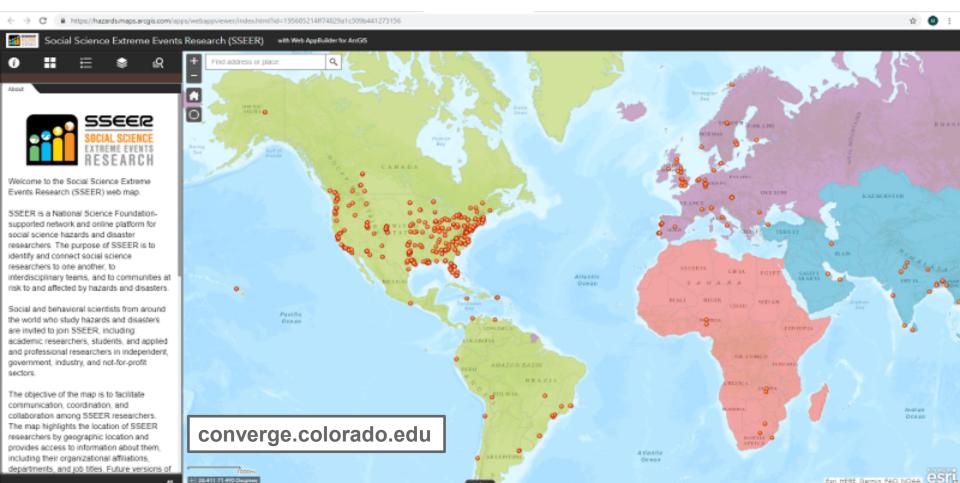
### Social Scientists Have Joined

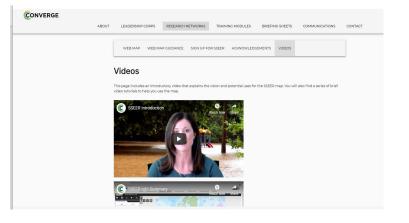
### **JOIN NOW**



### A Call to Social Scientists:

### converge.colorado.edu/Join-SSEER







## A **network** for social and behavioral scientists who study hazards and disasters

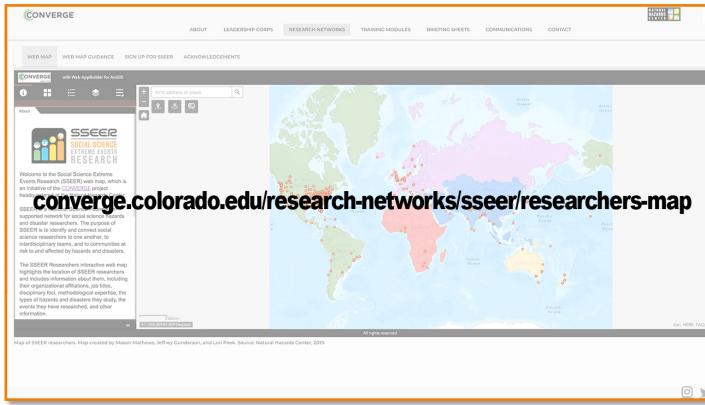


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# Learn more about diverse social scientists who study hazards and disasters

- discipline
- professional status
- methods
- events
- etc.







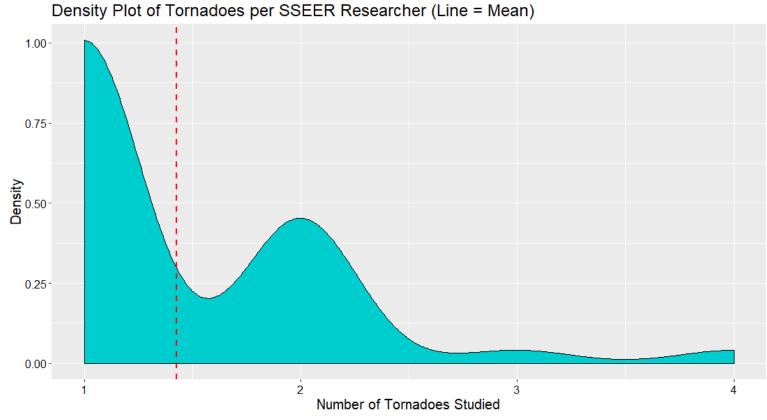
### **Crunching the Numbers**

How many SSEER researchers study tornadoes? 75 out of 816

What percentage of SSEER researchers study tornadoes? **9%** 

How many tornadoes did people study on average?

Mean = 1.43, Median = 1, Mode = 1, Stand. Dev. = .68, Min = 1, Max = 4



SSEER researchers studied 1.5 tornadoes on average.

A few researchers studied up to four.



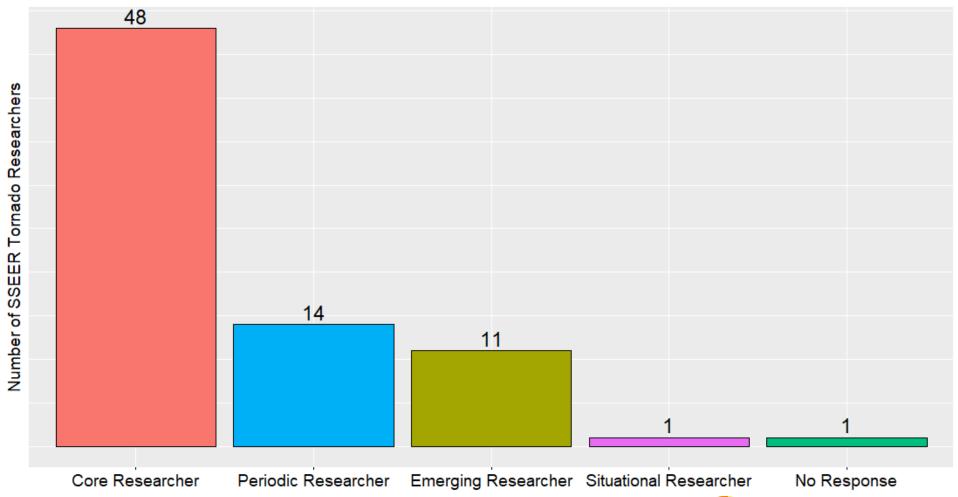
## Which SSEER researchers have studied the most tornado events?

| Name                  | Organization  | # of Tornadoes |
|-----------------------|---|----------------|
|                       |   |                |
| Lauren Clay           | D'Youville College, University of Delaware, New York University | 4              |
| Erica Kuligowski      | National Institute of Standards and Technology 3                |                |
| DeeDee Bennett        | University at Albany 3  |                |
| Brent Doberstein      | University of Waterloo 2  |                |
| Mary Nelan            | University of North Texas                                       | 2              |
| Elyse Zavr            | University of North Texas                                       | 2              |
| Lucy Arendt           | St. Norbert College   | 2              |
| Melissa Villarreal    | University of Colorado Boulder                                  | 2              |
| Scott Manning         | Jacksonville State University                                   | 2              |
| Daphne LaDue          | University of Oklahoma  | 2              |
| Michelle Meyer        | Texas A&M University  | 2              |
| Stephen Strader       | Villanova University  | 2              |
| William Lovekamp      | Eastern Illinois University                                     | 2              |
| Caroline Hackerott    | Arkansas Tech University  | 2              |
| Suzanne Horsley       | University of Alabama   | 2              |
| Jennifer First        | University of Southern Maine                                    | 2              |
| Kathy Sherman-Morris  | Mississippi State University                                    | 2              |
| Gary Webb             | University of North Texas                                       | 2              |
| Hilary Boudet         | Oregon State University   | 2              |
| Sherri Binder         | BrokoppBinder Research and Consulting                           | 2              |
| Daryl Yoder-Bontrager | University of Delaware  | 2              |
| Julie Demuth          | National Center for Atmospheric Research                        | 2              |
| Joshua Barnes         | US Department of Health and Human Services                      | 2              |
| Stephanie Ray         | University of North Texas                                       | 2              |



## What is the self-reported level of involvement in disaster research of the SSEER researchers who study tornadoes?

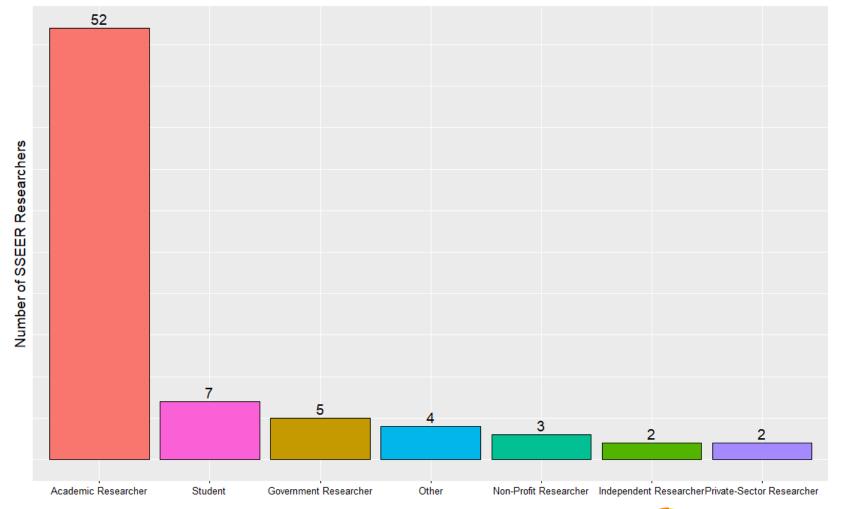
Level of Involvement in Disaster Research





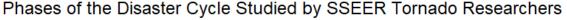
## What is the professional status of SSEER researchers who study tornadoes?

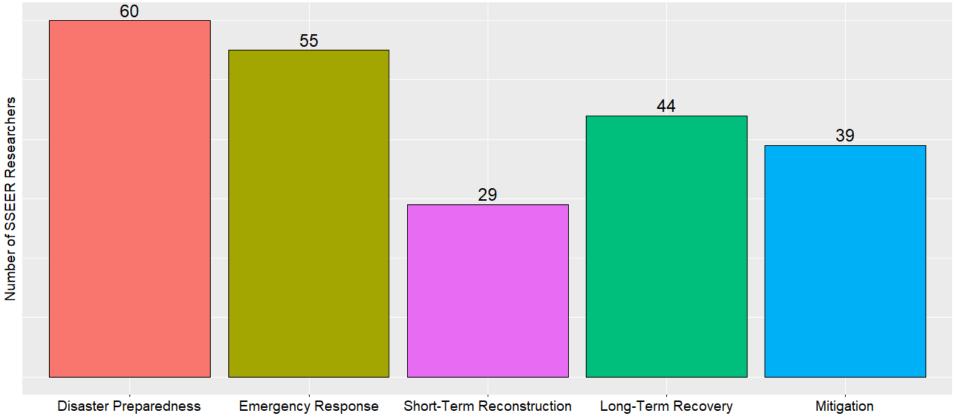
Professional Status of SSEER Tornado Researchers





## Which phases of the disaster cycle do SSEER tornado researchers study? (Most respondents chose multiple phases)

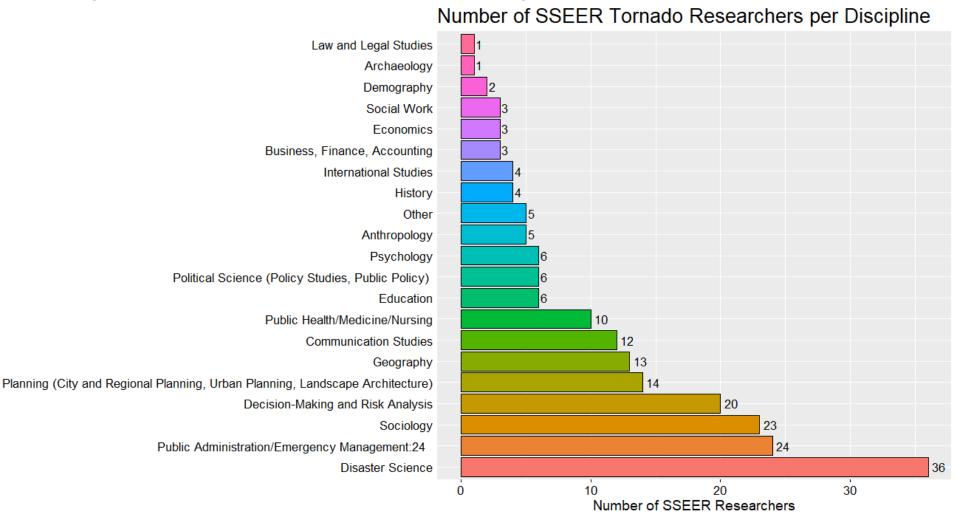






## What are the disciplinary backgrounds of the SSEER researchers who study tornadoes?

(Respondents often chose more than one discipline)

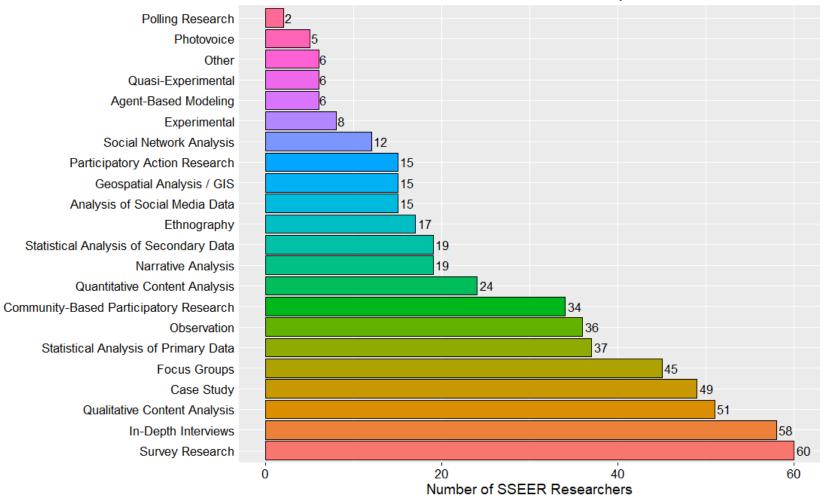




## Which methods do the SSEER researchers who study tornadoes use?

(Researchers chose multiple methods.)

Number of SSEER Tornado Researchers per Method





### Where are the SSEER researchers who study tornadoes?





# What are the top twenty most studied tornadoes by SSEER researchers? How many SSEER researchers studied each tornado?

| Rank | Tornado                               | Number of SSEER Researchers |
|------|---------------------------------------|-----------------------------|
| 1    | Joplin Tornado, 2011                  | 21                          |
| 2    | Moore Tornado, 2013                   | 21                          |
| 3    | Tuscaloosa-Birmingham Tornado, 2011   | 14                          |
| 4    | Super Outbreak, 2011                  | 4                           |
| 5    | Super Tuesday Tornado Outbreak, 2008  | 4                           |
| 6    | Adel-Albany Tornado, 2017             | 3                           |
| 7    | Hood County Tornado, 2013             | 3                           |
| 8    | Jacksonville Tornado, 2018            | 3                           |
| 9    | Bridge Creek-Moore Tornado, 1999      | 2                           |
| 10   | Hattiesburg Mississippi Tornado, 2013 | 2                           |
| 11   | Marshalltown Tornado, 2018            | 2                           |
| 12   | Xenia Tornado, 1974                   | 2                           |
| 13   | Angus (Canada) Tornado, 2014          | 1                           |
| 14   | Atlanta Tornado Outbreak, 2008        | 1                           |
| 15   | Coles County Tornado, 1917            | 1                           |
| 16   | Edmonton Tornado, 1987                | 1                           |
| 17   | Fort Worth Tornado, 2000              | 1                           |
| 18   | Granbury Texas Tornado, 2014          | 1                           |
| 19   | Greensburg Tornado, 2007              | 1                           |
| 20   | Hattiesburg Tornado, 2017             | 1                           |



### Where are the tornadoes SSEER researchers study?

(approximate location of tornadoes)





Where are the researchers in relation to the tornadoes they study?



## SSEER researchers and the tornadoes they study (approximate location of tornadoes)

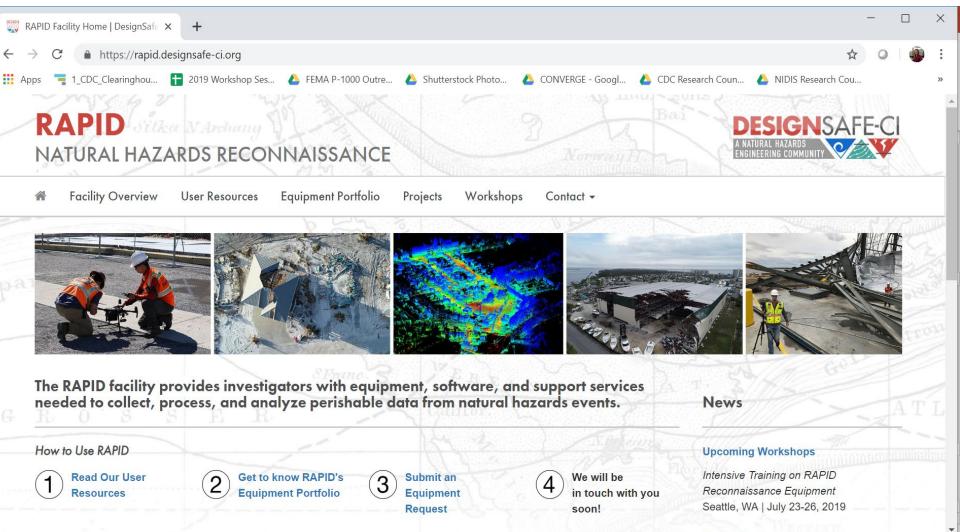






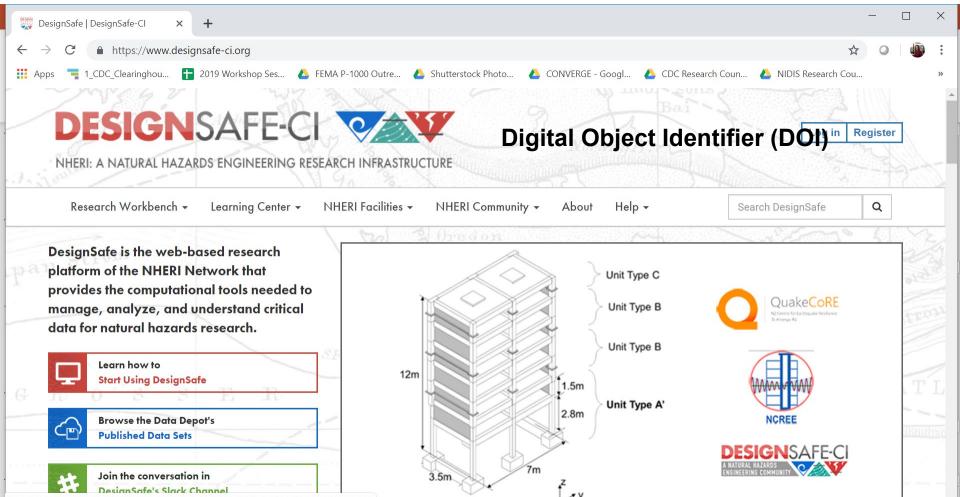
# Partner with the NHERI RAPID Facility to accelerate mobile applications for social science and interdisciplinary perishable data collection

rapid.designsafe-ci.org/



# Partner with the NHERI DesignSafe Cyberinfrastructure to create a novel field research data model for publication of research instruments, data collection protocols, and data sets

designsafe-ci.org/



## Thank you so very much!

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