Accelerating Integration of the Social Sciences in the Study of Earth System Interactions Workshop | Part 2

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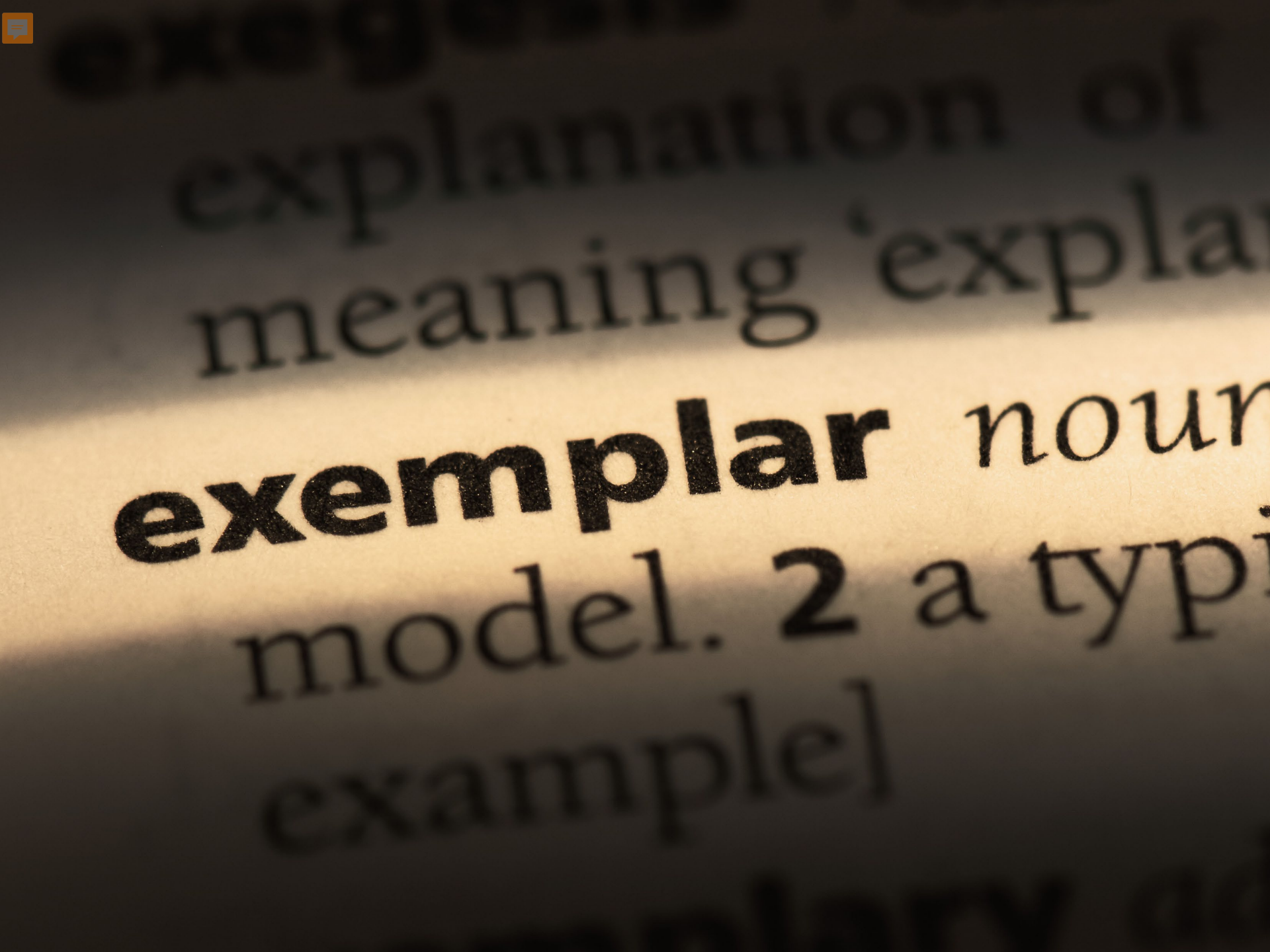
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ABOUT | RESEARCH NETWORKS | RESOURCES | DATA | COMMUNICATIONS | CONTACT

COVID-19 Working Groups for Public Health and Social Sciences Research

Due to the outpouring of interest from the research community and our mission to advance convergence research for the benefit of humanity, CONVERGE and the Social Science Extreme Events Research (SSEER) Network have funded 90 COVID-19 Working Groups for Public Health and Social Sciences Research. The Working Groups focus on a variety of issues and advancements in methods, ethics, and empirical topics related to the COVID-19 pandemic. Each group is led by a public health researcher or a researcher in the social, behavioral, or economic sciences, and includes researchers from at least three different disciplines to encourage convergent approaches.

The funded Working Groups are organized according to four focal areas of study: 1) population groups, organizations, and social institutions; 2) issues, impacts, and recovery; 3) compound hazards and cascading disasters; and 4) research networks, methods, and ethics. Many of the groups focus on cross-cutting issues. All groups submitted a Research Agenda Setting Paper which is available in the box below as well as on each Working Group's specific webpage.

POPULATION GROUPS, ORGANIZATIONS, AND SOCIAL INSTITUTIONS

ISSUES, IMPACTS, AND RECOVERY

COMPOUND HAZARDS AND CASCADING DISASTERS

RESEARCH NETWORKS, METHODS, AND ETHICS

https://converge.colorado.edu/resources/covid-19/working-groups

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NHERI Natural Hazards Engineering Research Infrastructure

PURDUE UNIVERSITY
Network Coordination
NSF Award #1612144

UNIVERSITY OF COLORADO BOULDER
Social science / Interdisciplinary resources
NSF Award #1841338

UC BERKELEY
Computational Simulation
NSF Award #1612843

UNIVERSITY OF WASHINGTON
Post-disaster RAPID Research
NSF Award # 1520817

UNIVERSITY OF TEXAS, AUSTIN
Community Cyberinfrastructure
NSF Award #1520817

OREGON STATE UNIVERSITY
Wave Basin and Flume
NSF Award # 1519679

FLORIDA INTERNATIONAL UNIVERSITY
Wind Simulation
NSF Award #1520853

UNIVERSITY OF TEXAS, AUSTIN
Portable Earthquake Simulation
NSF Award #1520808

UNIVERSITY OF FLORIDA
Wind Simulation
NSF Award #1520843

UC DAVIS
Geotechnical Centrifuges
NSF Award #1520581

UC SAN DIEGO
Large Outdoor Shake Table
NSF Award #1520904

LEHIGH UNIVERSITY
Hybrid Simulation
NSF Award #1520765

PURDUE UNIVERSITY
Network Coordination
NSF Award #1612144

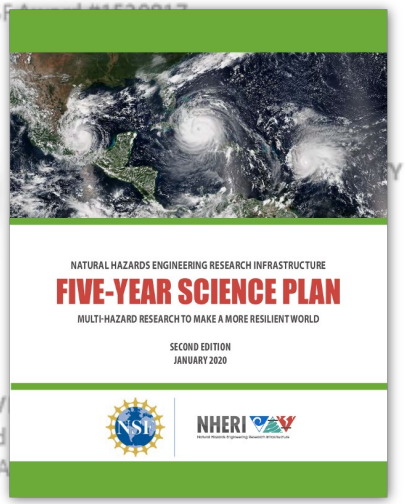
UNIVERSITY OF COLORADO BOULDER
Social science / Interdisciplinary resources
NSF Award #1841338

UC BERKELEY
Computational Simulation
NSF Award #1612843

NHERI Natural Hazards Engineering Research Infrastructure

1. **12 distributed, multi-user, <u>shared-use</u> facilities** that provide the natural hazards research community access to research infrastructure coupled with education and community outreach activities

2. NSF has invested heavily in **physical infrastructure, computational modeling and simulation capabilities, cyberinfrastructure, *<u>and</u>* <u>social infrastructure</u>** for the natural hazards community



UC SAN DIEGO
Large Outdoor Shake Table
NSF Award #1520904

Social Infrastructure

"The physical places and organizations that shape the way people interact…. The networks and taken-for-granted systems that support—or in some cases, undermine—all variety of collective life." -Klinenberg, 2018, *Palaces for the People*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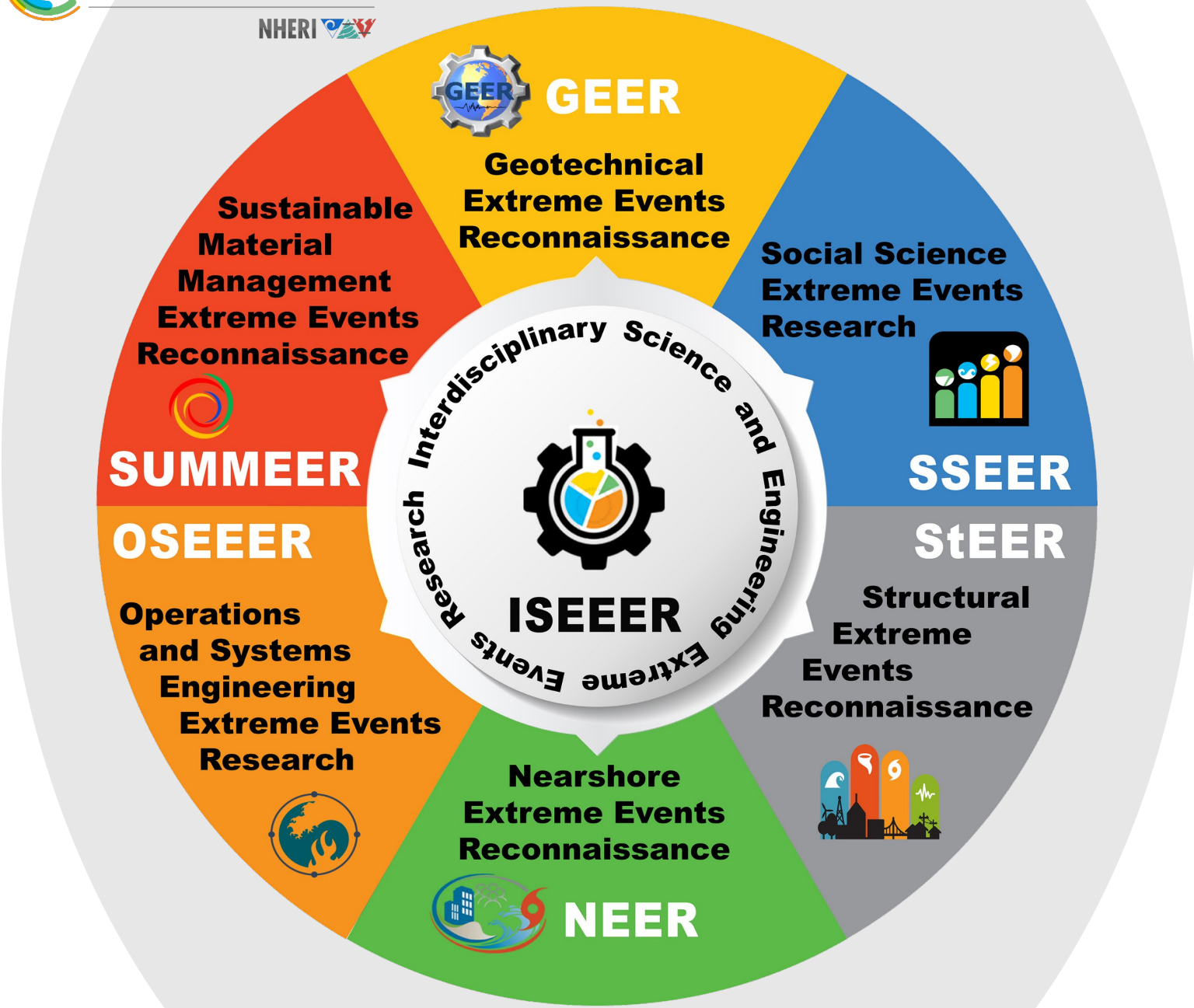
NHERI

1. Promote Extreme Events Research Coordination

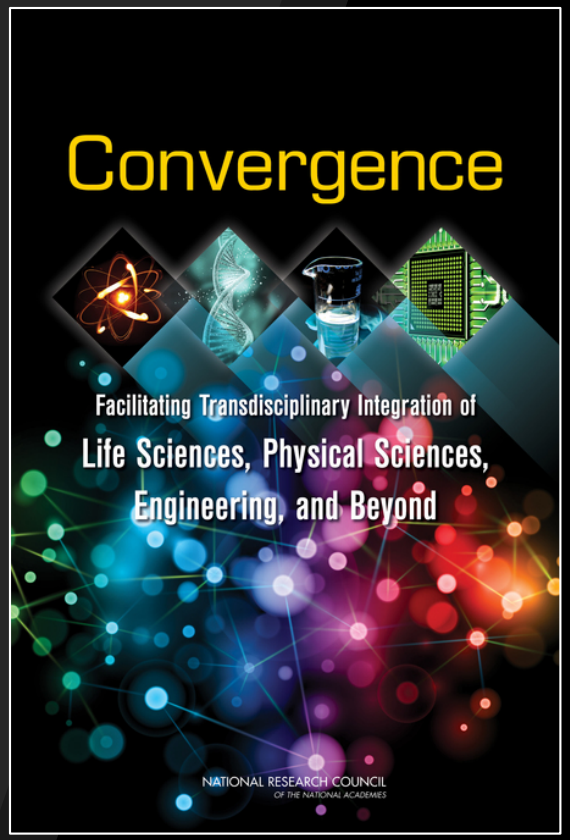
CONVERGE

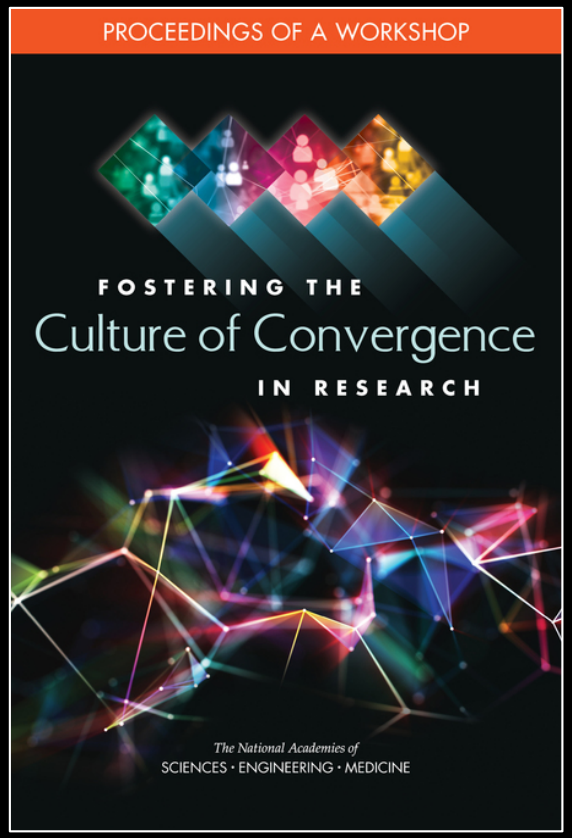
NHERI



2. Advance Convergence Research, Training, and Education in the Natural Hazards Field

Convergence





What is *convergence research*?

(1) Research driven by a specific and compelling problem

Convergence research is generally inspired by the need to address a specific challenge or opportunity, whether it arises from deep scientific questions or pressing societal needs (NSF, 2019, p.1).

(2) Research that involves deep integration across disciplines

As experts from different disciplines pursue common research challenges, their knowledge, theories, methods, data, research communities, and languages become increasingly intermingled or integrated. New frameworks, paradigms, or even disciplines can form sustained interactions across multiple communities (NSF, 2019, p.1).

https://spot.colorado.edu/~wisr7047/

Need for Social Sciences in the Convergence "Revolution"

"…social sciences and humanities are under-tapped resources for convergence efforts" (NRC, 2014, p. 14). ***(Yet, many of the grand challenges of pressing concern are at their core moral, ethical, social, political, and economic problems. Risk of "technical fixes" for social problems.)***

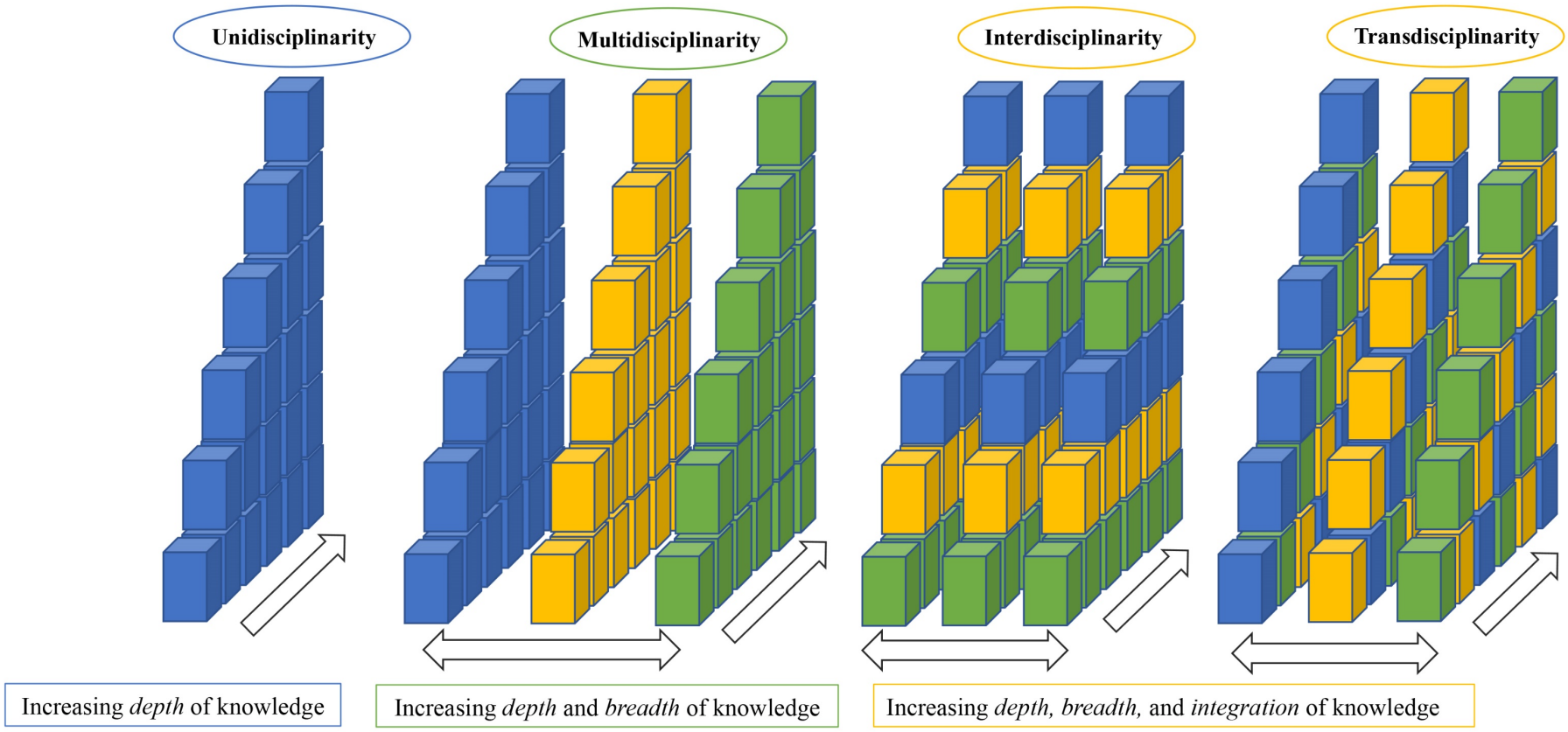
"Problem-driven" and "solutions-oriented" approaches can be highly fraught.

Important to Acknowledge: "Convergent-Like" Approaches

- "the remarkable reduction in earthquake fatalities in nations such as Japan, Chile, and the United States is the result of 'convergent-like' research partnerships between geologists, seismologists, earthquake engineers, architects, social scientists, and public officials…" (McNutt, 2017, p. 2-3).

- Why "*convergent-like*" rather than "*true convergence*"? (2 reasons)

(1) "Convergent-Like" – Most research in the field remains uni-disciplinary or multi-disciplinary in nature.



https://www.frontiersin.org/articles/10.3389/fbuil.2020.00110/full

(2) "Convergent-Like" – The field remains heavily in the "problem-diagnosis" stage. This is vital, but to move toward "true convergence" we need to more consistently *couple* problem identification with potential solutions.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A Framework for Convergence Research

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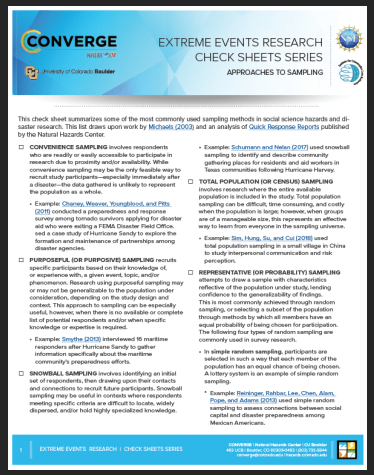

CONVERGE
EXTREME EVENTS RESEARCH
CHECK SHEETS SERIES
APPROACHES TO SAMPLING

This check sheet summarizes some of the most commonly used sampling methods in social science hazards and disaster research. This list draws upon work by Michaels (2003) and an analysis of Quick Response Reports published by the Natural Hazards Center.

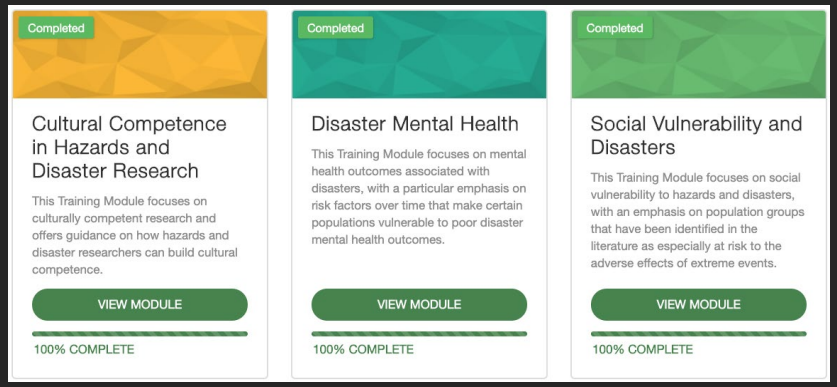
- **CONVENIENCE SAMPLING** involves respondents who are readily or easily accessible to participate in research due to proximity and/or availability. While convenience sampling may be the only feasible way to recruit study participants—especially immediately after a disaster—the data gathered is unlikely to represent the population as a whole.
  - Example: Chaney, Weaver, Youngblood, and Pitts (2011) conducted a preparedness and response survey among tornado survivors applying for disaster aid who were exiting a FEMA Disaster Field Office, and a case study of Hurricane Sandy to explore the formation and maintenance of partnerships among disaster agencies.
- **PURPOSEFUL (OR PURPOSIVE) SAMPLING** recruits specific participants based on their knowledge of, or experience with, a given event, topic, and/or phenomenon. Research using purposeful sampling may or may not be generalizable to the population under consideration, depending on the study design and context. This approach to sampling can be especially useful, however, when there is no available or complete list of potential respondents and/or when specific knowledge or expertise is required.
  - Example: Smythe (2013) interviewed 16 maritime responders after Hurricane Sandy to gather information specifically about the maritime community's preparedness efforts.
- **SNOWBALL SAMPLING** involves identifying an initial set of respondents, then drawing upon their contacts and connections to recruit future participants. Snowball sampling may be useful in contexts where respondents meeting specific criteria are difficult to locate, widely dispersed, and/or hold highly specialized knowledge.
  - Example: Schumann and Nelan (2017) used snowball sampling to identify and describe community gathering places for residents and aid workers in Texas communities following Hurricane Harvey.
- **TOTAL POPULATION (OR CENSUS) SAMPLING** involves research where the entire available population is included in the study. Total population sampling can be difficult, time consuming, and costly when the population is large; however, when groups are of a manageable size, this represents an effective way to learn from everyone in the sampling universe.
  - Example: Sim, Hung, Su, and Cui (2018) used total population sampling in a small village in China to study interpersonal communication and risk perception.
- **REPRESENTATIVE (OR PROBABILITY) SAMPLING** attempts to draw a sample with characteristics reflective of the population under study, lending confidence to the generalizability of findings. This is most commonly achieved through random sampling, or selecting a subset of the population through methods by which all members have an equal probability of being chosen for participation. The following four types of random sampling are commonly used in survey research.
  - In **simple random sampling**, participants are selected in such a way that each member of the population has an equal chance of being chosen. A lottery system is an example of simple random sampling.
    - Example: Reininger, Rahbar, Lee, Chen, Alam, Pope, and Adams (2015) used simple random sampling to assess connections between social capital and disaster preparedness among Mexican Americans.

EXTREME EVENTS RESEARCH | CHECK SHEETS SERIES

CONVERGE | Natural Hazards Center | CU Boulder
483 UCB | Boulder, CO 80309-0483 | (303) 735-0644

Extreme Events Research Check Sheets

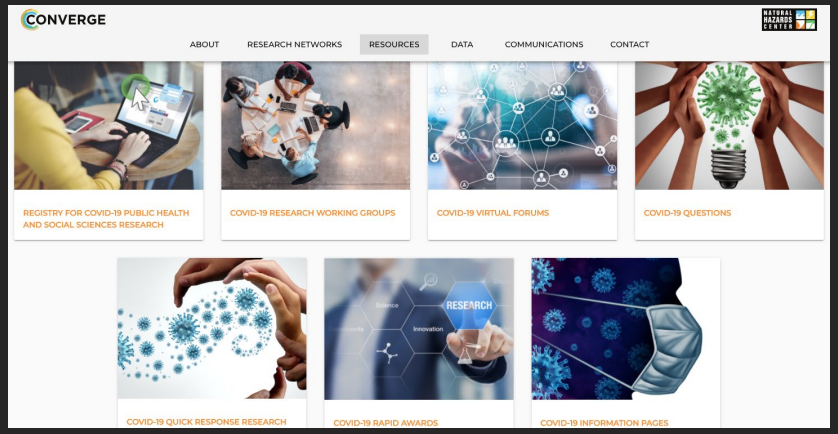
Data and Instrument Publication


Completed
Cultural Competence in Hazards and Disaster Research
This Training Module focuses on culturally competent research and offers guidance on how hazards and disaster researchers can build cultural competence.
VIEW MODULE
100% COMPLETE

Completed
Disaster Mental Health
This Training Module focuses on mental health outcomes associated with disasters, with a particular emphasis on risk factors over time that make certain populations vulnerable to poor disaster mental health outcomes.
VIEW MODULE
100% COMPLETE

Completed
Social Vulnerability and Disasters
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.
VIEW MODULE
100% COMPLETE

Training Modules



COVID-19 Resources

converge.colorado.edu/signup

A Final Few Words

(1) None of this work would have been possible without NSF's focus on *shared-use facilities* and their support for *social infrastructure* to help bring diverse disciplines and people together

(2) This type of training, mentoring, and networking takes motivated people, time, and resources

(3) The environmental, social, political, economic, moral, and ethical challenges we face are all deeply interconnected – that means we must invest in programs that foster our scholarly interconnections as well

Thank you!

Please sign up for updates and information for the Natural Hazards Center and CONVERGE:

hazards.colorado.edu/signup

converge.colorado.edu/signup

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Slide #1

Hello everyone! It is an honor to be with you today. Before I begin with my remarks, I wanted to offer a special thanks to the NSF, the National Academies, and the members of the Study Committee who are leading this effort.

Slide #2

I am so excited to be with you for this particular Workshop, which as you just heard, is focused on exemplars of transdisciplinary research and models of deep social science and earth science integration in multi- and interdisciplinary efforts.

Slide #3

To that end, I want to actually begin with a story of a rapid mobilization of over 1,200 researchers from many different disciplines in the wake of COVID-19.

In early March of 2020, we put out a call through our CONVERGE facility, for a series of virtual forums related to the pandemic. Then, in April of 2020, we issued a call for COVID-19 Working Groups to be led by Social Scientists or Public Health Researchers, but with the additional requirement that each group would involve at least *3 different disciplines* in order to encourage interdisciplinary, convergence-oriented research.

In the end, we were able to fund 90 of these COVID-19 Working Groups, which again, involved over 1,200 researchers from around the world. These groups included people ranging from undergraduate students to seasoned veterans in the field. And while we only provided an initial $1,000 in seed funding, many of the groups went on to attain much larger multi- as well as interdisciplinary grants as well as to publish their findings.

For years, researchers in our field have called for these types of bottom-up, collaborative efforts in the wake of catastrophe. Therefore, I want to talk to you about some of the ENABLING CONDITIONS that made this effort possible.

Slide #4

To tell that story, I need to begin with progress that the National Science Foundation has *already* made – through its Engineering Directorate – in funding SHARED USE facilities for the nation through the National Hazards Engineering Research Infrastructure—or NHERI. This work is now supporting ever-deepening INTEGRATION across disciplines, so I want to linger for a moment on the contributions of NHERI and the transformations that are now taking place.

Slide #5

- Over the past decade, NSF made a major, multi-million dollar investment in 12 distributed, multi-user, shared use facilities that provide the natural hazards research community with access to research infrastructure that is, in turn, coupled with education and community outreach activities. I've underlined shared use here, because I think that all too often, we are still stuck in the model where one university or a small collaborative of universities receive a large grant, and then all of the resources associated with that grant remain in the hands of one or a few institutions or investigators. Through its commitment to shared use facilities and its Science Plan, NHERI actively encourages researchers across the nation and international partners to collaborate and to apply for funding to access and use these facilities.
- A second major point about NHERI, the one I will be focusing on today, has to do with the TYPES of research infrastructure they have funded and how this has enabled integrated approaches to hazards research. As might be expected, much of the NHERI investment has gone toward physical infrastructure – such as earthquake shake tables, wind tunnels, and a tsunami wave facility.

  Beyond the physical laboratories, NHERI also supports a computational modeling and simulation center and cyberinfrastructure that allows all members of the hazards research community – including social scientists, engineers, and physical scientists – to publish our data and data collection instruments.

  Importantly, NHERI has also made major investments in the SOCIAL INFRASTRUCTURE for our community.

Slide #6

When I use the term social infrastructure, I'm referring to what sociologist Eric Klinenberg defines as: "The physical places and organizations that shape the way people interact…. The networks and taken-for-granted systems that support—or in some cases, undermine—all variety of collective life."

Social infrastructure therefore often involves investments in the invisible webs of human connection that bind us together – and in our case – allow for the deeper levels of interdisciplinary integration that we are here to discuss today.

Slide #7

The CONVERGE facility, is the FIRST SOCIAL SCIENCE-led component of NHERI. Our facility was established in 2018, and I am going to share with you some of the activities that we have been engaging in that have opened up the opportunity not just for social science integration with engineering and earth science activities, but also for clear social science leadership in extreme events research.

I'm going to focus on two of our main mission areas at CONVERGE, again, as exemplars for how I think we can achieve some of what has been discussed in these Workshops to date as related to enhancing collaboration and building a diverse workforce that is prepared for 21st century challenges.

Slide #8

First, one of our primary mission areas is to promote ethical, rigorous, and coordinated extreme events research. Oftentimes in large scale disasters such as earthquakes and hurricanes, dozens if not hundreds of researchers may travel to affected areas. While massive amounts of perishable data may be collected, this can also create research coordination and scientific agenda setting challenges. This is where support from the NSF to build our social infrastructure has really made a difference.

Slide #9

The NSF now funds 7 Extreme Events Reconnaissance and Research Networks, which are all coordinated under the umbrella of CONVERGE. Within this EER ecosystem, we have networks for geotechnical engineering, social sciences, structural engineering, nearshore research, operations and systems engineering, sustainable material management, and interdisciplinary science and engineering.

I want to emphasize that the support of these networks has allowed us not only to get organized WITHIN our discrete research communities. It also allows for us to collaborate, coordinate, and share data and information ACROSS disciplines like never before.

Slide #10

The second major, and broader, mission area of CONVERGE is to advance convergence research, training, and education for the natural hazards field.

Slide #11

Over the past two decades, the National Academies as well as the NSF have supported several major initiatives to understand and foster convergence research.

Slide #12

According to the NSF, convergence research has two main components. It involves research that is (1) driven by a desire to address a specific and compelling problem and (2) the research itself involves deep integration across disciplines.

Examples of such work now abound in engineering as well as biomedical sciences. For example, my colleague at the University of Colorado Boulder, Wil Srubar, runs a lab that brings together biologists, structural engineers, and chemists to work on issues related to self-healing concrete and other cutting edge living materials breakthroughs for the built environment.

Slide #13

Despite the major progress in this area, the Academies have acknowledged gaps and barriers in advancing the Convergence Revolution.

(1) First and foremost, as highlighted in a 2014 National Research Council report – the "social sciences and humanities remain under-tapped resources for convergence efforts."
   a. This is a major gap, because many of the grand challenges that convergence research purports to solve are at their core moral, ethical, social, political, and economic in scope. This means that we are at risk of issuing short-sighted, inappropriate, "technical fixes" for what are really social problems.

(2) A second major gap in the convergence literature is the lack of recognition that problem-driven and solutions-oriented approaches are often highly fraught – especially when all relevant parties are not brought into the conversation.
   a. Consider, for example, the recent Yellow Vest protests in France. The government was looking to solve one problem (reducing climate emissions through taxation) but in the process, created large scale social upheaval as rural and low-income groups argued that they would be disproportionately disadvantaged by these new taxes. Had representatives of more diverse communities been involved from the start in these efforts, perhaps a different "solution" to the climate crisis would have been introduced.

Slide #14

Even though the social sciences were not systematically included in many of the early major convergence efforts, I do want to underscore that those of us working at the interface of earth systems, engineering, and social sciences are well poised to advance the convergence revolution.

As Marcia McNutt recently pointed out, this is perhaps especially true for the hazards and disaster field.

- She wrote that "the remarkable reduction in earthquake fatalities in nations such as Japan, Chile, and the United States is the result of 'convergent-like' research partnerships between geologists, seismologists, earthquake engineers, architects, social scientists, and public officials…" (McNutt, 2017, p. 2-3).
- This begs the question, why do we remain convergent like, rather than exemplars of "true convergence"? I have two explanations for that that I think are relevant for our discussion today.

Slide #15

First, despite increasing calls for more integrative research, most research in the hazards and disaster field remains uni-disciplinary or multi-disciplinary in nature, where even when we come together as, for example, civil engineers, sociologists, and seismologists, each one of our disciplinary contributions remains distinct.

For us to move toward "true convergence" we need to move further to the right as shown in this graphic, moving into interdisciplinary and transdisciplinary spaces.

Slide #16

The second reason that our field remains "convergent-like" is because we remain heavily (although certainly not entirely) in the "problem-diagnosis" stage. This is vital, but to move toward "true convergence" we need to more consistently *couple* problem identification with potential solutions.

Take Hurricane Katrina, for example. There were many hundreds of articles that were published after Katrina that focused on the institutional racism, class, and gender inequality that turned that natural hazard into a deeply human tragedy. Only a fraction of those papers, however, offer any tangible solutions-oriented recommendations for what might be changed in the environmental, social, economic, and policy realms to help lessen human suffering.

Slide #17

With the establishment of the CONVERGE facility, one of the key questions motivating our effort is how can we take concrete steps to move toward "true convergence"?

To my mind, that means that if we are actually doing convergence research, social scientists, earth scientists, and engineers are working in true partnership, ever deepening our disciplinary integration, as we rigorously assess problems and co-develop solutions.

Slide #18

With that vision in mind, I want to close today by walking your through our framework for advancing convergence research and associated interdisciplinary efforts for the natural hazards field.

At CONVERGE, our five main activities entail.

1) First, Identifying researchers – We recognize you cannot change a landscape if you don't understand the demographic and disciplinary diversity of your research workforce. From the outset, we were committed to identifying and understanding the skillsets of our hazards workforce.
2) Second, Educating and Training Researchers is core to our mission – The hazards field is highly event driven, with new researchers often becoming involved soon after a disaster. We want to ensure that all new scholars who come to the field share a common baseline understanding of our theories, methods, approaches, and ethical commitments.
3) Third, setting a community-driven Convergence Research Agenda that is both problem focused and also solutions based is one of the core activities of CONVERGE.
4) Fourth, we Connect Researchers Across Disciplines and Coordinate Research Teams through the NSF extreme events reconnaissance ecosystem.
5) And fifth, we have dedicated Funding to support Convergence Research and Implementation efforts, such as the COVID-19 Working Groups I referred to earlier.

Slide #19

In practice, this means that through CONVERGE, we have spent the last two years developing a series of resources such as research check sheets and training modules to help support, educate, and integrate researchers. These resources are all freely available online, and we have had over 2,000 researchers complete our online training modules over the last year.

We also have rolled out a major data publication training effort, and have named nearly a dozen CONVERGE Data Ambassadors to date. These faculty members are now sharing the possibilities with their students and colleagues.

Slide #20

I want to end by wrapping back to my three main points

(1) None of this work would have been possible without NSF's focus on *shared-use facilities* and their support for *social infrastructure* to help bring diverse disciplines and people together.

(2) This type of training, mentoring, and networking takes motivated people, time, and resources

(3) The environmental, social, political, economic, moral, and ethical challenges we face are all deeply interconnected – that means we must invest in programs that foster our scholarly interconnections as well

Slide #21

Thank you so much for your time and attention today, and please know how much I am looking forward to the panel and the conversation to follow.