



COMING EVENTS

SHORELINE21

2021 Workshop on Shared Operational Research Logistics In the Nearshore Environment

April 26-27 (Virtual)

Organizers: NHERI U of Florida, Nearshore Extreme Events Reconnaissance (NEER) program, NOAA National Ocean Service Disaster Preparedness; UF Center for Coastal Solutions

6th AAWE Workshop

May 12 - May 14 (Virtual)

Organizer: American Association for Wind Engineering, Clemson University

DOE-PEER Workshop: Large-Scale Shake Table Testing for the Assessment of Soil-Foundation-Structure System Response for Seismic Safety of DOE Facilities

May 17-18 (Virtual)

Organizers: Department of Energy/Pacific Earthquake Engineering Research Center

International Science of Team Science Conference

June 7-11 (Virtual)

Organizer: International Network for the Science of Team Science

National Hurricane Conference

June 14-17

New Orleans, Louisiana

Organizer: National Hurricane Conference

NHERI Summer Institute for Early Career Faculty

June 16-17 (Virtual)

Organizer: Natural Hazards Engineering Research Infrastructure (NHERI)

3rd International Conference on Natural Hazards & Infrastructure

June 22 - June 23 (Virtual)

Organizer: ICONHIC

30th International Tsunami Symposium

July 1 - July 3

Sendai and Tohoku, Japan

Organizer: International Research Institute of Disaster Science, Tohoku University

46th Annual Natural Hazards Research and Applications Workshop

July 11-July 14 (Virtual)

Organizer: Natural Hazards Center

Researchers Meeting: Advances in Longitudinal Disaster Recovery Research

July 14-15 (Virtual)

Organizers: Natural Hazards Center, International Sociological Association Research Committee on Disasters, NHERI CONVERGE

FROM THE DIRECTOR

Dear Colleagues,

Spring 2021 offers the opportunity for a cautious return to normal operations. NHERI Council members continue to report on COVID-19 restrictions at their respective campuses and laboratories.

The NHERI NCO Education and Community Outreach team, led by Dr. JoAnn Browning, hopes for face-to-face REU and Summer Institute programming while simultaneously preparing contingency plans for remote participation. I highly recommend reading the article on lessons learned during a pandemic in this issue of the NHERI Research Quarterly.

In other news, many of the NHERI network experimental facilities and cyberinfrastructure have had their cooperative agreements renewed for the period of 2021-2025. We are grateful to NSF for another five years of seamless work supporting the efforts of NHERI researchers and enabling research that cannot be performed without this valuable infrastructure. Currently, the NCO is preparing for its own award renewal, as are the SimCenter and RAPID, the last three network components NSF awarded in the first phase of NHERI.

The NHERI Technology Transfer Committee recently conducted a review of NSF-NHERI funded awards to identify potential opportunities for accelerated transfer to practice. In its assessment, the TTC noted a significant trend toward embracing community resilience. Be sure to read this issue's article about the recent work of the TTC.



Julio Ramirez, Director
NHERI Network
Coordination Office

For our final story, we are pleased to highlight major work underway at the NHERI SimCenter. Within its Application Framework, the SimCenter team has created a novel, community-based process for building the next-generation of natural hazards simulation tools, "testbeds." Don't miss this article, which details the fundamentals of the effort.

Also in this issue, we provide a list of publications that mention the NHERI award and the DesignSafe Cyberinfrastructure in the prior quarter. It is fantastic to see the range of impact that our network is having on natural hazards research community.

I also urge you to share details about NSF's Engineering Research Initiation (ERI) program, which supports new investigators in non-R1 institutions as they initiate their research programs and advance in their careers as researchers, educators, and innovators.

We hope you enjoy this issue of the Research Quarterly. If you'd like to see specific projects highlighted in the future, please be sure to drop me a line ramirez@purdue.edu.

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FOLLOW US AND JOIN THE NATURAL HAZARDS ENGINEERING COMMUNITY!



Education and Outreach During a Pandemic: Lessons Learned

With strategic changes in 2021, the NHERI ECO team is creating safe, national-class learning opportunities

One year ago, March 2020, NHERI's [Education and Community Outreach team](#) was completing arrangements for its annual [Research Experience for Undergraduates program](#), the NSF-sponsored summer research program. Plans were on track to select 30 undergraduates who would travel to one of NHERI's experimental facilities and spend 10 weeks doing hands-on research in natural hazards engineering.

NHERI's core ECO team, based at the University of Texas at San Antonio, was working with the larger, network-wide [Education and Community Outreach Committee](#) to solidify curricula and logistics for each site. Facility mentors were planning ways to integrate students into their research. The [University of Washington RAPID facility](#) was preparing to host the NHERI-REU Research Symposium, the capstone event for REU students to present their research to the community.

Then the COVID-19 pandemic and quarantine hit. Suddenly, all plans for face-to-face events went out the window — including the NHERI REU program.

The NHERI ECO immediately altered tactics. The core team worked intensively with the network-wide ECO committee to devise a virtual REU curriculum. "We bonded over efforts to address the quarantine situation," said Karina Vielma, assistant professor of engineering education and chair of the ECO Committee. "We tried shifting to virtual events at all our sites. But because our REU involves ten or more Experimental Facilities, at ten different universities — and incoming students from all over the country — it was tough to develop a manageable approach in so short a time-frame," she said.

The team prioritized objectives for each Experimental Facility program and devised innovative ways to meet those objectives through virtual events. Nevertheless, despite transparent and prompt communications about evolving policies at the universities involved, the team could not surmount the barriers. They were forced to cancel the 2020 REU.

"Having to cancel our 2020 REU program was a blow," says JoAnn Browning, dean of engineering at UTSA and leader of NHERI's education and outreach efforts. "The REU is a critical community-building and success-driving activity for NHERI constituents."

A VIRTUAL SUMMER INSTITUTE

Fortunately, NHERI's ECO team did have time to "virtualize" the 2020 [Summer Institute](#), an annual program for introducing early-career faculty to NHERI faculty and network resources. Typically, 20-25 participants travel to San Antonio for the week-long event, and a smaller group attends online. The team's experience blending onsite and online programming, as well as the single event location, made logistics simpler for a purely virtual Summer Institute.

Participants at the 2020 Summer Institute were able to meet individually with NHERI site representatives and NHERI's NSF program director to discuss research proposals. Workshop-type sessions taught participants ways to engage NHERI network sites and leverage faculty expertise. NHERI's 2020 Summer Institute hosted 90 attendees for the two-day program, a significantly larger census than prior years.

Takeaways from the online-only event include:

- In the virtual environment, presentations must be concise.
- Seek interaction. It is crucial to participant engagement.
- Get creative online. Successful events must move beyond a simple Zoom meeting.
- A robust virtual experience can build a sense of community.
- A virtual program can accommodate more participants.

SUMMER INSTITUTE 2021

The team is hoping for an on-site event at the University of Texas San Antonio campus, which takes place June 16-17 this year.

"Early career researchers who interact personally with NHERI community members gain great confidence in writing new grants to use our facilities and are more successful in gaining funding, and more likely to continue their careers in research and education," Browning said.



*JoAnn Browning
Dean of Engineering
University of Texas
San Antonio*



*Karina Vielma, EdD
NHERI Education and
Community Outreach
Research Fellow and
Educational Specialist
University of Texas,
San Antonio*



*Robin Nelson, PhD
Educational Specialist,
NHERI ECO*

Lessons learned in 2020 are helping the ECO make contingency plans in case of COVID restrictions this year. The safety of faculty, staff, and attendees is paramount, so the NHERI ECO has plans for three scenarios: face-to-face, virtual-only, and a hybrid event.

NHERI REU 2021

This year, the ECO's challenge was devising a workable set of contingency plans for the network's multi-site REU program. Although information can be conveyed through virtual components, Browning and her team believe that personal, face-to-face interactions are the best way to foster confidence in young researchers.

"When undergraduates directly interact with renowned NHERI researchers, they feel empowered," Browning said. "And when physically located at one of our research facilities, they feel part of our research community, which encourages curiosity and builds confidence. Often, this translates into these students furthering their education in graduate school."

To ensure that NHERI's research experiences are safe for everyone, the core ECO team, in league with the network-wide ECO Committee, developed plans for face-to-face, hybrid, and virtual REU programs. Each alternative plan includes objectives, schedules, and online platforms.

A large part of the planning has been working with the eleven NHERI sites to navigate the complexities of various COVID restrictions. "It's been extremely challenging," said Robin Nelson, PhD, NHERI ECO program coordinator.

Fortunately, the NHERI REU program was originally designed as a hybrid experience. Students participate face-to-face at their research facility, and they connect virtually with the ECO and their REU cohort several times a week. This hybrid element served as a basis for defining the type of curriculum, communication, and research tasks needed in a virtual environment.

Even before the student application deadline in February 2021, each NHERI facility had developed methods for their students to connect to the site and conduct research virtually, if necessary. "Happily, we know from our interactions with prospective students that they are familiar with university quarantine policies," said Vielma. "Their understanding and flexibility will make it easier if we must implement changes at the last minute."

LOOKING FORWARD TO REU 2021

Given the current pandemic environment, Vielma said that NHERI's experience illustrates that, in the future, ECO programs must be flexible and prepared to activate contingency plans. "Devising alternative plans is an extra effort for everyone involved, but it is a necessary step."

Vielma added, "We are excited about the prospect of a face-to-face experience for our 2021 cohort, but no matter what COVID restrictions bring this summer, the NHERI research facilities are prepared to provide world-class summer-research experiences."



2019 REU alum Stephanie Boggs did research at the University of Florida Experimental Facility. She graduated from Jackson State University in 2020 with a BS in Civil and Environmental Engineering and is now an associate project engineer at Lockheed Martin.

Stay current!

Connect with NHERI's

Education and Community Outreach

community online

[Facebook](#), [Twitter](#), [YouTube](#)



2019 REU alum Joel Given did research at the NHERI UC Davis Experimental Facility. He is now a PhD student at Widener University.

NHERI Researchers Respond to Call for Improved Resilience

Tech Transfer Committee identifies NHERI-funded projects focused on resilient seismic design

Among natural hazards engineering researchers, the last few years have seen a national focus on improving seismic community resilience and functional recovery. This shift is practical. A holistic approach concentrates less on hardening infrastructure, which can be expensive, and more on ensuring swift return to normal civil operations, to minimize economic hardships because of natural disasters.



*Bill Holmes, SE
Senior Consultant
Rutherford + Chekene
Chair, NHERI Tech
Transfer Committee*

For examples, see the Earthquake Engineering Research Center's 2020 Distinguished Lecture by David Bonowitz, "[Functional Recovery: Designing for Community Resilience](#)," in which Bonowitz discusses how earthquake-resistant design is receiving new attention through state and federal legislation and showing new feasibility through research and technology.

Also, the National Institute of Science and Technology's publication, "[Options for Improving Post-Earthquake Re-Occupancy and Functional Recovery Time](#)" defines terms, provides detailed analysis and options, and explains why re-occupancy and functional recovery concepts are so vital to embrace.

ANALYSIS OF 81 ACTIVE RESEARCH AWARDS

NHERI's Technical Transfer Committee recently observed this trend in its February 2021 analysis of 81 active NSF NHERI Research Awards.

"In our review, we noted a robust response to the call for improved community resilience after seismic events, both nationally and in the [NHERI Science Plan](#)," said Bill Holmes, committee chair. "In fact, based on NSF award summaries, we found that 14 of the 81 NHERI awards are narrowly focused on improving seismic community resilience."

Find examples of these awards specified below. These NHERI research projects, among others, will provide a foundation for a new inventory of low-damage buildings that will provide increased seismic resilience in U.S. cities. For further information on the projects, see NSF.gov.

For more information about the NHERI Technology Transfer Committee, visit the [TTC page](#) on the NHERI-DesignSafe website, or download the [TTC flyer](#).

Title: [Seismic Isolation of Embedded Foundations Using Periodic Meta-material Barriers to Create Resilient Structures](#)

Award: 1761659

PI: Y.L. Mo

This research is developing a unique system of seismic isolation around and under structures within the soil. Among the advantages of such barriers is the ability to isolate the structure from vertical shaking as well as horizontal shaking.

Title: [Liquefaction Mitigation of Silts using MIDP and Field Testing with NHERI UTexas Large Mobile Shakers](#)

Award: 1935670

PI: Arash Khosravifar

In this project, Liquefaction Mitigation via Microbial Denitrification (MIDP) is targeted at low-plasticity silts that are susceptible to liquefaction in Oregon, a widespread issue. The research involves in-situ shaking using NHERI@UTexas' unique, mobile dynamic shakers at a site before and after treatment.



NHERI@UTexas mobile shaking equipment on-site in Portland.

Title: [Frame-Spine System with Force-Limiting Connections for Low-Damage Seismic Resilient Buildings](#)

Award: 1926326

PI: Richard Sause

This frame-spine-force-limiting connection system will rely on a conventional, economic base system that resists a significant proportion of the lateral load. The system judiciously employs floor-level force-limiting deformable connections and an elastic spine to protect the base system. This project will be conducted in collaboration with an ongoing synergistic research program in Japan.

Title: A Resilience-based Seismic Design Methodology for Tall Wood Buildings

Award: 1634204

PI: Jeffrey Berman

A recent new timber structural innovation, known as cross laminated timber (CLT), was developed in western Europe and is now being implemented around the world as a sustainable and low carbon-footprint alternative to conventional structural materials for tall buildings. This research will develop a seismic design methodology for resilient tall wood buildings that can be immediately re-occupied following a design level earthquake and quickly repaired after a larger earthquake.

Title: Resilient Seismic Retrofit by Integrating Selective Weakening and Self-Centering

Award: 1662963 PI: Sriram Aaleti

Many existing seismic retrofit methods achieve life safety through permanent damage (similar to the design of new buildings). Seismic retrofit practice in the U.S. also allows more damage than expected in new buildings. This project will investigate a new seismic retrofit method which focuses on not only public safety but also on resiliency by minimizing damage.

The following two similar but unrelated awards are investigating the use of dynamic instruments mounted in a concrete building to determine the level of damage after an earthquake. There is currently a high level of effort (time and cost) involved in inspecting and analyzing concrete buildings after an earthquake to determine safety and potential repairs. This effort often delays the re-use of the building.

Title: Japan-U.S. Collaboration on the Seismic Performance of Reinforced Concrete Structures

Award: 2000478 PI: Paolo Calvi

This award includes thoroughly instrumenting a full-scale concrete building on the shake table at E Defense in Japan to identify any type of dynamic recordings that are a good indicator of damage level.

Title: Field Testing of Concrete Buildings for Damage and Collapse Assessment

Award: 2036193 PI: Halil Sezen

This award is to instrument a parking structure during demolition to identify any type of dynamic recordings that are a good indicator of damage level.



A Resilience-based Seismic Design Methodology for Tall Wood Buildings. Above is the building specimen constructed for full-scale, two-story mass-timber building shaketable tests conducted at the NHERI UC San Diego large outdoor shake table facility. The specimen utilized a lateral force-resisting system consisting of two post-tensioned rocking walls made of cross-laminated timber (CLT) panels.

NHERI SimCenter Introduces Novel, Community-driven Model for Hazards Simulation

“Testbeds” demonstrate and provide entry-points for a multihazard, open-source ecosystem

To understand the behavior of structures under storm or earthquake loading, natural hazards engineers (NHE) rely heavily on software simulations that include realistic replications of the hazards and the structures they threaten. Researchers and programmers with the [NHERI SimCenter](#), the computational simulation hub for the NSF-funded Natural Hazards Engineering Research Infrastructure, have created a novel, community-based process for building the next generation of natural hazards simulation tools.

The SimCenter Application Framework, the foundational software that allows for developing modular applications, enables the creation of scientific workflows that connect commonly used and newly created software programs to create end-to-end simulations. These workflows can, in turn, smoothly compose and execute a series of computational and data manipulation steps — allowing the outputs from one application to pass directly as inputs to the next application, to transition between simulations.

These seamless workflows can execute portions of, or even a complete performance-based engineering (PBE) analysis in a given simulation. For the NHE research community, these workflows are game-changing. They are more streamlined, and they have unique features including state-of-the-art hazard representation, an artificial-intelligence (AI) enhanced data inventory, and greater fidelity and resolution of analysis.

To demonstrate the capabilities of the SimCenter’s Application Framework, the SimCenter has constructed sample “testbeds,” functional workflows that include the asset information for regions of interest and hazard scenarios for significant events. By providing outcomes of hazard scenarios via the Application Framework, the testbeds enable researchers to explore new ideas and opportunities. To provide a point-of-entry for the research community, examples drawn from testbeds have been incorporated into SimCenter’s recently released [Regional Resilience Determination \(R2D\)](#) tool.

FOUR REGIONAL TESTBEDS

The SimCenter created testbeds that consider earthquake and hurricane-driven hazards.

They include:

- (1) San Francisco Bay Area earthquake testbed;
- (2) Anchorage, Alaska earthquake testbed;
- (3) Atlantic City, New Jersey hurricane testbed;
- (4) Hurricane Laura testbed.

Specific to hurricane hazards, the Atlantic City testbed includes synthetic scenarios that simulate wind field, storm surge and damaging wave action in coastal communities, with corresponding damage and loss modeling for the impacts of these hazards on buildings.

Historical events (Superstorm Sandy) are also available as inputs. It includes residential and commercial buildings and critical facilities. The Hurricane Laura Testbed offers a hindcast of this event’s affects on residential construction, using the wind field released by NIST/ARA on DesignSafe. Both testbeds currently employ HAZUS as the primary description of damage and loss probabilities, as implemented in the SimCenter tool, called [pelicun](#).

As a multihazard simulation, the Atlantic City testbed can capture storm-surge-induced losses and wind-induced losses, which each exploit different aspects of the structural load path leading to differing levels of non-structural/content losses. While this currently adopts HAZUS’s approach to simulating multihazard losses in a given event, the SimCenter is developing more advanced approaches to capturing such multihazard effects as it increases the fidelity of the testbeds in the future.

[Tracy Kijewski-Correa](#), faculty member at the University of Notre Dame and leader of the team developing the hurricane testbeds, says that the most notable advancement is the granularity or resolution that the testbeds afford.

“The SimCenter application framework can resolve building performance and resulting damage/losses down to the individual asset level rather than the census tract, as was the previous state-of-the-art,” Kijewski-Correa says.



Tracy Kijewski-Correa is a SimCenter domain expert and leader of the SimCenter’s hurricane testbed team. At the University of Notre Dame, Kijewski-Correa is the Leo E. and Patti Ruth Linbeck Collegiate Chair and associate professor in the Department of Civil and Environmental Engineering and Earth Sciences and associate professor of global affairs.



Matt Schoettler is the associate director of operations at the NHERI SimCenter. He is an assistant research engineer at the University of California, Berkeley.



Laura Lowes is co-PI of the NHERI SimCenter. At the University of Washington, Lowes is the William M. and Marilyn M. Conner Professor and Chair of Civil and Environmental Engineering.

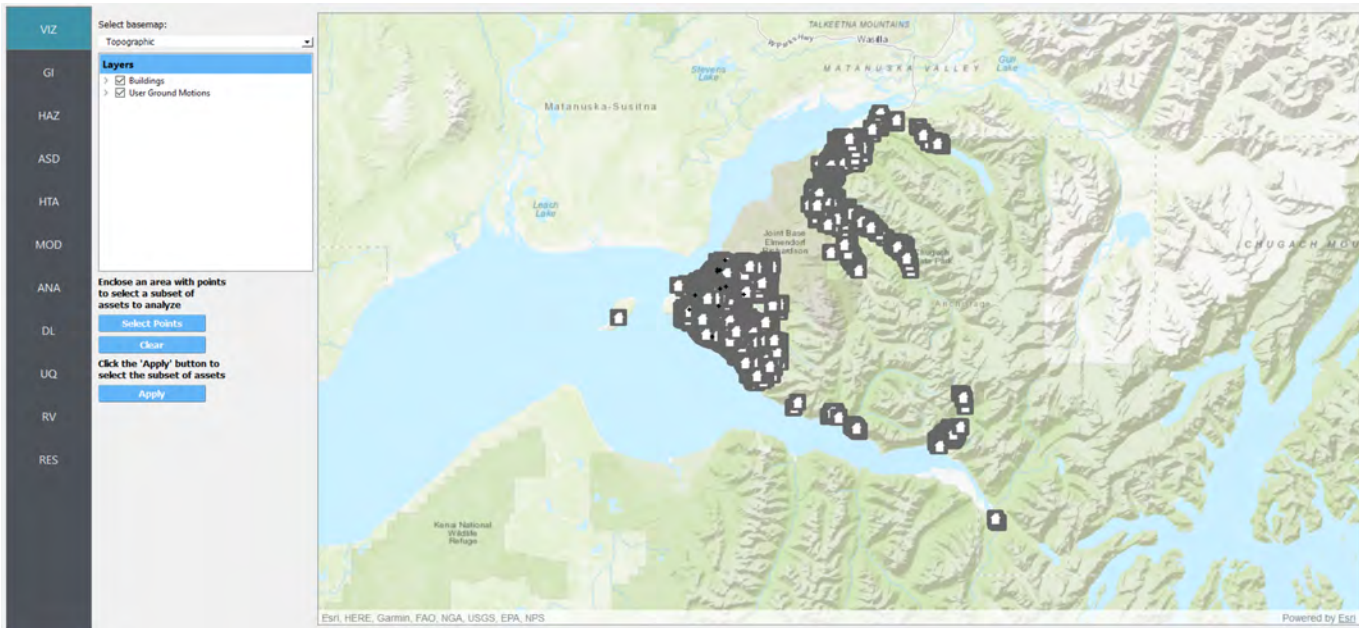


Figure 1 (above). Regional Resilience Determination (R2D) tool with graphical interface showing building inventory input for R2D Example 2, “E2 - MDOF Building Response.”

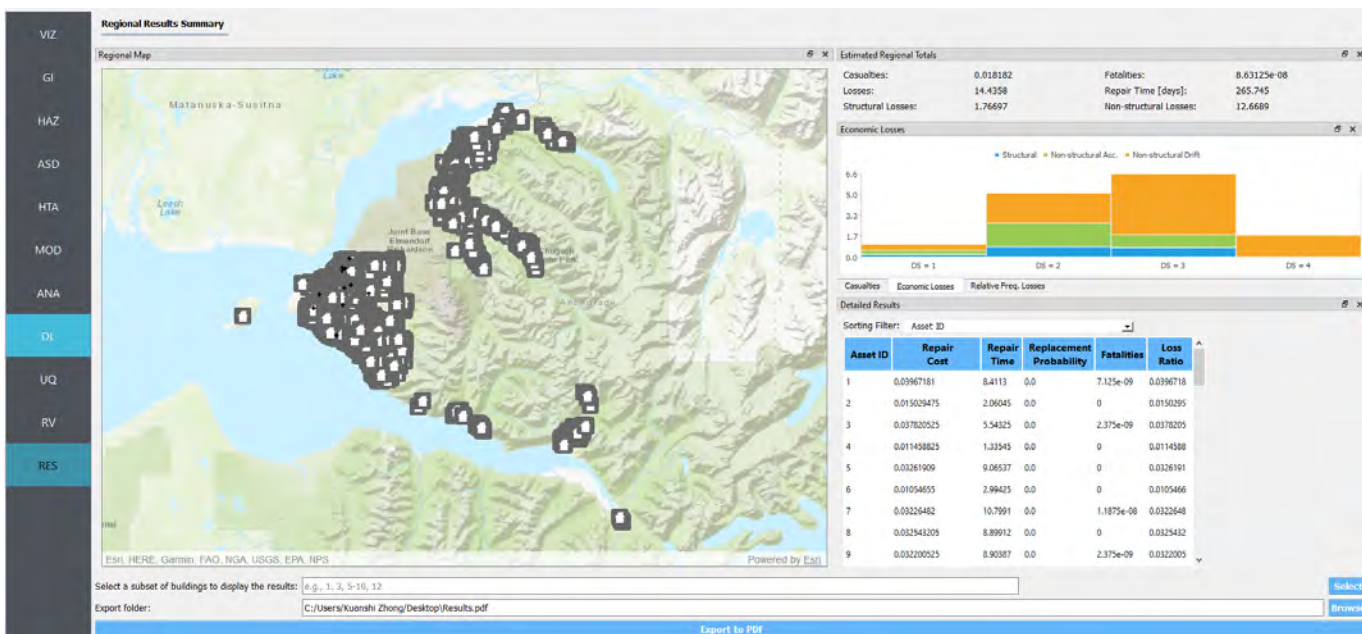


Figure 2. Regional Resilience Determination (R2D) tool with graphical interface showing damage and loss results for the building inventory shown in Figure 1.

“Second, with this shared and open-source workflow, we encourage community contributions. We think that, over time, we will have a best-of-breed simulation environment, one in which users benefit from advancements across the NHERI network, such as bringing in advanced hazard simulation capabilities like surrogate models or higher resolution building models. Such open-sourcing has previously not existed in public loss models or frameworks like HAZUS,” Kijewski-Correa says.

DEMONSTRATING RESEARCH IMPACT

The testbeds provide a venue for disseminating the broader impacts of a research project. For example, researchers could incorporate recent advancements in the modeling of buildings in seismic zones into one of the earthquake testbeds. Doing so enables a researcher to show new understandings, insights, and impacts of that research contribution, including how to make decisions about mitigating risk given limited resources.

“By using the testbed to integrate research at the community scale,” Kijewski-Correa says, “we can get a much better sense of its impact on society and how that work can guide how we build more resilient communities in the future.”

The ability to use computational simulation to inform mitigation investments is critical. Communities have limited resources to invest in upgrading assets like infrastructure or portfolios of buildings. And policies that require, for example, expensive retrofitting of vulnerable construction, are difficult to implement. “Because our testbeds provide simulation down to the individual building level, and eventually to the individual component level, we can reveal the potential return-on-investment of mitigation actions in future events. For example, we can use our hurricane testbeds to explore the impact of mandating window protection on all residences in a given area,” says Kijewski-Correa.

These testbeds, by showing similar simulations, allow city officials to see the impact of policies, and the potential avoided losses, in a way that they could not before. The ability to run different hazard scenarios, for example considering sea-level rise or intensifications of storms in climate change, and the ability to experiment with different mitigation investments through these tabletop exercises, can lead to better evidence-based decision making. That is where research can best serve practice.

ENTRY POINT FOR RESEARCHERS

Users can explore examples based on the testbeds with the SimCenter’s [Regional Resilience Determination \(R2D\)](#) tool, which utilizes another SimCenter software, called [rWHALE](#), as its backend for the workflow execution. The R2D tool features a graphical user interface that makes the simulation workflow easily accessible to users.

“These are exciting, hands-on workspaces,” says [Matt Schoettler](#), associate director at the SimCenter. “We believe that a broad range of natural hazards researchers will see the value of exploring these examples — to familiarize themselves with our application framework and to adapt and create new workflows that consider new locations, investigations, and scenarios. The SimCenter Application Framework is extensible, flexible, and scalable, so it represents a new — and genuinely limitless — resource for the NHE community. As a workspace ‘sandbox,’ it allows researchers to ask ‘what-if’ questions and investigate consequences and find improvements to regional events.”

The examples in R2D can be investigated and executed on basic laptop computers to explore the capabilities of the software by researchers. However, the full testbeds, from which the examples are derived, require significant high performance computational resources, and would be most effectively used by highly experienced users with research objectives in mind.

The SimCenter team envisions that the NHE community will incorporate these workflows and the various testbeds into their ongoing research by:

- Using the testbeds, and even coupling them with other social, societal or economic models, to understand the impacts of hazard events, mitigation investments and development decisions on community resilience.
- Expanding, enriching and contributing datasets in support of the testbeds to improve the characterization of hazards, the built environment or socio-economic/ demographic features.
- Incorporating their models — such as hazard simulations, detailed models of buildings, archetype models of buildings, and fragilities — to provide immediate visualization of broader impacts of their work by demonstrating how it expands our understanding of resilience at larger scales than an individual building.
- Contributing new methods, including AI algorithms and UQ methods, to show how they can improve the quantification of built environment performance at large scales.
- Using the visualization capabilities to share findings with audiences such as community stakeholders and planners to highlight the results of a mitigation investment, to reveal geospatial distribution vulnerability, and to inform future investments in risk reduction.

CONNECTING RESEARCHERS AND PROFESSIONALS

The SimCenter Application Framework also functions to connect researchers with other researchers for collaboration, and with end-users, engineers who want innovative tools that incorporate the latest research such as hazard characterization models, or fragility models updated by experiments at NHERI facilities like the Wall of Wind at Florida International University or the hybrid simulation lab at Lehigh University.

“We expect the community will identify additional features for the testbeds we’ve created,” Schoettler says. “They may find gaps and limitations in what’s provided, but this provides research opportunities for them to tackle and contribute back to the platform, which benefits the rest of the community.”

The testbeds are places for exploration and collaboration at multiple levels. Researchers can ask questions such as: What uncertainty quantification (UQ) methods are best? What artificial intelligence (AI) tools are needed to enrich asset inventories? And ultimately: What mitigation strategies should a city consider, and what are the costs and benefits?

“We’ve made certain that our documentation captures best practices and the use of SimCenter scripts and tools to generate regional inventories of assets such as buildings,” Kijewski-Correa says. “We further believe we are showing how the community can replicate these processes in other regions — including those who have recently experienced a natural hazard event — for hindcasting and systematic exploration of research questions that can inform more resilient construction in the future.”

BROAD COMMUNITY APPEAL

The entire natural hazards community has a stake in this open and adaptable ecosystem, says [Laura Lowes](#), professor of civil engineering at the University of Washington and SimCenter co-PI. “New users will find the R2D tool engaging, while advanced users will probably choose to modify and run the backend software (rWHALE) directly and use R2D to visualize results and to identify additional research questions.

“Researchers using the NHERI experimental facilities will be able to cite R2D results as motivation for new laboratory testing programs to provide data-informed advancement of structural response and damage-prediction models, and they can advance design methods to improve the performance of specific classes of structures,” Lowes adds. “In addition, R2D users will be able to employ data from NHERI experimental facility studies to advance their simulation.”

Kijewski-Correa explains: “We know that issues of resilience transcend any one component or structure, yet our discipline often focuses at the component or structure level. Thus the testbeds are a way to make contributions to both shared research infrastructure and a way to scale up individual research to illustrate the broad impact on society.”

**Interested in contributing to
SimCenter testbeds?
Express your interest by
completing [this survey](#).**

WHAT’S AHEAD

The SimCenter testbeds are in their first release, so it is an opportune time for the natural hazards engineering community to influence the next releases — and increase the level of fidelity in the incorporated models on both the hazards and built environment side.

“Since we are also expanding to other types of assets, like lifelines, this is a period of feedback and collaboration for shaping the directions that various hazard communities would like to go, based on current capacity and research priorities,” says Schoettler. Thus, the SimCenter team views the testbeds as critical computational infrastructure as well as a rallying point for the community to shape future directions of regional simulation capabilities.

The SimCenter’s current focus is on finalizing testbed documentation and continuing to carve out smaller slices of these testbeds in R2D so that users can explore and experiment with capabilities. As the full testbeds contain tens of thousands to millions of buildings and require significant high performance computing resources, the smaller exploratory inventories in the examples (numbering in the thousands of assets) are ideal for training new users in the workflow and its capabilities, Schoettler says.

Join the community. The SimCenter team is planning a series of webinars in 2021 to demonstrate and encourage exploration of the various testbeds. In the meantime, users have multiple ways to keep current. [Subscribe](#) to the SimCenter’s monthly email newsletter for notifications about testbed webinars. Users can also explore the [R2D application](#) and post questions and feature requests on the [SimCenter Forum](#). Lastly, community members can express their interest in contributing to the testbeds by [completing this survey](#).

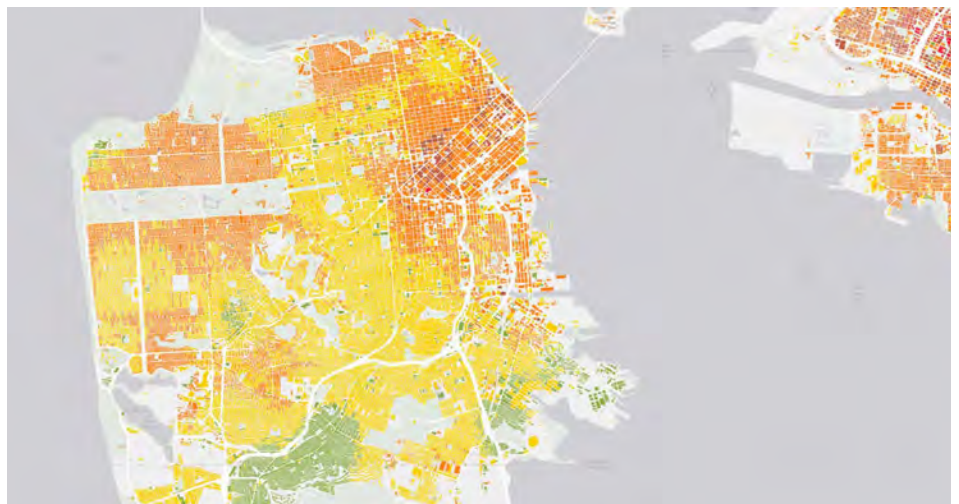


Figure 3. Visualization of regional damage and loss estimates for the San Francisco Bay Area earthquake testbed.

NHRI Network Publications

Oct. 1, 2020 through Dec. 31, 2020

The journal articles published in the last quarter of 2020 provide a snapshot of the work underway in the NHRI network. Each of the articles below reference the Natural Hazards Engineering Research Infrastructure, NHRI, or the DesignSafe Cyberinfrastructure.

OCTOBER 2020

Devkota, K., Wittich, C. E., & Wood, R. L. (2020). [Case Study on Dynamic Effects of Blast and Collapse Loads on Nearby Buildings at Roof Level](#). *Journal of Performance of Constructed Facilities*, 34(5), 04020094. [https://doi.org/10.1061/\(ASCE\)CF.1943-5509.0001501](https://doi.org/10.1061/(ASCE)CF.1943-5509.0001501)

Gao, Y., & Mosalam, K. M. (2020). [PEER Hub ImageNet: A Large-Scale Multiattribute Benchmark Data Set of Structural Images](#). *Journal of Structural Engineering*, 146(10), 04020198. [https://doi.org/10.1061/\(ASCE\)ST.1943-541X.0002745](https://doi.org/10.1061/(ASCE)ST.1943-541X.0002745)

Khosravikia, F., Li, M., Grigoratos, I., Clayton, P., Rathje, E. M., Cox, B., & Williamson, E. (2020). [Operating Manual for Importing Texas Bridge Data into ShakeCast](#) (No. FHWA/TX-20/5-6916-01-1). <https://trid.trb.org/view/1746081>

Kim, J. H., Moravej, M., Sutley, E. J., Chowdhury, A., & Dao, T. N. (2020). [Observations and analysis of wind pressures on the floor underside of elevated buildings](#). *Engineering Structures*, 221, 111101. <https://doi.org/10.1016/j.engstruct.2020.111101>

Liao, Y., & Wood, R. L. (2020). [Discrete and Distributed Error Assessment of UAS-SfM Point Clouds of Roadways](#). *Infrastructures*, 5(10), 87. <https://doi.org/10.3390/infrastructures5100087>

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