



**Update**  
**National Science Foundation (NSF)**  
**in the**  
**National Earthquake Hazards Reduction Program (NEHRP)**

**Presented to the**  
**NEHRP Advisory Committee for Earthquake Hazards Reduction (ACEHR)**  
**November 19-20, 2012**

**National Institute of Standards and Technology**  
**Gaithersburg, MD**

*Richard J. Fragaszy, Ph.D., P.E.*

*Program Director*

*Geomechanics and Geomaterials & Geotechnical Engineering*

*Division of Civil, Mechanical and Manufacturing Innovation*

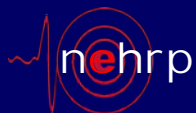
*National Science Foundation*

*4201 Wilson Boulevard*

*Arlington, VA 22230*

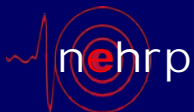
*Voice: 703-292-7011*

*Email: [rfragasz@nsf.gov](mailto:rfragasz@nsf.gov)*



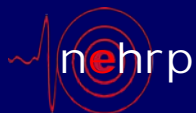
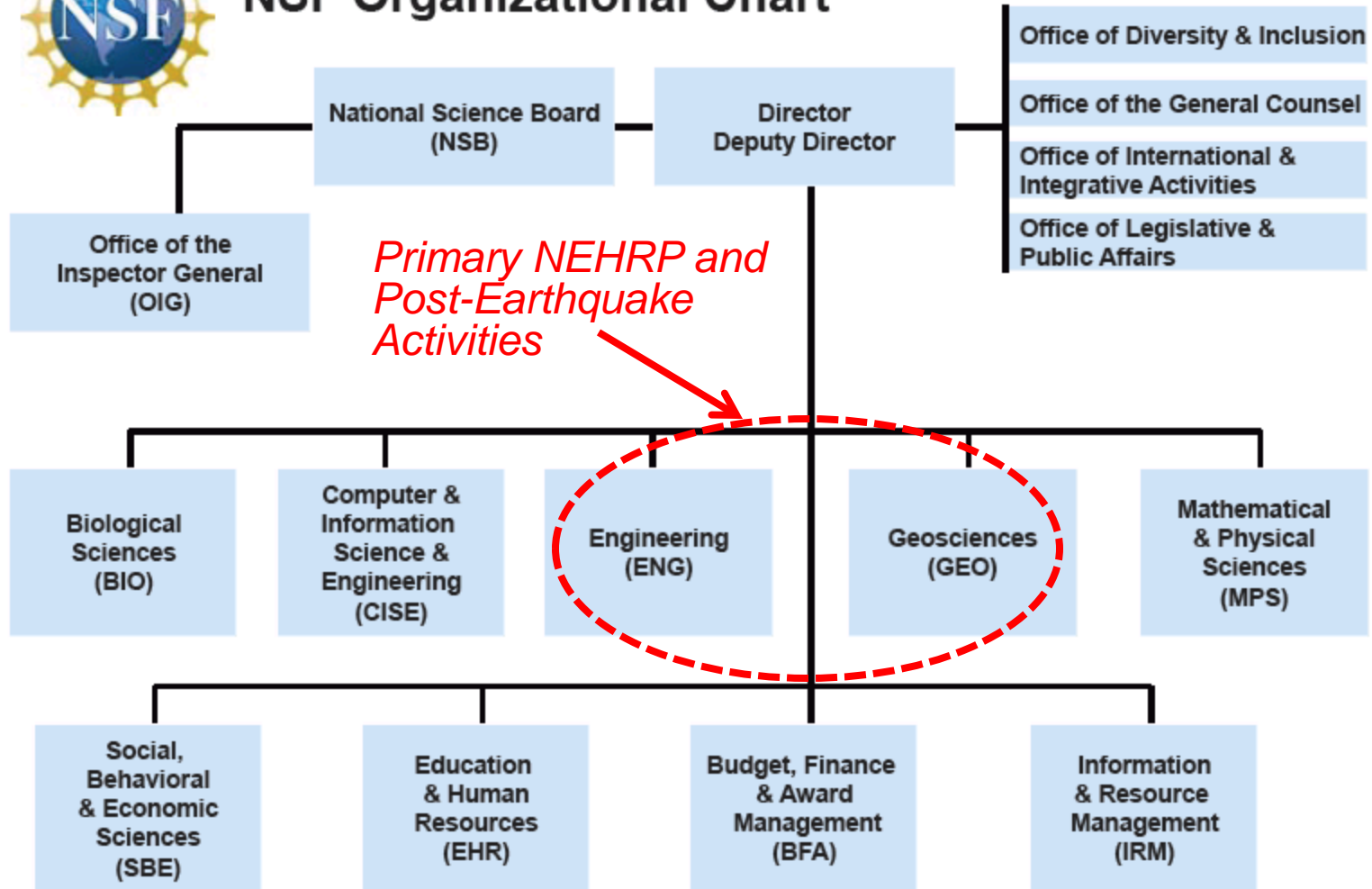
# Presentation Outline

- NSF Organizational Chart and NEHRP Activities
- NSF Response to 2012 ACEHR Report to the ICC, including NSF updates
  - Interdisciplinary basic research on resiliency and socioeconomic issues
  - Earthquake engineering multi-user research infrastructure
  - Post-earthquake research investigations





# NSF Organizational Chart



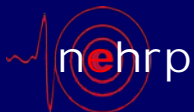
# 2012 ACEHR Report to ICC

## NEHRP and NSF Recommendation 3: Resiliency and Socioeconomic Issues

- **ACEHR NEHRP Recommendation:** *NEHRP should focus on the following two recommendations in the 2011 NRC National Earthquake Resilience Report:*
  - *Socioeconomic Focus on Hazard Mitigation and Recovery: \$3 million/year*
  - *Observatory Network on Community Resilience and Vulnerability: Approx \$3 million/year*

**AND**

- **ACEHR NSF Recommendation 3:** *Reassess the effectiveness of current approaches to soliciting and coordinating research in comparison with past approaches, and develop a future approach that adopts best practices to achieve the NEHRP strategic plan. Coordinated research programs should be supported to efficiently achieve resilience objectives, including the observatory network envisioned in NRC task 11.*

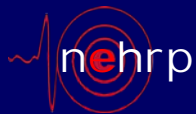


# 2012 ACEHR Report to ICC

## NSF Response to Recommendations on Resiliency and Socioeconomic Issues

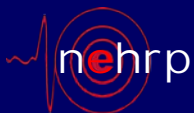
Many NSF funding opportunities available for earthquake and broader hazards communities to conduct ***interdisciplinary, coordinated basic research*** on resiliency and socioeconomic issues related to hazards, e.g.,

- Program solicitation NSF 12-610 Hazards SEES
- Ongoing ENG and GEO core research programs, e.g., in FY 2012 the ENG Infrastructure Management and Extreme Events (IMEE) program primarily supported basic research on *socioeconomic issues for hazard mitigation, recovery, and resilience*
- Engineering Research Centers (ERCs)
- Science and Technology Centers (STCs, e.g., NSF/USGS-supported SCEC)
- Integrative Graduate Education and Research Training (IGERT)
- NSF Cyberinfrastructure Framework for 21<sup>st</sup> Century Science and Engineering (CIF21) solicitations on data, computational and data-enabled science and engineering, etc.



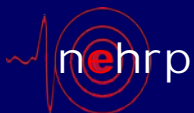
# NSF 12-610 Interdisciplinary Research in Hazards and Disasters (Hazards SEES)

- Follow-up from the June 2011 “Creating a More Disaster Resilient America (CAMRA)” Workshop Report, available at <http://archone.tamu.edu/hrrc/camra/report.pdf>
- Catalyze well-integrated **interdisciplinary research in hazards-related science & engineering** in order to improve understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters:
  - advance understanding of fundamental processes associated with specific natural hazards and technological hazards linked to natural phenomena, and their interactions
  - better understand causes, interdependences, impacts and cumulative effects of hazards on individuals, the natural and built environment, and society as a whole
  - improve capabilities for forecasting or predicting hazards, mitigating their effects, and enhancing capacity to respond to and recover from resultant disasters
- Interdisciplinary: Cross boundaries of atmospheric and geospace, earth, and ocean sciences; computer and information science; cyberinfrastructure; engineering; mathematics and statistics; and social, economic, and behavioral sciences
- Projects designed around one or more locations, identifiable hazards, and/or themes



# NSF 12-610 Interdisciplinary Research in Hazards and Disasters (Hazards SEES) - continued

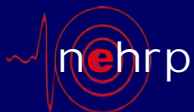
- Key attributes of Hazards SEES research
  - Integration across disciplines
  - Broadly applicable/transferable
  - Partnerships
  - Education and workforce development
- Two tracks – proposal deadline February 4, 2013
  - Type 1: forge new/emerging interdisciplinary teams – exploratory research, networking activities (up to \$300K, 2 yrs)
  - Type 2: major new integrated hazards research – theoretical, field, laboratory, and/or modeling activities (up to \$3M, 4 yrs)
- Anticipated program budget: \$23.75M for FY2013
- NSF Directorates/Offices: Computer & Information Science & Engineering (CISE); Engineering (ENG); Geosciences (GEO); Mathematical & Physical Sciences (MPS); Cyberinfrastructure (OCI); Social, Behavioral, and Economic Sciences (SBE)



## 2012 ACEHR Report to ICC

### NSF Recommendation 2: Support Multi-user Research Infrastructure

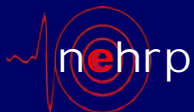
- **ACEHR NSF Recommendation 2:** *Complete the assessment of large-scale experimental facilities throughout the United States, including the equipment sites of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES), to determine how best to ensure that sufficient state-of-the-art experimental capabilities for earthquake science and engineering are available. Continue support for the NEES laboratories, data repository, and remote participation and simulation capabilities, at least those elements that have demonstrated their effectiveness during the past 10 years of NSF support. Continue to support, at current or increased levels, research that uses these facilities.*
- **NSF Response**
  - Planning phase outlined in NSF DCL 10-071 Dear Colleague Letter “*Plans for the Future of Earthquake Engineering Research Infrastructure Support beyond 2014*”  
<http://nsf.gov/pubs/2010/nsf10071/nsf10071.jsp>
  - Path forward outlined in NSF DCL 12-107 Dear Colleague Letter “*Operations and Management of Earthquake Engineering Research Infrastructure during FY 2015 - FY 2019*”  
<http://www.nsf.gov/pubs/2012/nsf12107/nsf12107.jsp>





# ***“Second Generation” of NEES (NEES2) Plans Outlined in NSF DCL 12-107***

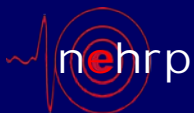
- NEES completes 10 years of NSF support for research and operations at end of FY2014
- Plans for “second generation” of NEES operations (NEES2 ops) presented to National Science Board at July 2012 meeting and outlined in NSF DCL 12-107
  - Entire research infrastructure recompeted for FY 2015-FY 2019
    - Management headquarters
    - Earthquake engineering experimental facilities (4-6 facilities)
    - Cyberinfrastructure
    - Education, outreach, and training
  - Planning grants to be supported in FY 2013 and FY 2014 to use NEES2 starting in FY 2015
  - ENG will support longer-term community planning for FY 2020-FY 2029



# 2012 ACEHR Report to ICC

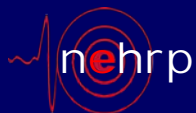
## NSF Recommendation 1: Post-earthquake research investigations

- **ACEHR NSF Recommendation 1**—Commit to supporting, in close cooperation with the NEHRP Office, coordinated earthquake reconnaissance, technology transfer, and dedicated research programs to learn from significant earthquakes occurring throughout the world. Back this commitment to immediate reconnaissance with support for follow-up research enabling in-depth analysis of the tectonics, earthquake source, ground motion, engineering and socioeconomic consequences, emergency response, and long-term recovery.
- **NSF Response**
  - NSF has long history of supporting post-earthquake rapid response research
  - Follow-up research from post-earthquake reconnaissance may be submitted to ongoing NSF core research programs
  - NSF staff participate in NEHRP/USGS-led coordination phone calls
  - NIST, USGS, FHWA, and FEMA staff participated with NSF-supported reconnaissance teams, e.g., 2010 Haiti and Chile earthquakes



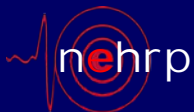
# NSF Support for Post-earthquake Reconnaissance and Dissemination of Quick Response Research Findings

- NSF supports post-earthquake reconnaissance through
  - Unsolicited proposals, primarily through the RAPID proposal mechanism
  - Supplements to existing NSF research awards
  - Core program research awards, e.g., Geo-Engineering Extreme Events Reconnaissance (GEER) (CMMI-0825760, -0825734, -0825507)
  - Event-based Dear Colleague Letter, as warranted (e.g., 2010 Haiti earthquake and 2010/2011 New Zealand earthquakes and 2011 Japan earthquake/tsunami)
- NSF supports dissemination of rapid response research findings via grantee workshops, e.g.,
  - 2010 Haiti earthquake workshop and report  
[http://www.eqclearinghouse.org/20100112-haiti/wp-content/uploads/2010/10/Haiti-Workshop-Report\\_FINAL1.pdf](http://www.eqclearinghouse.org/20100112-haiti/wp-content/uploads/2010/10/Haiti-Workshop-Report_FINAL1.pdf)
  - 2010 Chile earthquake/tsunami workshop and report  
[http://www.eqclearinghouse.org/20100227-chile/wp-content/uploads/2010/11/Chile-Workshop-Report\\_FINAL.pdf](http://www.eqclearinghouse.org/20100227-chile/wp-content/uploads/2010/11/Chile-Workshop-Report_FINAL.pdf)
  - 2010/2011 New Zealand earthquakes and 2011 Japan earthquake/tsunami workshop and report  
[https://www.eeri.org/wp-content/uploads/JAPAN\\_NZ\\_RAPID\\_Workshop\\_Final.pdf](https://www.eeri.org/wp-content/uploads/JAPAN_NZ_RAPID_Workshop_Final.pdf)
- NSF-supported “Workshop on Deploying Post-Disaster Quick-Response Reconnaissance Teams,” June 12-13, 2012 at NSF
  - NSF ENG Award 1153981, University of Delaware, James Kendra, PI  
<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1153981>



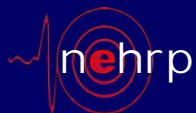
# Post-disaster Rapid Response Research Support for 2010/2011 New Zealand (NZ) Earthquakes & 2011 Japan Earthquake/Tsunami

- NSF 11-045 and 11-049 Dear Colleague Letters for RAPID proposals
- Over 60 RAPID Awards
- Workshop on Research Needs Emerging from the NZ and Japan RAPIDs
  - NSF ENG Award 1154279, Earthquake Engineering Research Institute (EERI)
  - Location: National Science Foundation, Arlington, VA, February 9-10, 2012
  - Key Recommendations for future research
    - Support perishable data collection
    - Establish an interdisciplinary digital data center
    - Advance modeling, computational and analytical capabilities
    - Support a holistic research program on vulnerability and resilience that integrates many disciplines and researchers across three countries



# Examples of NSF-supported research for in-depth post-earthquake/tsunami research investigations

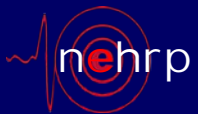
- In-depth post-earthquake/tsunami research supported by relevant NSF core research programs
- NSF supported the following awards that are incorporating data, observations, and lessons learned from the 2010 Chile earthquake and tsunami to better understand earthquake processes and impacts:
  - 1118678 - Permanent Upper Plate Deformation Associated with the Mw8.8 Maule, Chile Earthquake of 2010
  - 1206271 - NEESR: Tsunami Run-up and Withdrawal Dynamics on a Sloping Beach with Discontinuous Macro-Roughness
  - 1129574 and 1130013 - Collaborative Research: Post-seismic response updip of the Chilean megathrust earthquake of February 27, 2010
  - 1045597, 1045606, 1045609, 1045633 - Collaborative Research: Analysis of Seismicity Associated with the Mw=8.9 2010 Maule Earthquake and Implications for Subduction Processes
  - 1235526 - Development and Validation of Performance Based Design Procedures for Kinematic Loading of Pile Foundations During Lateral Spreading
- NSF award 1250260: SAVI/EAGER for Global Research on Applying Information Technology to Support Effective Disaster Management (GRAIT-DM)
  - Virtual institute for U.S.-Japan cooperative research on big-data approach to disaster management
  - Links over 20 NSF-supported RAPID awardees who conducted post-earthquake reconnaissance of the 2011 Japan earthquake/tsunami



# Further Information

**National Science Foundation**

*<http://www.nsf.gov>*



national **earthquake** hazards reduction program

