

Organizing Post-Earthquake Reconnaissance to Optimize Impact

Workshop Summary and Outcomes Report



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The Earthquake Engineering Research Institute (EERI) is a nonprofit membership organization that connects those dedicated to understanding earthquake risk and increasing earthquake resilience in communities worldwide. EERI envisions a future where communities worldwide understand their earthquake risk and act to improve their resilience to earthquakes and other hazards. Our mission is to provide our members with the technical knowledge, leadership and advocacy skills, collaborative networks, and multidisciplinary context to achieve this vision. This report has been produced through EERI's Learning From Earthquakes (LFE) program. The mission of the LFE Program is to accelerate and increase learning from earthquake-induced disasters that affect the natural, built, social and political environments worldwide. For more information, visit <http://www.learningfromearthquakes.org/about>.

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Executive Summary

An impactful major earthquake will happen again in the United States, potentially at any time. To improve readiness for the inevitable, EERI's Learning From Earthquakes (LFE) Strategic Working Group invited over 170 earthquake researchers and practitioners to a half-day workshop in July 2022. The aim was to clarify important needs and potential next steps for improving reconnaissance coordination.

Through a variety of activities, workshop invitees were asked to imagine themselves two years after a major earthquake occurred in the U.S. Participants then explored this hypothetical through three themes: what **desired impacts** they want to see resulting from the scientific reconnaissance activities conducted in the aftermath of such a quake; any coordination **challenges and gaps** they perceive that might affect our ability to achieve those impacts; and, **next step** ideas that could be undertaken in the months or first year following the workshop.

The workshop used multiple activities to facilitate information exchange. First, invitees were invited to fill out a pre-event questionnaire, which allowed any invitee to give input on the topics to be covered at the workshop, even if they couldn't attend in person. Sixty five people responded. The Working Group analyzed this information and integrated it into the content and activities conducted at the workshop.

Second, the Working Group organized a technical session at the 12th National Congress on Earthquake Engineering (12NCEE) where key leaders in earthquake reconnaissance presented about what their organizations are doing. Finally, a series of interactive exercises and in depth discussions took place at a half-day in-person workshop immediately following 12NCEE, with 55 people in attendance representing over 40 organizations.

Key Workshop Outcomes & Findings

Through robust, multi-modal involvement of nearly 100 expert members of the earthquake reconnaissance community over the course of several months, this process produced a wealth of information about what members of this community wants to accomplish, what might be standing in the way or occurring suboptimally when working together, and what can be done to prepare the reconnaissance community. To organize and present this information, the Working Group developed a framework of six opportunity areas for reconnaissance coordination: Reconnaissance Workforce, Research Agenda; Plans and Protocols, Data Collection and Management, Outputs and Dissemination, and Changes in Policy and Practices. These coordination categories provide a structure for clarifying important types of inputs, strategies, and outcomes that the reconnaissance wants to pursue.

Second, there is a stakeholder-generated list of **Top 26 Desired Impacts** held in the minds of people who lead, fund, and carry out, and use reconnaissance data collection. Although in one sense "end goals," these desired impacts are meaningfully pursued throughout the reconnaissance process. There is relevance and some aspects of work to be done for each of these issues in all reconnaissance phases, as well as plenty of opportunities and need to work on them during the interim period between major events.

Third, this process gave participants both private, small and large group opportunities to express and discuss some of their own perceptions and worries about where the reconnaissance community is not as ready as it could be. This includes concerns ranging from their own personal preparation to their organizations and collectively, and to who is “not in the room” that might have other concerns or be essential to achieving the south-after changes of practice and outcomes. Those concerns are now sorted into a more concrete, shareable, and absorbable list of **Top 20 Coordination Concerns**. A longer, archived list of raw responses contains even more specific issues that were brought up and could be considered.

Participants also engaged in multiple opportunities to reflect and provide suggestions as to specific, impactful possible next steps—for themselves, for their own organizations, and for EERI LFE. Post-workshop analyses distilled all the shared ideas into a more compact but still substantial list of **48 Consolidated Next Step Ideas**. Many of these ideas are highly actionable and timely, and could be taken up constructively by individuals, individual organizations, or in various combinations of entities or in new or existing collaborative efforts.

Table ES-1 offers consolidated findings for the three workshop themes organized by coordination category. Beyond this very high level report-back, the three key outputs are: 1) a summary report, 2) a robust set of supporting Appendices that offer further descriptions of the workshop process and ideas generated, and, 3) several raw data files that are available upon request for those seeking even more detail.

Table ES-1. Key Desired Impact, Coordination Concerns, and Next Step Idea take-aways from the Stakeholder Workshop.

Coordination Category	Key Take-Aways
RECONNAISSANCE WORKFORCE	<p>We want a multi-disciplinary, inclusive, well-prepared, and sustainable reconnaissance workforce.</p> <p>We have concerns about worker readiness, especially for human-engaged research and for work in interdisciplinary teams and topics, as well as how to include more people with a wider range of skills and transfer knowledge across experience levels.</p> <p>We have ideas for making progress including creating lists of reconnaissance workers, recruiting people from missing areas of expertise such as IT, creating interdisciplinary teams in advance, doing more exercises together to practice and involve more stakeholders, and holding regional coordination summits that expand pre-event involvement to include emergency management and communities.</p>

Coordination Category	Key Take-Aways
RESEARCH AGENDA	<p>We want agreement and clarity about what is important to study during each phase of earthquake reconnaissance to advance the aims of hazard understanding and risk reduction.</p> <p>We have concerns about the “sexy damage problem,” redundancy of efforts, how to involve locals and communities in setting priorities, and what we really want and can achieve as far as interdisciplinary, applied, and longitudinal research.</p> <p>We have next step ideas including consolidating and building on existing lists of grand challenges, mapping out important potential research projects in advance, and thinking carefully about how to integrate reconnaissance research with community goals, functional recovery, and future risk reduction.</p>
PLANS & PROTOCOLS	<p>We want to conduct reconnaissance activities with efficient cross-boundary cooperation and create enduring and dynamic programs and collaborations that communicate smoothly and are funded adequately for the tasks and roles they play.</p> <p>There is a lack of awareness about each others’ plans, and there are concerns that our joint planning is not sufficient and inclusive of all important parties. More joint practice is needed. Communication ambiguities and the need for adequate and equitably distributed resource support are also issues.</p> <p>Next step ideas include establishing more formalized collaborations through MOUs, creating a shared communication system and protocols, conducting a community asset mapping exercise, establishing more regular opportunities to exchange information, practice together, and update plans accordingly, and devoting effort to diversifying, stabilizing, and deepening our funding streams.</p>
DATA COLLECTION & MANAGEMENT	<p>We want to create new and useful data sets, methods, and tools, with centralized access points and platforms so that data is accessible, impactful, and well-maintained.</p> <p>We have concerns about the lack of commonly shared platforms and our readiness to do standardized, streamlined data collection within and across teams and areas of investigation.</p> <p>We have ideas such as creating opportunities for researchers to gather to discuss how to unify discipline- and topic- specific data collection practices, initiating an effort to converge on shared platform(s), involving more data experts in advance of events, and investing in R&D to develop data technology solutions for identified shared needs.</p>

Coordination Category	Key Take-Aways
OUTPUTS & DISSEMINATION	<p>We want the outputs of reconnaissance research to include comprehensive impact maps and databases, inform emergency response, improve hazard models, and update risk maps elsewhere. Publications address a range of different audiences' needs and are widely distributed and used. We host influential information sharing events.</p> <p>There are a variety of concerns about creating potentially redundant reports, reaching only limited audiences and missing others, over-proliferation of reports, timing, and a lack of shared protocols for community interactions and information sharing with local non-experts.</p> <p>Next step ideas include developing audience-specific strategies for reconnaissance briefings and products, and conducting region- and topic-specific "reconnaissance to recovery" summits a couple of months or a year after a major quake.</p>
CHANGES IN POLICY & PRACTICES	<p>Beyond scientific advancement, the ultimate aim of reconnaissance is to support recovery and increased resilience, through updated regulations, codes, and construction practices which are supported by increased public understanding. Our agenda for reconnaissance research and mitigation evolves after every quake as we learn.</p> <p>It is unclear how findings about structural and ground failures (and non-events) can be integrated into post-event mitigation and recovery, and we lack skills, systems, and relationships in place to communicate with the general public and influential local actors.</p> <p>Ideas for making progress include creating organizational and inter-organizational response plans for how to intentionally engage the public, improving "peace time" communications with social and main media outlets on messaging, developing a database and archive of post-event After-Action Reports and lessons learned, and tracking of the implementation of recommendations over time and place.</p>

As an initial foray into this arena, this process was aimed at *generating ideas* along with categorization, clarification, and some prioritization. The work of interpreting and choosing what to do with this information will take continued effort from all stakeholders. EERI is proud to be a leading multidisciplinary professional organization in the earthquake reconnaissance space, and sees clear roles for itself in helping to advance reconnaissance coordination in each of the six coordination categories. Two priority activities that EERI will undertake include clarifying roles in the reconnaissance space through formal MOU's with its partners and conducting community-wide exercises to take steps to address coordination concerns identified through the workshop. A fuller list of current and potential EERI efforts in each of the coordination categories is included in Section 5.

1. Introduction

EERI has been conducting earthquake reconnaissance since the organization's founding in 1948. The Learning from Earthquake (LFE) program was formalized in 1973 with support from the National Science Foundation. Through LFE, EERI has led and contributed to investigations of over 300 earthquakes in 50 countries. The LFE program has contributed to the improved understanding of earthquake impacts, which has led to major advances in seismic safety around the world.

Now, 70 years later, the earthquake reconnaissance landscape looks vastly different. With a growing number of organizations conducting reconnaissance (many with dedicated NSF support), new and rapidly evolving technologies, and the ever-urgent need for natural hazard risk reduction especially for the most vulnerable, EERI is taking action to improve coordination among the many reconnaissance groups and to clarify its own roles in reconnaissance as an organization and for its members.

2. Workshop Motivation & Format

In support of these overarching goals, EERI's LFE Strategic Working Group organized and conducted a *Stakeholder Workshop on Organizing Post-Earthquake Reconnaissance to Optimize Impact* on July 1, 2022. The objective was to bring together a diverse group of researchers and practitioners to clarify important needs and potential next steps for improving earthquake reconnaissance coordination, with an emphasis on domestic events in the United States but with relevance to international cooperation as well. By identifying, compiling, and sharing these ideas, EERI can better work with its partners, members, and the overall reconnaissance community and stakeholders in planning for the most efficient, highest quality, and influential collaborative reconnaissance in the future.

The July 1, 2022 in-person half day workshop was preceded and informed by a **pre-event questionnaire**, in which 65 respondents shared their own thoughts about **desired impacts**, **coordination concerns**, and potential **next steps** for organizing for earthquake reconnaissance (Figure 1) as well as a special session at the 12th National Conference on Earthquake Engineering that initiated discussion on the roles of various reconnaissance organizations. At the workshop, 55 attendees affiliated with over 40 different organizations and roles (listed in Appendix A of the main report) took part in discussing and refining ideas for each of the three workshop themes.

The workshop process (Figure 2), included the pre-event questionnaire, and a series of individual reflection and small and large group interactions, and a wrap-up survey at the workshop. Participants were asked to contemplate the lessons and knowledge that should have been gained in the two years following a major U.S. earthquake. Participants then engaged around this (inevitable) hypothetical to advance their shared understanding. Appendices B through F go into more detail about what was done during and after each activity to derive the findings of this report.

Figure 1. Three defining themes that guided the workshop content and structure.

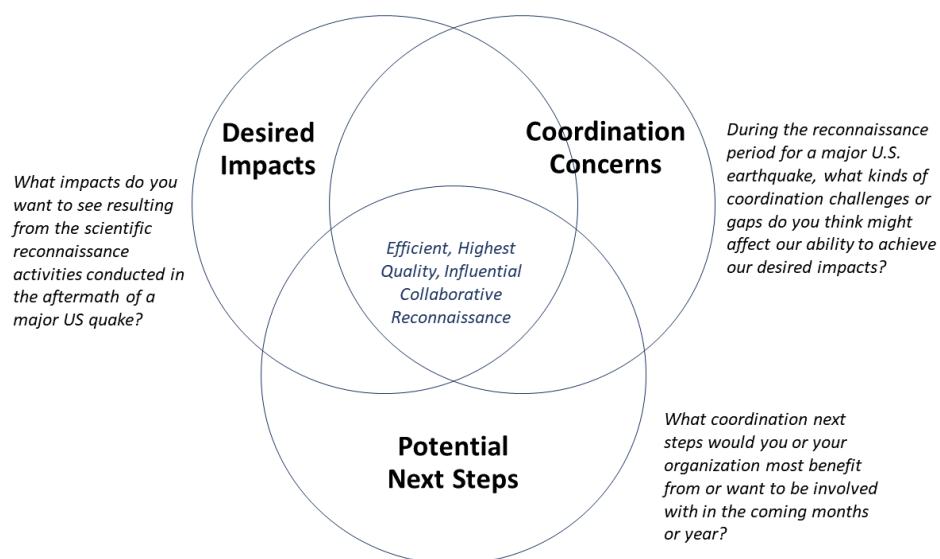
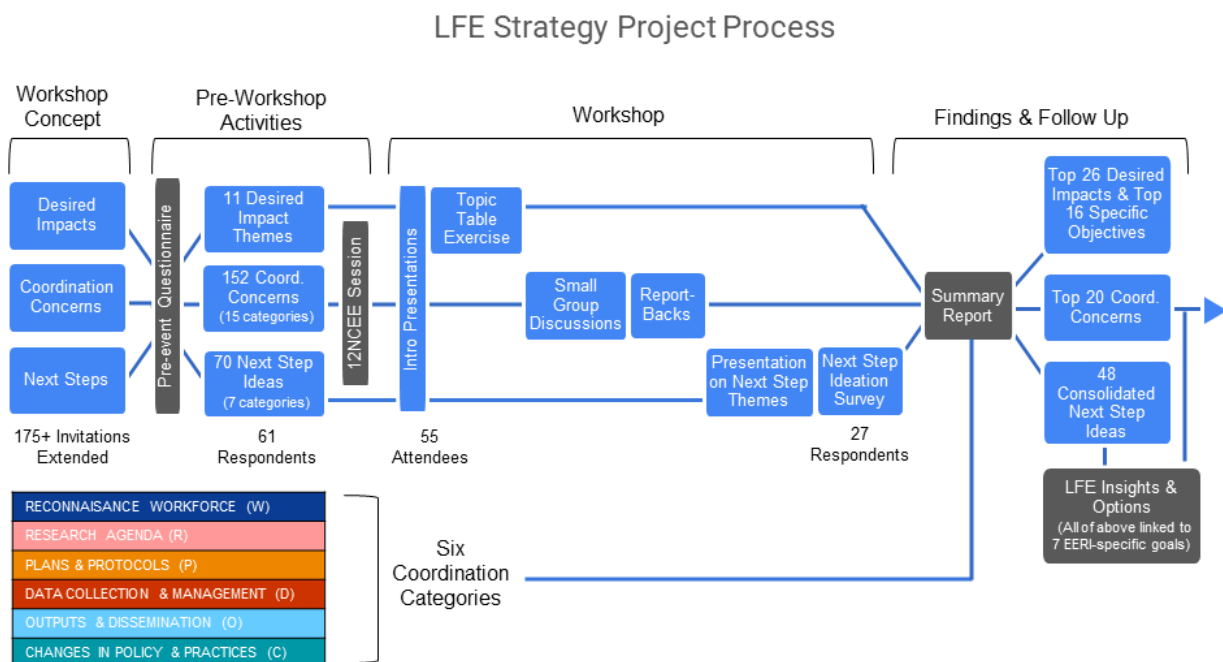


Figure 2. Diagram mapping the flow of ideas during the overall project process.



3. Workshop Outcomes & Findings

Through robust, multi-modal involvement of nearly 100 expert members of the earthquake reconnaissance community over the course of several months, this process produced a wealth of information about what members of this community want to accomplish, what might be standing in the way or occurring suboptimally when working together, and what can be done to improve current practices.

The LFE Strategic Working Group synthesized all this information and distilled it into three formats: 1) this Summary, 2) a robust set of supporting Appendices, and 3) several raw data files that are available upon request for those seeking further detail. The summary is meant to serve as a report-back to participants, a source of input for EERI as it develops strategies for LFE and partnerships going forward, and a vehicle to share insights for discussion among the broader earthquake reconnaissance community.

The report presents the workshop findings using a framework that organizes the diverse set of considerations within reconnaissance coordination into six categories – **Workforce, Research Agenda, Plans & Protocols, Data Collection & Management, Outputs & Dissemination, and Changes in Policy & Practices**, as described in Table 1. All the desired impacts, coordination concerns, and next step ideas are presented in relation to these categories. The Working Group also flagged topics and ideas of high relevance to EERI and the roles it plays in reconnaissance, including how it involves members and develops organizational partnerships.

Table 1. Coordination Categories used to frame the analysis in this report.

Coordination Category	Description
WORKFORCE	Who plans and carries out reconnaissance research. What roles do reconnaissance researchers play, how are people trained, what is their expertise?
RESEARCH AGENDA	Knowledge creation objectives. The work that is planned and done and topics to be investigated, including when and how that agenda is set.
PLANS & PROTOCOLS	How organizations jointly approach knowledge creation and sharing across all phases of reconnaissance, such as roles, logistics, and communication.
DATA COLLECTION & MANAGEMENT	Data collection practices, both in the field and remote, including technologies, platforms, formats, storage, security, and shared access.
OUTPUTS & DISSEMINATION	The products of the research process and how they are disseminated. What formats, audiences, messages, and channels are used?
CHANGES IN POLICY & PRACTICES	The influence that reconnaissance outputs have on the world, such as reduced risk via improved laws, design methods, or building practices.

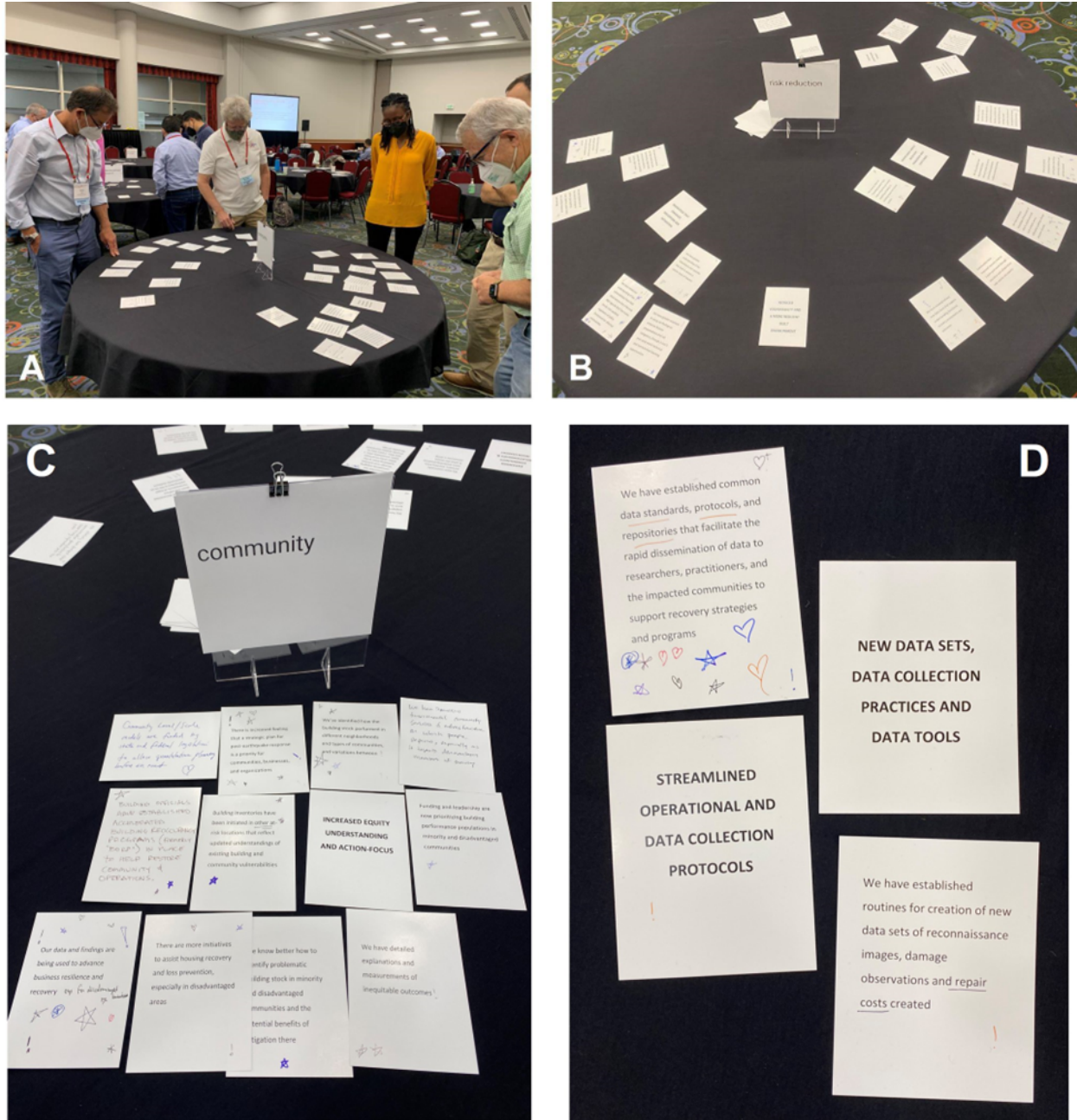
The LFE Strategic Working Group members processed the information collected through the surveys and discussed by participants as well as endorsed and refined during in-person activities at the workshop. This required substantial consolidation and paraphrasing, and the Working Group took great care to maintain fidelity to the breadth and depth of what participants had to say.

3.1 – Desired Impacts

Sixty one respondents to the pre-event questionnaire responded about what they hope to see result from reconnaissance research following a future major earthquake. Responses ranged from very specific scientific objectives to broad aspirations for future attitude change and risk reduction. The Working Group read and sorted those ideas into eleven preliminary emergent themes and presented the ideas back to workshop attendees in an exercise and follow up discussion. During the workshop, about 100 physical cards were placed on tables in the room, allowing attendees to silently circulate, add to, and interact with the ideas (Figure 3 A & B). Attendees could put a star, exclamation point, or heart on the ideas they felt most excited or passionate about. In effect, this served as a way for attendees to collectively “elevate” certain impact ideas as more motivating and important. Figure 3 (C) shows a more detailed example of card layout, and the use of interactive marks during the activity (D).

The result is a list of **Top 26 Desired Impacts**, shown in the first column of Tables 2 through 7 (starting on page 15). These are the outcomes that participants agreed were among the most important for the reconnaissance community to achieve. More details on the desired impacts and some high priority examples can be found in Appendix C.

Figure 3. (A) Workshop attendees circulating among tables displaying previously solicited “desired impact” ideas, and (B) an example “Risk Reduction” themed table showing layout of desired impact idea cards. (C) An example of cards laid out around a particular theme, and (D) the kind of interactive marks that participants made during the activity.



3.2 – Coordination Concerns

The Working Group qualitatively sorted 61 pre-event responses received for this question into fifteen broad types of perceived challenges, but the volume of information generated for this question was large, rich, and challenging to summarize. The Working Group provided workshop participants with a paper packet listing all the submitted coordination concerns, loosely grouped by type. A pared down version of that full list is in Appendix E.

At the workshop in small table groups, participants took 45 minutes to generate their own unmet coordination concern lists. A speaker from each table then reported back the “top two” highly important yet actionable coordination issues. The report-backs led to the real-time recorded list shown in Figure 4.

Figure 4. Top reconnaissance coordination concerns, as recorded live during small group report-backs at the workshop.



When this list was cleaned up and integrated with the survey data, the result is a list of the group’s **Top 20 Coordination Concerns**, which are synthesized in the second column of Tables 2 through 7. These are the gaps, obstacles, and worries that participants most brought forward in the survey and workshop discussions. More details on the discussion of coordination concerns can be found in Appendix D.

3.3 – Next Step Ideas

Questionnaire respondents again provided a wealth of ideas to this question, often several per person, ranging from general advice to very specific objectives. The Working Group sorted them and selected a subset to present to attendees at the workshop. Then, as the final workshop activity, workshop organizers solicited next step ideas in a second online questionnaire that participants filled out at the end of the workshop. The form asked for next steps from three different perspectives: (1) for EERI LFE, (2) for the organization(s) the respondent represents, and (3) for the individual themselves. Twenty seven respondents filled out the Next Step survey.

The combined list of potential next steps added up to 166 ideas, including some duplicates and some entries too broad to consider as a concrete suggestion. After the workshop, the Working Group qualitatively reviewed, grouped, clarified, and boiled down this list into **48 Consolidated Next Step Ideas**, which are synthesized in the third column of Tables 2 through 7. These are the outcomes that participants agreed were among the most important for the reconnaissance community to achieve. More details on the next steps and some high priority examples can be found in Appendix F.

Tables 2 through 7, which go through a high level summary of the top desired impacts, coordination concerns, and next steps ideas for each of the six Coordination Categories, comprise the core findings of the workshop.

Table 2. WORKFORCE

Desired Impacts	Top Coordination Concerns	Summarized Next Step Ideas
1. Well-Prepared Reconnaissance Workforce 2. Increased Participation with Opportunities for Skill Growth and Knowledge Transfer 3. Effective Interdisciplinary Teams 4. Broader Involvement	<p>A. The reconnaissance workforce is not adequately prepared for working in interdisciplinary teams and doing ethically- and community- grounded research.</p> <p>B. Disciplinary involvement in coordination planning is too narrow. Especially missing seems to be information technologists and potential users (e.g., emergency managers, building officials, and affected communities).</p> <p>C. There is a need to involve more people in reconnaissance and assure their professional development and effective knowledge transfer from one generation of researchers to the next.</p> <p>D. There is a lack of plans for how we get information to potential volunteers and researchers about how to join and deploy.</p>	<p>i. Update and publicize formal reconnaissance preparation expectations and protocols.</p> <p>ii. Encourage reconnaissance organizations to engage with professions outside of their domains (i.e., EERs to engage with professional societies) in planning for a major event response.</p> <p>iii. Encourage taking responsibility for personal readiness to participate.</p> <p>iv. Create lists of reconnaissance scientists, volunteers, organizations, and past and potential participants with contact and expertise information.</p> <p>v. Conduct targeted recruitment to expand those lists, filling in gaps and get those people up to speed and involved.</p> <p>vi. Identify and address barriers to participation.</p> <p>vii. Find ways to start building interdisciplinary teams in advance of earthquakes.</p> <p>viii. Consider who are the vital stakeholders beyond the scientists/engineers and initiate targeted, sustained relationship-building. Find ways to involve non-scientists in reconnaissance agenda-setting, operational planning and results-sharing across all phases.</p> <p>ix. Conduct region-specific reconnaissance coordination summits.</p>

Table 3. RESEARCH AGENDA

Desired Impacts	Top Coordination Concerns	Summarized Next Step Ideas
1. Building Performance Well-Understood 2. Geophysical Knowledge Advanced 3. More Interdisciplinary Research (e.g., Functionality, Socioeconomic Impacts, Human-Built Environment Interactions) 4. Prioritize Relevance to Risk Reduction 5. Longitudinal Studies to Track Recovery	<p>A. There is some concern about the level of commitment to addressing equity and vulnerable population needs through our research emphases and processes.</p> <p>B. There are issues in the selection of sites and topics of study, for instance, how to avoid redundancies of effort at high-visibility sites (i.e., damage that has received substantial press attention), which can produce redundant documentation while other less-publicized sites are not emphasized during data collection.</p> <p>C. There are gaps in our understanding of community, emergency manager, and other user needs, capabilities, and potential roles.</p> <p>D. There are difficulties to forming and operating effective interdisciplinary teams, for instance concerns about overlooking opportunities to work together, getting teams together at the right time, with the right discipline mix, who are able to merge their deep experience into understandings of multi-dimensions of disaster causes and impacts.</p>	<p>i. As appropriate to their missions, organizations can map out post-event research projects that are well suited to meet identified knowledge needs about structural and geotechnical system performance and that will help improve hazard, response, and impact models.</p> <p>ii. Write up a challenge and suggest a structure for triaging efforts in the field to address over-emphasis on “high-visibility damage.”</p> <p>iii. Organizations should map out reconnaissance research projects that are well suited to meet identified seismological and geotechnical knowledge needs that will help improve hazard characterization models.</p> <p>iv. Leverage EERI subcommittees in creating a unified list of critical data for reconnaissance teams to collect.</p> <p>v. Organizations should map out reconnaissance research projects that are well suited to meet identified knowledge needs about the socially constructed nature of natural hazard vulnerability, human and economic impacts, and recovery tactics and trajectories.</p> <p>vi. Develop a list of research needs/questions to support functional recovery standards.</p> <p>vii. Consolidate any (already available) “grand challenges” type of documents with specific application to reconnaissance.</p> <p>viii. Develop a list of research needs/questions to support understanding of longitudinal and post-event phenomena over time, including multidisciplinary topics.</p>

Table 4. PLANS & PROTOCOLS

Desired Impacts	Top Coordination Concerns	Summarized Next Step Ideas
<p>1. New, Enduring and Evolving Programs and Collaborations</p> <p>2. Efficient Cross-Boundary Cooperation</p> <p>3. Clear Communication Practices</p> <p>4. Sufficient Funding and Resources</p>	<p>A. Concerns exist about there being adequate, stable, scalable, and equitably- distributed funding and resource support for earthquake reconnaissance research, including for smaller and/or rural events.</p> <p>B. There are ambiguous roles and unclear priorities and plans of approach among leading organizations in the reconnaissance community, which causes confusion and potential overlaps, gaps, and inefficiencies.</p> <p>C. There are concerns about having sufficient communication systems, tools, and protocols in place, well-funded and maintained over time.</p> <p>D. There are coordination issues around international participation in helping and learning after a US event and how US experts help for events abroad.</p> <p>E. There is a sense of a lack of operational response plans that everyone seeking to do research can share, point to, and make their own plans based on.</p> <p>F. Consistent, shared plans for coordinating with local, state and federal officials are lacking.</p> <p>G. There may be confusion for the public and local actors due to communication gaps within and among reconnaissance teams and responders.</p>	<p>i. Establish MOUs that establish cross-boundary expectations, roles, and commitments.</p> <p>ii. Establish a regular, repeated routine of practicing together —across and within disciplines, regions, and jurisdictional levels.</p> <p>iii. Conduct a community asset mapping/landscape analysis.</p> <p>iv. Disseminate USGS Circular 1242 widely and make sure it is integrated into other organizations' plans in an ongoing way.</p> <p>v. Create regular opportunities to build relationships and exchange information and ideas.</p> <p>vi. Facilitate organizations doing their own preparedness and planning and developing readiness to proactively share information with other entities.</p> <p>vii. Consider communication needs, roles, timelines, and the necessary supporting infrastructure and resources within the reconnaissance research community considering mutual roles and coordination expectations.</p> <p>viii. Make sure that results from this workshop are widely distributed and presented in accessible summary formats.</p> <p>ix. Initiate an effort to identify funding champions, new and existing, including the private sector and philanthropy.</p> <p>x. Identify and better publicize opportunities to coordinate with NSF-funded research networks.</p>

Table 5. DATA COLLECTION & MANAGEMENT

Desired Impacts	Top Coordination Concerns	Summarized Next Step Ideas
<ol style="list-style-type: none"> 1. Produce Useful New Data Sets, Methods, and Tools 2. Shared Data Standards, Platforms, and Access 3. Create Centralized Website 	<ol style="list-style-type: none"> A. There are concerns about how to avoid or jointly address data collection impediments, and a sense that we are not as prepared as we could be in advance for how to operate together in any particular region, issue, or types of sites. B. There is a lack of commonly shared platforms, standardized data collection methods, technologies, and formats, and whether we have sufficient documentations tools ready for everyone to use. C. There is a lack of arrangements in place for widespread data access and sharing arrangements. 	<ol style="list-style-type: none"> i. Create a data structure for listing all the data-collecting organizations/teams, sites, and activities that will be filled out during active reconnaissance periods. ii. Make sure that non-EER organizations are aware of, contribute to, and use DesignSafe’s image repository. iii. Develop agreements about which open-source, geo-located databases would best allow for input and sharing of observations for which purposes. iv. Identify the data platforms, datasets, data collection infrastructure, etc. that the various players are using. v. Create opportunities for researchers to gather to discuss how to unify discipline- and topic- specific data collection practices. vi. Develop data technology solutions for identified shared needs and preferences. vii. Refine the information exchange interfaces to improve user experience and functionality, and implement those changes through LFE, clearinghouse activities, and the new centralized earthquake-specific NEHRP websites. viii. Outline an initial set of questions for recon organizations to populate the resource parts of the website.

Table 6. OUTPUTS & DISSEMINATION

Desired Impacts	Top Coordination Concerns	Summarized Next Step Ideas
<ol style="list-style-type: none"> 1. Well-Documented, Widely Disseminated Publications 2. Better Support for Emergency Response 3. Comprehensive Impact Maps and Databases 4. Updated Risk Maps 5. Findings Sharing Events 6. Improved Hazard Models 	<ol style="list-style-type: none"> A. There are a variety of concerns about creating potentially redundant reports, reaching only limited audiences and missing others, and other dissemination concerns such as over-proliferation of reports, timeliness, need for responsiveness to different audiences. B. There is a lack of shared protocols for community interactions and joint operations that include local non-experts and the media. How will we manage relationships and two-way communications with locals (e.g., sharing findings and getting information to and from them)? 	<ol style="list-style-type: none"> i. Consider communication needs, pathways, timelines, and the necessary supporting infrastructure and resources with information users and stakeholders. ii. Meet user communities where they are at, physically and in terms of their immediate goals and needs. iii. Create a standardized (and hopefully simplified) method of reporting reconnaissance findings for EERI and other professional audience communities. iv. In follow up to the new USGS Circular, collect, align, and disseminate protocols for activation to direct individuals and organizations on where they fit in a cohesive response. v. Integrate reconnaissance plans and data with FEMA RiskMAP. vi. Conduct region-specific reconnaissance coordination summits a couple of months following a major earthquake. vii. Set up a process to give the community/press basic info each evening as a tandem presentation each night during reconnaissance.

Table 7. CHANGES IN POLICY & PRACTICES

Desired Impacts	Top Coordination Concerns	Summarized Next Step Ideas
<ol style="list-style-type: none"> 1. Increased Public Understanding 2. Updated Regulations, Codes, and Construction Practices 3. Supports Recovery and Resilience 4. Clarified R&D Agenda 	<ol style="list-style-type: none"> A. Besides technical reports, there is not enough effort placed in the assembling and publishing of less technical material for the general public. B. It is unclear, given the LFE historical mission to learn from major events, how much researchers should prioritize and take responsibility for sharing information with the public. C. There are challenges around how structural findings and new engineering insights can best inform the work of local builders, developers, permitting processes, FEMA Public Assistance, HUD CDBG-DR and other programs. D. It is unclear how findings about structural and ground failures can be integrated into post-event mitigation and recovery. E. How and when can reconnaissance researchers engage with local businesses and communities in supporting effective reconstruction? F. There are gaps in addressing how new funding and programs, e.g., "Build Back Better" initiatives, can better target resources for those who had less beforehand. 	<ol style="list-style-type: none"> i. Hold report-back events and share publications for non-technical audiences to build awareness and spur momentum in improving codes and raising building resilience. ii. Create organizational and inter-organizational response plans for intentionally engaging the public in all reconnaissance phases. iii. Improved "peace time" communications with social and main media outlets and messaging consistency. iv. Develop a database and/or archive of post-event After-Action Reports and lessons learned. v. Initiate better coordination between FEMA Public Assistance/HMA/406 Mitigation and FEMA NEHRP/EERI regarding post-event recovery advisories, Community Education and Outreach (CEO), and PA/406 processes.

4. Collaborating on Reconnaissance Going Forward

The workshop demonstrated the commitment and passion of the reconnaissance community to not only learn from earthquakes, but to also ensure that lessons learned are translated into impacts. As an initial foray into this arena, this process was aimed at *idea elicitation and generation*, accompanied by categorization, clarification, and some prioritization. It created a framework for exploring ideas more deeply and from multiple perspectives. There was no intention to identify or screen next step ideas in relation to budget, ripeness, authority, distributions or roles, responsibilities, costs, or feasibility, nor to go into detail on any particular idea to turn it into an *action plan*. That kind of *evaluative* thinking comes next.

The LFE Strategic Working Group is continuing to consider and use this information in advising EERI staff and Board on future LFE program strategies, and will continue to support collaboration in this area for the benefit of EERI and all its partners. The Working Group sincerely hopes this process and resulting report will contribute to many other ongoing—and perhaps even new—efforts to do the same. Working Group members perceive many questions and opportunities for EERI from this workshop process, some of which are shared in Appendix G. Appendix H contains links to several existing EERI LFE resources.

4.1 – Roles & Opportunities for EERI

While addressing the coordination concerns identified through the workshop activities will take continued efforts from all stakeholders, EERI sees clear roles for LFE and as an organization in the following areas:

Reconnaissance Workforce

- **Training:** Grow in-person and virtual training opportunities for EERI members, especially by leveraging training modules developed by partners to train EERI members and potentially collaborate on creating new ones.
- **Pipeline:** Engage early career members in the LFE program to build the reconnaissance workforce pipeline, for instance through the [EERI Younger Members Committee](#), the Virtual Earthquake Reconnaissance Team, [LFE Travel Study Program](#), and LFE subcommittees.
- **Recruitment:** Conduct targeted outreach to recruit or partner with individuals with essential knowledge and skills that are currently missing from the reconnaissance workforce (such as IT, emergency managers, building officials, and affected communities).

Research & Reconnaissance Agenda

- **Topic-Focused Reconnaissance Agendas:** LFE subcommittees can develop important topics for reconnaissance data collection priorities based on their topics of expertise (e.g. housing, schools, etc.). As needed, new LFE subcommittees could be formed around identified research areas for which EERI members have special interest and skills. LFE subcommittees on [Public Health](#) and [Business Resilience](#) are currently active.

- **Reconnaissance Over Time:** EERI conducts multi-disciplinary or topic-focused reconnaissance in several timeframes. EERI's [Virtual Earthquake Reconnaissance Team \(VERT\)](#) regularly activates to develop virtual reconnaissance reports within days of an earthquake. EERI will also conduct field reconnaissance with objectives defined by the LFE Committee within days to weeks of an earthquake. An area of coordination that needs attention is avoiding conflicting priorities between those doing VERT reconnaissance and those deploying to the field (field deployments should be prioritized following a major event). EERI will also conduct long-term reconnaissance aimed at resilience and recovery topics years after an earthquake. EERI will look to partner with other organizations in all reconnaissance phases as appropriate to make the best use of available resources.
- **Research Needs Workshops:** EERI convenes post-earthquake research needs workshops to create research agendas based on impacts (e.g., following the 2010 Haiti Earthquake, 2010 Chile Earthquake, the 2011 Tohoku Earthquake and Tsunami, and the 2010-11 Canterbury Earthquake Sequence). More recently, EERI hosted one-year anniversary events for the 2018 Alaska Earthquake and the 2019 Ridgecrest Earthquake Sequence.

Plans & Protocols

- **State Earthquake Clearinghouses:** As a managing partner of several state earthquake clearinghouses, EERI will continue to update and improve clearinghouse response plans and conduct training and outreach to ensure the community is aware of plans and how to engage. Also through state clearinghouses, EERI will work with state partners to outreach to less engaged stakeholders such as emergency managers and GIS professionals. More information about state clearinghouse efforts is available here: <https://learningfromearthquakes.org/activities/clearinghouses>.
- **Reconnaissance Activation Exercises:** Given EERI's role in state clearinghouses and the NEHRP Post-Earthquake Investigations Plan, EERI is well-positioned to lead regular earthquake exercises to practice the community response to a US earthquake. Addressing the needs of different subsets of the reconnaissance community might be beneficial, for instance through discipline-, region-, or reconnaissance phase- specific exercises.
- **Workshops:** With its multi-disciplinary membership, EERI is a natural community convener and can work with partners to organize follow-up events to tackle some of the issues identified in Section 3.2 on Coordination Concerns in this report (such as the need to convene practical exercises and establish communications protocols and data management agreements).

Data Collection & Management

- **Virtual Clearinghouse Websites:** EERI quickly stands up virtual earthquake clearinghouse websites after earthquakes with a significant reconnaissance response. These websites go live quickly and serve as a good short-term platform for sharing preliminary reconnaissance data. The physical clearinghouse meeting space also provides a venue for reconnaissance teams to meet at the end of the day, share experiences, and mutually plan next-day activities. EERI has established over 30 virtual clearinghouse websites for major earthquakes since 2009, all of which can be accessed through the [LFE Reconnaissance Archive](#).
- **Long-term Data Curation:** EERI recognizes that other partners have more resources to support data curation and long-term archiving. EERI will work with partners such as DesignSafe, FEMA, USGS, and state geological surveys to develop best practices for long-term data archiving, access systems, and curation.
- **Reconnaissance Data Papers:** EERI will encourage the publication of data papers on curated reconnaissance datasets in [Earthquake Spectra](#).

Outputs & Dissemination

- **Reconnaissance Briefing Webinars:** EERI hosts multi-disciplinary reconnaissance briefing webinars to update members and the broader reconnaissance community on preliminary findings. Webinars often include relevant partners conducting reconnaissance. These webinars should be coordinated with collaborating reconnaissance organizations, including EERs. Webinar recordings from past events can be viewed here: https://www.youtube.com/c/EERIVideos/playlists?view=50&sort=dd&shelf_id=1.
- **Meeting and Conference Sessions:** EERI organizes technical program sessions on recent reconnaissance findings at its annual meetings, the National Earthquake Conference, the National Conference on Earthquake Engineering, and other events organized by partner organizations (such as the World Conference on Earthquake Engineering).
- **Impacted Community Outreach:** EERI is committed to sustained engagement with earthquake-affected communities throughout the clearinghouse activation process: pre-event, during active recon (daily briefings), after reconnaissance through findings reports and presentations.
- **Reconnaissance Reports & Data:** EERI teams produce interim and conclusive scientific reports and data and cooperate in creating multi-organization summary reports and data sets. EERI will continue to encourage publishing single discipline, multidisciplinary, topic-focused, interdisciplinary reconnaissance observations, and reconnaissance data papers in *Earthquake Spectra*.

Changes in Policy & Practice

- **Public Policy and Advocacy Committee:** Through collaboration between LFE and EERI's Public Policy and Advocacy Committee (PPA), EERI can leverage earthquake events to advocate for local, regional, and national advances in seismic safety, building on developed EERI Policy Position Statements. The PPA has also developed training modules for EERI members and the broader community to become citizen advocates for these issues. Based on earthquake impacts, the PPA can also make specific policy recommendations that are relevant and timely to the local region or can be applied to regions with similar hazard and risk. PPA advocacy and policy resources are available here: <https://www.eeri.org/advocacy-and-public-policy>.
- **EERI Regional Chapters Advocacy:** With training from the Public Policy and Advocacy Committee, EERI's regional chapter members are well-positioned to advocate for local change based on lessons learned from earthquakes. A list of EERI's regional chapters can be found here: <https://eeri.org/get-involved/regional-chapters/>.

EERI, largely throughout the LFE program, has played a central role in earthquake reconnaissance for seventy years. As the landscape grows and changes, EERI looks forward to working with partners to formalize future relationships to make the best use of the collective resources to learn from earthquakes.

5. Appendices

Appendix A: Organizations and Groups Represented at Workshop

Alaska Seismic Hazards Safety Commission (ASHSC)	LFE Executive Committee
ASCE IRD	McMaster University/CAEE
ATC 155 Project Technical Committee	National Science and Technology Center for Disaster Reduction (NCDR), Taiwan
California Seismic Safety Commission	NIST
California Earthquake Authority (CEA)	NSF
CONVERGE/ISEER/SSEER	Past Board/Utah Seismic Safety Commission
EERI Board of Directors	PEER
EERI British Columbia Chapter	Pontificia Universidad Catolica del Peru/LFE
EERI LFE Strategic Working Group	Travel Study
EERI PPA	RAPID
EERI Sacramento Chapter	SALT LAKE CITY CORPORATION
EERI SESI	SCEC
EERI Staff	Slate Geotech/Housner Fellows
Exponent	SMIS, Mexico
FEMA	Southern California Earthquake Center
FortisBC	StEER
GEER	UC Davis/LFE Travel Study
Greater Salt Lake Municipal Services District	University of Utah
Holmes	USGS
ICC/Travel Study	Utah DPS/DEM
Idaho OEM	Utah Geological Survey
Institute of Social Safety Science, Japan	EERI & IAEE World Housing Encyclopedia

Appendix B: Workshop Approach and Description

An impactful major earthquake will happen again in the United States, potentially at any time. Given that, EERI's Learning From Earthquakes (LFE) Strategic Working Group began planning a *Stakeholder Workshop on Organizing Post-Earthquake Reconnaissance to Optimize Impact* for summer 2022. The Working Group invited about one hundred and seventy five earthquake reconnaissance researchers and practitioners to a half-day workshop held on July 1st, 2022 in Salt Lake City, Utah.

The workshop process was somewhat unusual in that it involved three different information exchange activities, each distinct in nature and involving different yet overlapping sets of participants. First, workshop invitees were invited to fill out a **pre-event questionnaire**, which allowed any invitee to give input on the topics to be covered at the workshop, even if they couldn't attend in person. Sixty five invitees submitted responses. The Working Group then analyzed this information and integrated it into the content and activities conducted at the workshop. Second, the Working Group organized a **technical session** at the 12th National Congress on Earthquake Engineering (12NCEE) where key leaders in earthquake reconnaissance presented about what their organizations are doing. And finally, a series of interactive exercises and in depth discussions took place at the **half-day workshop** immediately following the conference, with 55 people in attendance.

This report summarizes the pre-event questionnaire and workshop aspects of this process. The Working Group organized the overall effort around the concept of leading stakeholders in clarifying the **desired impacts, coordination concerns**, and potential **next steps** for organizing for earthquake reconnaissance, with emphasis on the United States. At the workshop, attendees discussed and refined ideas in all three areas, which the Working Group integrated into this summary report. This Summary contains an overview of findings, with appendices that offer further raw and categorized information for those seeking additional depth.

Summary of Pre-Event Questionnaire and Workshop Activities

The Working Group began the workshop process with an online pre-event questionnaire a month before to which all invitees were welcome to respond. The questionnaire asked three open-ended questions that would set the stage for the three workshop themes:

1. "Imagine yourself TWO YEARS AFTER a major earthquake has occurred in the U.S. What IMPACTS do you want to see resulting from the scientific reconnaissance activities conducted in the aftermath of the quake?"
2. "During the reconnaissance period for that major u.s. earthquake, what kinds of coordination challenges or gaps do you think might affect our ability to achieve the impacts just listed?"
3. "Given the desired impacts and coordination needs just discussed, what coordination NEXT STEPS would you or your organization most benefit from or want to be involved in IN THE COMING MONTHS following this workshop?"

The LFE Working Group read and qualitatively analyzed the 61 response sets received, sorting them into emergent categories and incorporated this information into the workshop agenda.

At the workshop, the 55 attendees first heard briefly from Project Lead Chris Poland about the forthcoming USGS Circular 1242 update that is nearing completion after a multi-year process. Circular

1242 forms the framework for collective earthquake reconnaissance for the four lead NEHRP agencies: USGS, FEMA, NIST, and NSF.

Dr. Lori Peek then shared information about the vision and activities of CONVERGE, an NSF-funded collaborative framework for advancing the ethical conduct and scientific rigor of hazards and disaster research and strengthening networks between disciplinary communities conducting such work, and the seven discipline-specific Extreme Events Research / Reconnaissance centers (EERs).

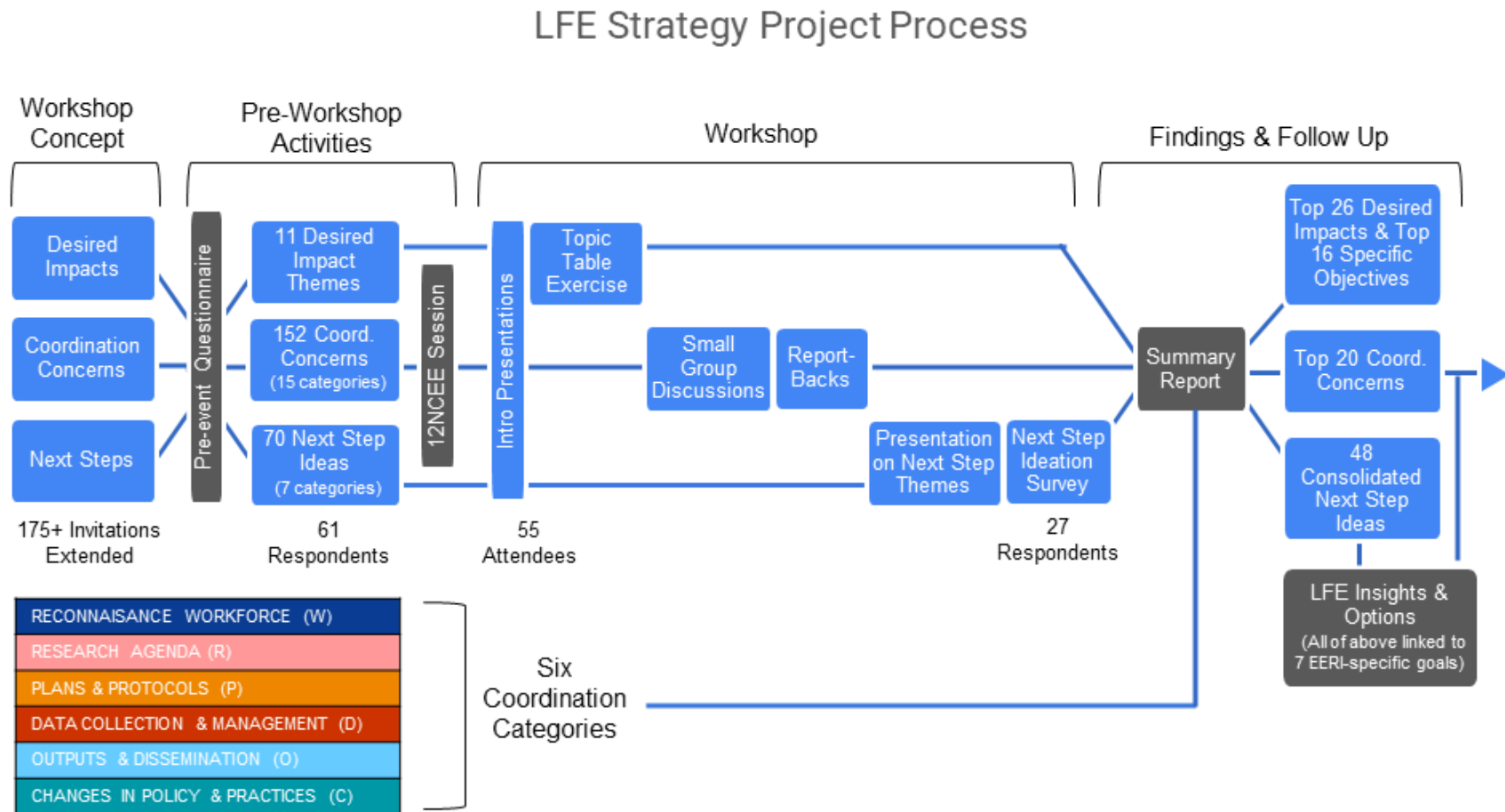
Facilitator Dr. Sharyl Rabinovici then led participants through three workshop activities. In the first, she invited participants to fast forward in their minds to several years after a major U.S. quake, and explore high priority ***Desired Impacts*** our community wants to achieve in the areas of earthquake understanding and risk reduction. This was achieved by placing about 100 physical cards on tables in the room, allowing attendees to circulate, add to, interact with and express enthusiasm for their favorite ideas on the cards.

Next, in breakout groups, attendees worked in small groups at their tables to clarify unresolved ***Coordination Concerns*** that may affect our ability to achieve those important desired outcomes. Each table then reported out its top two concerns, which created a “Top Concern” list and fueled a larger group discussion.

The last section of the workshop focused on potential ***Next Steps***. Dr. Rabinovici presented a summary of themes among the pre-event questionnaire responses as to steps that the reconnaissance community can take in 2022 to get us ready to perform our best in the planning and active reconnaissance, analysis, and insight dissemination periods in the next major U.S. earthquake. She then invited attendees to take 20 minutes to fill out an online survey, describing one specific next step idea each for EERI, their own organization, and themselves, respectively. Twenty seven persons completed that three question Next Steps survey.

The diagram in **Figure B1** gives an overview of the sequence of interactions, activities, and outcomes of this process. Outputs include: (1) raw response data from the pre-event questionnaire and workshop activities, and, (2) a written report offering follow-up synthesis of the all accumulated information and ideas, including preliminary take-aways generated by EERI’s LFE Strategic Working Group.

Figure B1. Diagram mapping the flow of ideas during the overall project process.



Appendix C: Desired Impacts

“Imagine yourself TWO YEARS AFTER a major earthquake has occurred in the U.S. What IMPACTS do you want to see resulting from the scientific reconnaissance activities conducted in the aftermath of the quake?”

Sixty one respondents to the pre-event questionnaire offered answers to the above question, ranging from very specific scientific objectives to broad aspirations for future attitude change and risk reduction. The LFE Working Group read and qualitatively analyzed and sorted those ideas into eleven preliminary emergent themes and presented the ideas back to workshop attendees in the table card exercise and follow up discussion. The result is a **16 Specific Objectives** list (far right column of Table C1).

Table C1. Top Desired Impacts for the earthquake reconnaissance by Coordination Category, with high priority examples as rated by participants.

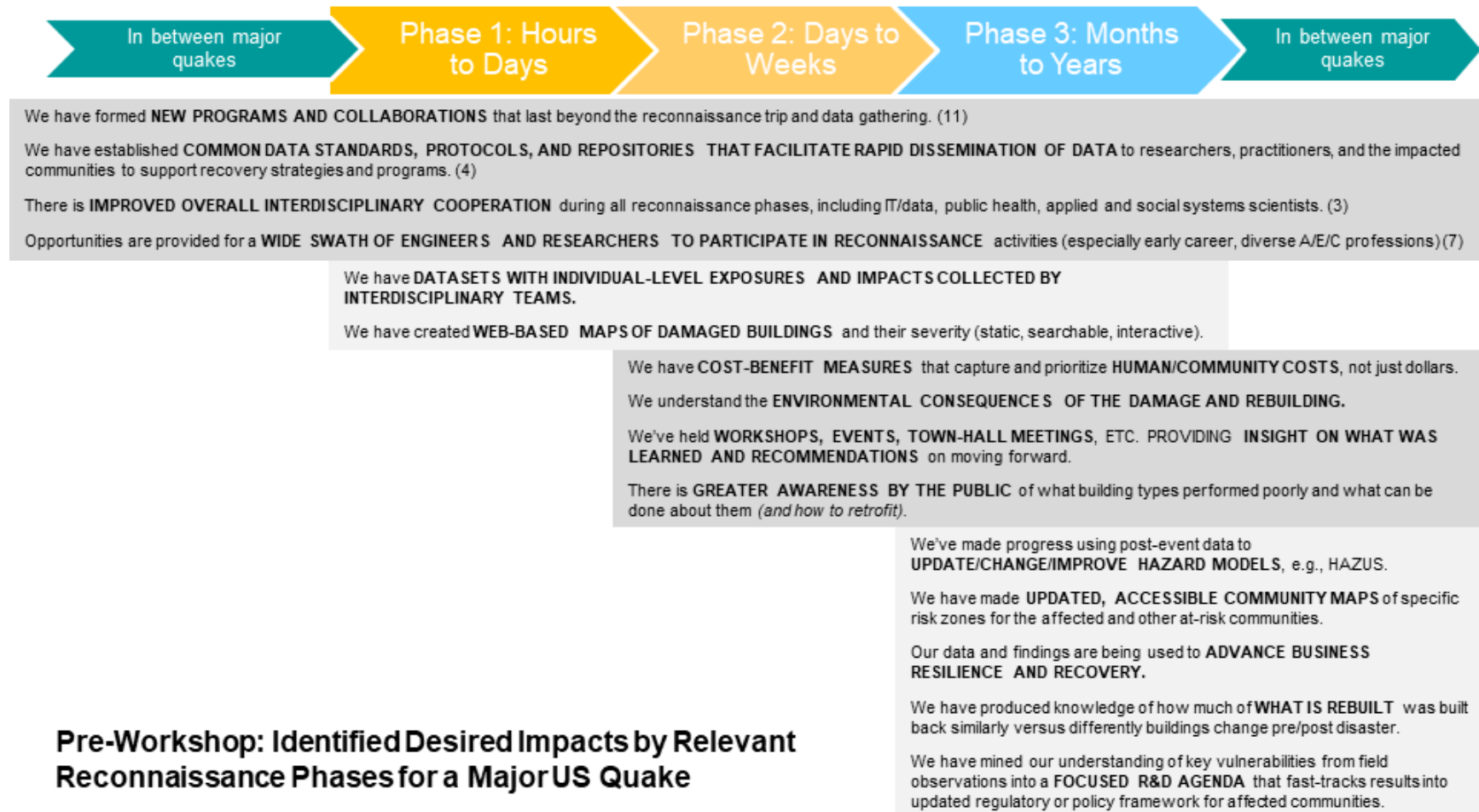
Coordination Category	Top Desired Impacts	High Priority Examples
WORKFORCE	1. Well-Prepared Reconnaissance Workforce	Opportunities are provided for a wide swath of engineers and researchers to train for and participate in reconnaissance activities (especially early career, diverse A/E/C professions).
	2. Increased Participation with Opportunities for Skill Transfer	
	3. Effective Interdisciplinary Teams	There is improved overall interdisciplinary cooperation during all reconnaissance phases, including IT/data, public health, applied and social systems scientists.
	4. Broader Involvement	
RESEARCH AGENDA	1. Structure Performance Well-Understood	We have datasets with individual-level exposures and impacts collected by interdisciplinary teams.
	2. Geophysical Knowledge Advanced	We understand the environmental consequences of the damage and how the community is recovering and rebuilding.

Coordination Category	Top Desired Impacts	High Priority Examples
	3. Interdisciplinary Research	We have "cost" benefit measures that capture and prioritize human/community costs , not just dollars.
	4. Risk Reduction Relevance	We have produced knowledge of how much of what is rebuilt was built back similarly versus differently, and understand how the built environment is changing from pre- to post- disaster.
	5. Longitudinal Studies	
PLANS & PROTOCOLS	1.New, Enduring and Evolving Programs and Collaborations	We have formed new programs and collaborations that last beyond the reconnaissance trip and data gathering.
	2.Efficient Cross-Boundary Cooperation	
	3.Clear Communication Practices	
	4.Sufficient Funding and Resources	
DATA COLLECTION & MANAGEMENT	1.New Data Sets, Methods, and Tools	We have established common data standards, protocols, and repositories that facilitate rapid dissemination of data to researchers, practitioners, and the impacted communities to support recovery strategies and programs.
	2.Shared Data Standards, Platforms, and Access	
	3.Centralized Website	
OUTPUTS & DISSEMINATION	1.Well-Documented, Widely Disseminated Publications	
	2.Informs Emergency Response	
	3.Comprehensive Impact Maps and Databases	We have created web-based maps of damaged buildings and their severity (static, searchable, interactive).
	4.Updated Risk Maps	We have made updated, accessible community maps of specific risk zones for the affected and other at-risk communities.

Coordination Category	Top Desired Impacts	High Priority Examples
	5. Findings Sharing Events	We've held workshops, events, town-hall meetings , etc. providing insight on what was learned and recommendations on moving forward.
	6. Improved Hazard Models	We've made progress using post-event data to update, invent, and improve hazard models , e.g., HAZUS.
CHANGES IN POLICY & PRACTICES	1. Increased Public Understanding	There is greater awareness by the public of what building types performed poorly and what can be done about them (and how to retrofit).
	2. Updated Regulations, Codes, and Construction Practices	We have mined our understanding of key vulnerabilities from field observations into a focused R&D agenda that fast-tracks results into updated regulatory or policy frameworks for affected communities .
	3. Supports Recovery and Resilience	Reconnaissance data and findings are being used to advance resilience and recovery .
	4. Clarified R&D Agenda	

After the workshop, the Working Group reflected that these reconnaissance objectives can be presented somewhat chronologically in relation to the phase of reconnaissance where they are most relevant. That is how the specific objectives are presented in **Figure C2**.

Figure C2. Top 16 Specific Objectives presented by most relevant reconnaissance phases.



Appendix D: Coordination Concerns

“During the reconnaissance period for that major U.S. earthquake, what kinds of coordination challenges or gaps do you think might affect our ability to achieve the impacts just listed?”

The Working Group qualitatively sorted the 61 responses received for this question into fifteen broad “types” of perceived challenges, but the volume of information generated for this question was large, rich, and challenging to summarize. The Working Group provided workshop participants with a paper packet listing all the submitted coordination concerns, loosely grouped by type. That list is available in Appendix 8 for anyone wanting further detail.

At the workshop in small table groups, participants took 45 minutes to discuss unmet coordination needs as they perceived them. A speaker from each table then reported back the “top two” highly important yet actionable coordination issues. The report-backs led to the real-time recorded list shown in **Figure D1**.

Figure D1. Top reconnaissance coordination concerns, as recorded live during small group report-backs at the workshop.



Following the workshop, the Working Group melded the live-produced concern list with the pre-event list of emergent themes, arriving at a final list of **20 Final Top Coordination Concerns** (again, there were duplicative/overlapping topics).



Appendix E. Pre-Event Questionnaire Coordination Concerns Handout

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

DURING THE RECONNAISSANCE PERIOD for that major U.S. earthquake, what kinds of coordination CHALLENGES OR GAPS do you think might affect our ability to achieve the impacts just listed?

To whom is this challenge relevant?

Expanded multi-disciplinary involvement	Me	LFE	Other
• There are significant gaps/challenges in integrating science teams with social science teams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• A lack of multi-discipline guidelines to operate following the event,			
• There are not enough non-engineering researchers on teams with many more engineers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is a lack of understanding about how to coordinate with stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• International experts are not given enough opportunities to be familiar with protocols and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Field work is too limited in who participates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in utilizing the EERI/LFE working groups, such as the Public Health Working Group, as a mechanism for making and supporting linkages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in awareness about how to become more involved in EERI/LFE	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is a lack of a previously defined network of collaborators working at the intersection of social sciences, earth sciences, planning, and engineering.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of clarity in how PCWG can coordinate broad-based post-earthquake investigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of understanding in how to incorporate many more potential investigators	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are challenges in communicating and sharing investigation plans, details about data gathered, and lessons learned in real time with many different groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in connecting different disciplines perspectives on topics (recon and research areas) to engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is a lack of shared clarity in what EERI's mission is in coordination planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in alignment between the Geologist community and the geotechnical engineering community (EERI and SSA/SCEC are not allied worlds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is a lack of funding available for field work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

- There is a lack of funding in the reconnaissance community ☐ ☐ ☐ _____
- There needs to be more funding for smaller events/projects/proposals ☐ ☐ ☐ _____
- There are challenges in proper allocation of reconnaissance sources to many different teams ☐ ☐ ☐ _____
- The resources and equipment of NSF-funded NHERI RAPID facility are not fully sufficient ☐ ☐ ☐ _____
- Alternative /new sources of funding are not considered often enough ☐ ☐ ☐ _____
- There is a lack of resources that enable integration, standardization, and efficiency of data collection efforts ☐ ☐ ☐ _____
- There are challenges in addressing public willingness to bear the costs ☐ ☐ ☐ _____
- There is less than adequate resources in most communities to address structural needs ☐ ☐ ☐ _____
- There are challenges in efficient funding mechanisms for longitudinal studies ☐ ☐ ☐ _____

Identifying impacted community disparities and risks	Me	LFE	Other
• Identifying which vulnerable communities / businesses are less likely to have the recovery networks and resources is a challenge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in current studies between local relationship establishment and management facilitating local priorities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are no single coordinating position to coordinate the data evaluation, collection and interactions with those impacted in the community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of understanding how the affected members of the community is getting what they need – recon work should be mutually beneficial	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of an effective digital platform (mapping database) for communication and coordination between many groups/stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Gaps in understanding coordination needed to ensure effective ethical practices in site visits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of a model response mechanism for post-earthquake actions that provides guidance for those Building Departments not able to engage their communities with means to survey buildings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Gaps in understanding how non-events can be documented, in a way that will help encourage future retrofit efforts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

• Challenges in addressing who/how we can manage legitimate ethical concerns about researchers overwhelming a site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of technical resources coupled with local experience to support post-earthquake investigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of implementation of Reciprocity - what can we offer the community?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
Improved multi-level protocols	Me	LFE	Other	
• Meeting inefficiency is a challenge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is insufficient protocol for how teams are established and dispersed to collect data at all levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are no national level protocols for how post-reconnaissance will be done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges in limiting Federal agencies as a singular influence on protocols and data collection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is no government apparatus pointing organizations/agencies in one direction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Lack of clarity /consensus around EERI as the international network and clearinghouse for all recon teams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges to including social science and public health perspectives on topics (recon and research areas) that link to engineering (in direct and indirect ways).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges around managing all the different individuals, organizations, & governments collecting data and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• International experts should be invited and familiarized more with protocols to work together	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges in organizational management of top-down directives before, during, after event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
Lack of pre-event site planning	Me	LFE	Other	
• Gaps in planning the resources (e.g. local engineers, social scientists, planners) for all the areas (not only focusing cities in USA) and allocated for specific aspect of emergency response and recovery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Challenges with enabling identification of reconnaissance goals for each major city before an EQ even occurs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in preparation for earthquake(s) that may impact all the west coast states, including Vancouver, BC.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in perceptions of value between taking pictures and mapping critical failures at sites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Real-time exercises are not rehearsed enough so that challenges and gaps could be identified in sites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Challenges with effectively incorporating the teaching of inexperienced field personnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

- | | | | | |
|--|-----------------------|-----------------------|-----------------------|-------|
| • There is not enough motivation to participate in a team effort to perform the thorough checking that is needed to characterize ground failure | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |
| • Lack of pre-event planning of issues to inspect and observe after a significant earthquake; depending on the type of urban environment affected (pre-event planning for larger cities, smaller cities, lifelines, etc) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |
| • There are gaps in coordination and identification of reconnaissance goals for each major city before an EQ even occurs (where will the damage happen?) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |
| • There is no established pre-event formal organization on the part of professional and academic sectors | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |
| • Building histories are not well documented or accessible | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |
| • Reconnaissance teams do not plan what to look for in different environments often enough | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |
| • There are challenges when coordination is not planned in advance i.e. prior to earthquake, it would be difficult to master and utilize experienced experts in a short notice | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | _____ |

Data collection challenges	Me	LFE	Other
• Data collection is limited in areas focused on construction safety and updating the building codes (e.g., by NIST and FEMA focus)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in knowing what mix of data will be needed to get a sound portrait of what performed well, what did not, and why.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are challenges in documenting good performance consistently and not just primarily focus on damage or inadequate performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of standardization across data collection activities, e.g., using different apps, different rating systems/guidance which creates barriers for sharing data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• A lack of an online data collection tool/platform that is adopted by EERI, USGS as a standard approach to collecting and sharing field data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is a lack amongst teams that may collaborate following reconnaissance efforts in reducing overlap of building inspections to maximize the collection of data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is a lack of timely technical support (including from outside traditional reconnaissance actor sets)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are challenges in missing time windows for collecting valuable performance information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Lack of consensus in how to address unnecessary re-visiting of sites by multiple groups; and the many aspects that are very specific to an event and therefore cannot be fully coordinated and planned in advanced	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are not enough standardized forms of data collection and methods of dissemination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

Lack of standard collection practices	Me	LFE	Other	
• A lack of a model response mechanism for post-earthquake actions that gives guidance for those Building Departments with little resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Lack of consensus among recon teams to agree on standard, consistent procedures to be used in collection of data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a significant need to know in advance what data would be most important for validation of the multiple types of predictive model	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Gaps in understanding how to best use an image as data; sometimes used without acknowledgments of original collector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of clarity around who develops and maintains common data standards and repos?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Lack/challenges in collating independently collected engineering data sets and sharing them widely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Lack of uniformity of building damage data collection by various groups, and lack of open availability of resulting data sets.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
Improving external collaboration:	Me	LFE	Other	
• There is a gap in lobbying to elect more progressive officials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of timely technical support externally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Lack of clarity in understanding how to implement Reciprocity - what can we offer the community?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps between the LFE historical mission to learn from major events and sharing information with the public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in utilizing local knowledge and expertise; Knowing who is doing what?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in coordinated outreach to the local/federal/state public officials from the Geoscience and Engineering community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of consensus amongst organizations + agencies and their <i>individualized</i> and <i>collaborative</i> roles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are not enough standardized forms of collaboration - MOUs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
Collaboration roles for EERI within the reconnaissance community	Me	LFE	Other	
• EERI relationships: to what is EERI central?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Gaps in utilizing EERIs ability to be the international network leader and clearinghouse for all recon teams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• EERI has the international network and the clearinghouse for all reconnaissance teams but there are gaps in clarity, roles, funding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is lack of consensus around clear goals of LFE reconnaissance. Basic science, engineering, yes, but how far into social science, recovery, etc.?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

• There are gaps in the creation of multi-organizational teams (i.e., EERI, ASCE, Designsafe, CONVERGE, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• For EERI to retain its influence in these events, coordination prior and up front is essential	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of timely technical support internal to the recon community, and inconsistency in capabilities between organizations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in creating specific rules of how to acknowledge the data collected by others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in understanding how to better encourage and facilitate engineers and scientists to collaborate through a jurisdictional scientific organization or event "clearinghouse"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in mechanisms for the various research communities to have discussed research priorities in advance, to create maximum potential for buy-in and enthusiasm for coordination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of consensus around how independent reconnaissance teams should operate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Geologists and geotechnical engineers are different worlds = for example most folks in earthquake geology don't belong to EERI, and many geotechs not part of SSA/SCEC. Where to focus, how to coordinate these allied worlds is a missed opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps between findings of structural/ground failures and integration into post-event mitigation and recovery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges around how the structural findings and recommended repairs inform local builders/developers/permitting processes/FEMA Public Assistance/HUD CDBG-DR	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Multi-organizational teams do not have enough of a unique focus to reduce question redundancies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Building departments do not keep detailed/digitized records of the work completed on single family dwellings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Emergency managers are not informed sufficiently of city-wide damage information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps/needs for more effective digital platforms for communication and coordination between many stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges in coordinating amongst state and local officials, technical/policy organizations such as EERI, SSA, SEAOC (SEOW, SEO, SEU etc.) and NEHRP agencies led by USGS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Significant challenges in coordinating recon efforts that avoid overlap of building inspections	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
Communication challenges	Me	LFE	Other	
• There is a lack of effective communication channels in the field among the different groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Gaps in efficient information sharing and communication between reconnaissance teams, local officials and decision makers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in establishing essential lines of communication between feds/state/local authorities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

- Downed communications and networks are a challenge in the field and out/remote ☐ ☐ ☐ _____
- Besides technical reports, more effort must be placed in the assembling and publishing of less technical material for the common public ☐ ☐ ☐ _____
- There are significant challenges in how often to include local businesses and communities in determining how and where to rebuild. ☐ ☐ ☐ _____
- Expanding LFEs audience is a major challenge ☐ ☐ ☐ _____
- There is a lack of consensus around who EERIs audiences are for reports– just members? members or the public? ☐ ☐ ☐ _____
- There are gaps in process for producing coordination contact lists, roles, and responsibilities ☐ ☐ ☐ _____

Streamlining data sharing	Me	LFE	Other	
• There is a gap in efforts assembling and publishing of less technical material for the common public and city authorities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Gaps in effective data evaluation, collection and interactions with those impacted in the community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Combining data amongst groups/disciplines is too challenging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of a central sharing system for data collected by different organizations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a gap in coordinated timelines for sharing important data findings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a gap in coordinated GIS databases for consult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Gaps between findings of structural/ground failures and integration into post-event mitigation and recovery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a gap in rapid set-up and promotion of earthquake clearinghouse to enable data to flow quickly and efficaciously.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is no effective digital platform for communication and coordination in single platform with stakeholder mapping and database.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Lack of a centralized GIS database and organization tool to coordinate and access damage assessments with regular updates and use by all levels of government (local, state, and federal).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There is a lack of consensus in the community amongst competing priorities: protecting data privacy and sharing data freely and openly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are challenges with too much coordination, and we lose some originality in the recon objectives and process, maybe even the results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• Local relationship establishment and management, facilitating and encouraging influence of local priorities on what is studied and how	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in documenting resilience case studies - good performance/adaptation/functional recovery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
• There are gaps in documenting 'non-events' due to community-scale use of codes, enforcement, and good performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____

PRE-EVENT QUESTIONNAIRE: COORDINATION CONCERNS

- There are challenges in using remotely gathered data (using new technologies) or crowdsourced (using a minimally trained, locally-sourced volunteer workforce) ☐ ☐ ☐ _____

Equitable Access to Physical Risk Reduction Resources:	Me	LFE	Other
• There are gaps in ensuring that all damaged buildings are evaluated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Challenges around the tendency to focus on individual goals and applications, rather than the needs of the affected population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Challenges in (pre?) identifying the critical needs of impacted communities to support them most effectively in the recovery process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Gaps in understanding how/if the affected members of the community are getting what they need - work should be mutually beneficial.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are significant challenges for owners reticent to contact authorities for fear of the building being declared unsafe to occupy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Gaps in addressing how new funding i.e. "Build back better" should include better resources for those who had less before hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____

Employment pathways and skills/professional development:	Me	LFE	Other
• There is a gap in experience and influence with widened involvement, mentorship and succession/talent pipeline development in fieldwork	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are gaps in the process of getting people certified/ deputized so that they can get to work ASAP after an event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are significant challenges to getting on the ground field work recon experience	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are not enough opportunities for professional development of new EERI and community members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There is not enough training available in a multidisciplinary context for all practitioners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____

Physical barriers to coordination	Me	LFE	Other
• Downed communication channels (e.g., internet, cell, power) are a significant challenge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Inadequate physical access to facilities and background data about them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Damaged transportation routes, communications, staffing, fuel, and supply shortages inhibit reconnaissance teams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• The challenges around the ability to identify the reasons for a cordon, who creates and enforces it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• Single family houses are privately owned with limited interior and insurance info	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____
• There are challenges in local governmental entities restricted access following disasters – legal constraints	<input type="radio"/>	<input type="radio"/>	<input type="radio"/> _____

Appendix F: Next Steps

“Given the desired impacts and coordination needs just discussed, what coordination NEXT STEPS would you or your organization most benefit from or want to be involved in IN THE COMING MONTHS following this workshop?”

Questionnaire respondents again provided a wealth of ideas to this question, often several per person, ranging from general advice to very specific objectives. The Working Group sorted them and selected a subset to present to attendees at the workshop. Then, as the final workshop activity, workshop organizers solicited next step ideas in a second online questionnaire that participants filled out real time. The form asked for next steps from three different perspectives (relative to who or what entity can carry out the idea): (1) for EERI LFE, (2) for the organization(s) the respondent represents, and (3) for the individual themselves. Twenty seven respondents filled out the Next Step survey.

The combined list of potential next steps added up 166 ideas, including some duplicates and some entries too broad to consider as a concrete suggestion.

At a high level, the types of **Next Steps Action Areas** mirror the Coordination Categories, as shown in **Table F1**. It is not a one-to-one correspondence, but provides reassurance that the coordination categories are all meaningful, and that attendees and survey respondents thought broadly and covered substantial ground across the coordination landscape.

Table F1. Seven overarching Next Step Action Areas by Coordination Category.

WORKFORCE	Cultivate the reconnaissance workforce
RESEARCH AGENDA	Clarify Shared Reconnaissance Goals and Research Agenda
PLANS & PROTOCOLS	Improve Inter-organization cooperation and information sharing
	Conduct workshops, convenings, and events
	Improve communication networks and protocols
DATA COLLECTION & MANAGEMENT	Enhance technologies and procedures regarding data
OUTPUTS & DISSEMINATION	Set strategy for disseminating findings
CHANGES IN POLICY & PRACTICES	(none chosen)

After the workshop, Dr. Rabinovici qualitatively reviewed, grouped, clarified, and boiled down this list into **48 Consolidated Next Step Ideas**. These were presented in a set of accompanying tables, in relation to the six **Coordination Categories**, **26 Top Desired Impacts**, and including the corresponding **Top 20 Coordination Concerns**.

Notably, there were very few if any Next Step Ideas that specifically spoke to the desired impact of creating *Change in Policy and Practices*. This is understandable, given the longer term, more abstract and applied nature of this objective, especially for a community that came together over the need to conduct time-sensitive research. We must do that first in order to be ready to pursue the subsequent, even if very important underlying and ultimate, goal of systemic practical change. Another interpretation is that many of the Next Step Ideas in other Coordination Categories relate to creating the preconditions for effectively advocating for, supporting, and achieving changes in policy and practice.

Appendix G: Additional Preliminary Insights from the Workshop

The lists generated in the workshop process—whether taken one at a time, across coordination categories, or in alternative groupings—also reveal some gaps in our thinking and invite new questions. As example, here are a few preliminary observations:

- The **16 Specific Objectives list** contains several outcomes that participants rated as highly important but about which no specific concerns or next step ideas were expressed. These point to new areas for developing a reconnaissance research agenda, expanding expert participation, and new perishable, more interdisciplinary, and longitudinal data collection goals. Some examples are:
 - The ambition to better document and explore the environmental and sustainability impacts of disasters and how we rebuild from them.
 - Data collection that documents and measures human, psychological, and intangible “costs.”
 - Study of business impacts and recovery trajectories.
- Participants did not list coordination concerns about every desired impact. It is unlikely that means we are perfectly ready to pursue those particular impacts. Perhaps instead we have not considered yet our readiness and potential obstacles in these less explored areas of desired impact. Is this because we have been focusing on other, perhaps more immediate or salient concerns? Only further thought can discern. Some of the desired impacts which had few to no specific concerns were:
 - Advancing Geophysical Knowledge
 - Longitudinal Studies
 - Centralized Website
 - Comprehensive Impact Maps and Databases
 - Updated Risk Maps
 - Findings Sharing Events
 - Improved Hazard Models
 - Clarified R&D Agenda
- The Next Step lists do not contain ideas addressing all our key concerns, especially in the longer term impact categories of outputs and dissemination and policy and practical change. Again, this points out areas where we may need to dig deeper, in a different kind of format or with a different set of participants, in order to clarify the concerns and be able to imagine productive next steps we could take.
- Finally, not all the desired impacts, concerns, and next steps are equally well thought out. People seeking to act on these informative lists will need to do further discovery, elaborative, and clarifying work.