Post-Earthquake Data Collection Workshop

Executive Summary

Anchorage, Alaska
July 20-22, 2014

Overview and Purpose

A workshop to discuss recent experiences and future needs related to post-earthquake data collection was held in Anchorage, Alaska from July 20 – 22, 2014 with participants from several different countries including New Zealand, Italy, Chile, Japan, Canada, and United States. Due to recent earthquakes in many of the represented countries, the workshop provided a unique opportunity to review data collected internationally, critically evaluate current data collection approaches, initiate collaborative international research efforts to maximize the knowledge gained from recent devastating events, and begin to develop international consensus on data collection protocols for future events.

To achieve a manageable scope, the workshop focused on building-related data. Lifelines such as roadways, power distribution systems, etc. are clearly essential for resilience but such data is generally collected in a systematic manner already since lifelines are typically managed by a single entity. Data collection for private buildings is considerably more challenging. Data of interest to this workshop include building performance, business interruptions, housing impacts and post-earthquake decisions.

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Participants of Post-Earthquake Data Collection Workshop, Anchorage, Alaska, July 2014

Workshop Procedure

On Day 1 workshop participants from Italy, Japan, New Zealand, and Chile shared their experiences with data collection and data use after recent earthquakes. A few other presentations also were given to share lessons from recent efforts to measure resilience, summarize the key features and challenges of data collection tools developed by a variety of organizations, and hear perspectives from the insurance and risk modeling communities. These presentations prompted discussion and prepared participants for the next day of breakout discussions. The workshop purpose and agenda can be found in Appendix I and the Day 1 presentations can be found in Appendix II.

On Day 2, workshop participants broke into three groups for half-day discussions on data collection protocols for the following three topics areas: Physical Damage Data (led by Santiago Pujol), Impact Data (led by Mary Comerio), and Reconstruction and Recovery Data (led by Stephanie Chang). The groups were asked to consider and reach consensus on (1) "Why do we collect data?",(2) "What do we collect?", and (3) "How do we collect this data?" Summary presentations of these Day 2 breakout discussions can be found in Appendix III.

The final event of the workshop was a two-hour conclusion-generating discussion based upon the outcomes of the Day 2 breakouts. The resolutions and action items from this discussion are summarized below, after brief summaries of the breakout sessions.

Damage Data Breakout

Building damage data is collected for several purposes following an event: guide immediate response and building management (e.g. placarding); identify knowledge gaps; collect damage statistics; assesses repair actions; insurance evaluation; and forensic studies. Data from the latter three purposes are not typically easily accessible due to privacy considerations. Different data will be collected depending on the purpose but common links between the data collected would serve to reduce duplication of effort. Discussants identified data fields to be collected under the following categories: Earthquake, Structure, and Consequences (Appendix AIII, pp. A431-A441). To avoid the restrictions of established checklists, damage descriptions can use narratives if standard terms and keywords are identified in advance.

The importance of having a representative sample, including both damaged and non-damaged buildings, was emphasized, particularly when using the data for damage statistics. This highlights the need for pre-earthquake data on buildings. In addition of helping with the selection of a representative sample, pre-earthquake data enables post-earthquake building management and improved assessment of building safety given better knowledge of structural system.

Research needs were identified for potential collaborative research proposals. In particular, it is critical to establish and validate methods for measuring the residual capacity of damaged building structures. Development of such a method will also inform the post-earthquake data collection needs.

Impact Data Breakout

Impact data represents a holistic view of the impact on the social, economic and natural environments as a consequence of damages to the physical environment. The critical sectors include but are not limited to: Housing, Health, Education, Economy (Jobs), Environment, Communication, Lifeline operability, and the Safety of Civil Society. For each sector, it is important to define critical metrics and

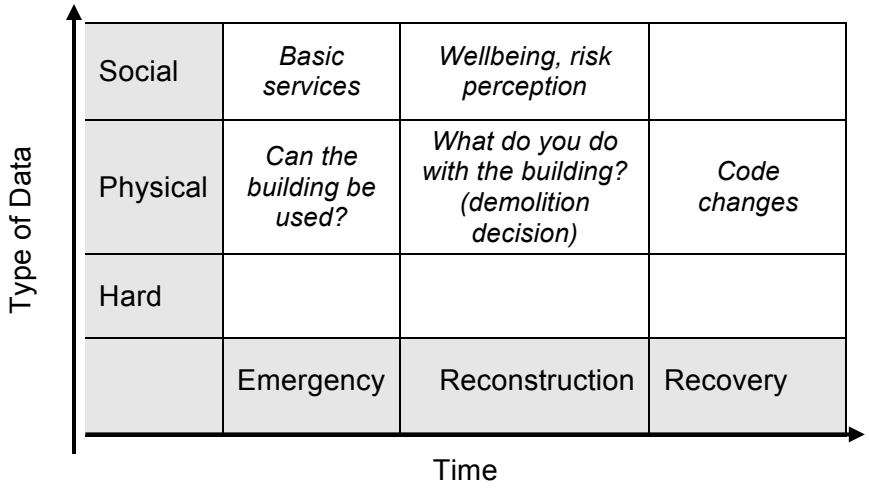
recognize the need for baseline data of what existed before as well as after the event. The discussants recognized that there could be barriers to access for such data. However, the value of such information cannot be overstated. Impact data connects the physical damage with operational effectiveness—to define building functions by structure type and link loss/damage with disruption of service.

Minimum parameters for a baseline and post event data include: Population of the impacted area (make up by census); the percent Urbanized vs non-urbanized; the number of Dwelling Units (+ types), the number of Hospitals/beds (+types); the number of Schools (+types); the number of Government buildings; the number of Industrial/commercial buildings; economic Productivity of the impact area; Ground Surface Changes and Lifeline Status; to be linked with Structural and Non-Structural Damage.

Discussants were clear that data protocols would be critical and suggested existing examples such as the GEM consequence protocols, the World Health Organization reports, Sphere Standards, UNDAC and other existing models as a starting point. In addition the discussants made the case that the engineering community needs to take ownership of functionality requirements to improve Performance Based Design. See notes in Appendix AIII, pp. A442 - A446.

Recovery Data Breakout

In addition to general research purposes, data collection during recovery is primarily intended to inform decision makers on "how recovery is proceeding". The specific question to be addressed with the collected data depends on the phase of response and recovery as shown in figure below. Identification of data to be collected for each phase will assist in decision making after future events.



The following categories of data were identified by the discussants: Damage; Rebuilding; Functionality; Decisions; Economics; Behavior; Population; Perceptions. Types of data under each of these categories were identified and listed in Appendix AIII, pp. A447 - A453. Interviews with staff and general population will be an important data source for many of the categories identified.

Multiple sources and approaches to data collection are needed to achieve a complete picture of "how recovery is proceeding". In particular, linking different data sources and types (e.g., buildings with owners/tenants; business actions/time/impact) is key to understanding cause and effect during recovery. The importance of making data public and available to all was emphasized during the breakout session.

Resolutions

Empirical evidence from past earthquakes, documented through standardized collection of data, is essential to understanding and improving community resilience to earthquake disasters. The participants involved in this workshop are dedicated to reducing earthquake risk and increasing resilience of communities to future earthquakes by enhancing and improving the practice of pre- and post-earthquake data collection worldwide. To this end, the participants at this workshop resolve to:

1. Cooperate in future post-earthquake data collection and sharing efforts to the extent possible.
2. Promote a culture of open sharing of data in the field of earthquake engineering, similar to other scientific fields;
3. Work toward international agreements that will support standardization, interoperability, and sharing of data collected worldwide;
4. Collaborate in the development of a document identifying why post-earthquake data collection is critical to understanding and improving community resilience and use this document to promote the importance of standardized data collection with government agencies involved with post-earthquake recovery;
5. Establish lines of communication and relationships with data collectors and agencies that will be involved in future earthquake response and recovery in an attempt to initiate pre-earthquake data collection and coordinate data collection and sharing after future earthquakes;
6. Explore the creation of a standardized taxonomy that describes damage, impacts, and recovery;
7. Explore means of validating and assigning quality ratings to post-earthquake data;
8. Promote the development of inventories of existing infrastructure to benchmark existing conditions, train users in data collection tools, and be available immediately post-earthquake to improve data collection and damage assessments;
9. Promote the development of standardized damage descriptions for building structures to enable comparison of performance across an inventory of buildings and estimate building residual capacity;
10. Compile a list of common models used to quantify recovery/risk/vulnerabilities that would inform the types and amounts of data to be collected to calibrate the models.

Planning details of the above resolutions will be carried out based on further mutual agreement and through close consultation and exchange of information between the workshop participants.

Action Items

Discussion led to the following action items to be implemented by the workshop participants.

1. Gather and translate data collection forms and protocols from each country in one place to allow others to review and study.
    - *EERI staff will lead this effort and host forms on an EERI website.*

2. Create working groups to consider how to attract funding to provide time and resources to act on the many ideas discussed in the meeting and included in the resolutions, considering but not limited to the following themes:
    a. Standardization (for consistency and international interoperability of data)

   b. Defining value of data collection
   c. Consideration of categorizing data under time and purpose

3. Create a working group (perhaps the meeting conveners) to develop a short opinion paper based upon notes and outcomes of this workshop.
4. Conduct a case study exercise to share existing data from recent earthquakes amongst workshop participants. This case study exercise could explore opportunities and challenges to sharing protocols, test data sharing platforms and approaches, and help inform the development of an international taxonomy or data framework to standardize data.

Appendix