

## **EERI-NSF Rapid and Research Needs Workshop**

### **Breakout Session #2 – Response 2**

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**Session Overview:** The session first focused on the questions: How do we define what is meant by response? What are the types of response needs? This discussion developed into two threads concerned with humanitarian response and research directions. Humanitarian response has a range of time frames, from immediate medical needs, search and rescue, housing, building inspections, food and water, electrical power, communications, and stabilization of the affected area. Research topics related to the need to collect both the data that will quickly vanish as recovery begins and longer-term data related to the recovery process and events on the timeline. Immediate data collection needs to be done for geological, structural and infrastructure assessment and information and communication needs. The discussion led to four research areas described below.

#### **1. Research needs related to the humanitarian disaster response**

A major problem in the global response to the Haiti earthquake was the flood of people and supplies that flowed toward Haiti and jammed the supply channels. Planeloads of containers with food, clothing, blankets, etc. collected by communities and churches arrived without manifests and had to be unloaded, cataloged and distributed.

This raises a major logistical issue that is critically important. What are some practical methods for a loosely-connected network of aid efforts and organizations to work in concert? How can donation patterns and donation deliveries be influenced and managed?

- Research is needed to determine methods of data collection about the supply chain and communication of needs to responding organizations.
- Research is needed in methods to identify and communicate immediate resource requirements. Can the FEMA model for the US be translated to an international context?
- Research is needed into methods to reduce and streamline bureaucratic requirements in face of the need for rapid response. Examples are: need for IRB certification for human interviews, difficulty in getting high-tech export-controlled equipment to the response area, and difficulty in getting scientific samples such as coral out of the region to science centers.

#### **2. Research needs related to civil engineering in the context of earthquake hazards**

The ability to predict the consequences of a major earthquake with respect to building and infrastructure damage depends upon the models and data that are available. Improvement of models depends upon data collection for verification of modeling algorithms that predict infrastructure response to earthquake loads. This serves two purposes: The humanitarian need of structural safety assessment, for the immediate need of advising people which buildings are safe and not and the need for improvement of understanding of earthquake effects and models.

- Protocols are needed for the collection of data on structural response relative to construction methods. There is much that can be learned from examining the structures that remained standing but were damaged.
- Protocols are needed for the construction and validation of microzonation maps to provide structural damage data for the validation of model predictions and for model improvement.

### 3. **Research needs related to geosciences and earthquake physics**

To better understand the physics of earthquakes and exacerbating or mitigating factors it is important to collect seismic and geological data. This will lead to improved capabilities to predict the consequences of future hazards. Research questions include:

- Relating the pattern of surface ruptures to seismic data, topography, soil types and other data
- Explaining secondary effects such as landslides, tsunamis, liquefaction, and lateral spreading
- Explaining the amount and location of uplift and subsidence
- Locating and describing the signature of this event in the sedimentary layer

Data collection for this research includes onshore and offshore imaging, field observations, and field sampling.

### 4. **Research needs related to information and communication systems**

A large variety of information is required for planning and implementation of an effective response. Much of the information is not available until after the event has happened, and is can only be collected from locations that are broadly distributed. Analysis of the data needs to include a broad range of information about the geography, roads, buildings, seaports, population, etc. that may be in a variety of records. Given the temporal nature of the observations, the distribution of observers and responders, and the distributions of analytical expertise:

- What are the effective methods and systems to get the information of needs and supplies to the right people at the right time?
- To what extent do these decisions need to be made on a centralized basis?
- How should decisions and guidance be communicated to the public?