AmericanLifelinesAlliance

A public-private partnership to reduce risk to utility and transportation systems from natural hazards and manmade threats

American Lifelines Alliance Workshop on Unified Data Collection

November 2007

FEMA

National Institute of BUILDING SCIENCES

American Lifelines Alliance

The American Lifelines Alliance (ALA) is a public-private partnership project funded by the Federal Emergency Management Agency (FEMA) of the Department of Homeland Security (DHS) and managed by the Multihazard Mitigation Council (MMC) of the National Institute of Building Sciences (NIBS). The ALA's goal is to reduce risks to lifelines – the essential utility and transportation systems that serve communities across all jurisdictions and locales – from all hazards. To do so, it facilitates the development, dissemination, and implementation of planning, design, construction, rehabilitation, and risk-management guidance and encourages use of this information to improve the performance and reliability of new and existing critical infrastructure.

The ALA's key stakeholders are lifeline operators and the communities they serve, standards development organizations, and engineering and risk-management professionals. The ALA provides a forum to address current industry and community needs and crafts unique partnerships to work across lifelines systems. ALA products either are incorporated in national consensus standards documents or are disseminated to key industry stakeholders through relevant associations and industry publications.

The ALA seeks partners in the public and private sectors to collaborate with the ALA in identifying and supporting mutually beneficial projects. In addition to FEMA and NIBS, current partners are Pacific Gas and Electric Company, Radian/ROHN, US Geological Survey, and Bureau of Reclamation.

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For further information on ALA activities and products, write the ALA at the Multihazard Mitigation Council of the National Institute of Building Sciences, 1090 Vermont Avenue NW, Suite 700, Washington, DC 20005 or visit the ALA website at:

www.AmericanLifelinesAlliance.org

ACKNOWLEDGEMENTS

The American Lifelines Alliance (ALA) of the National Institute of Building Sciences' Multihazard Mitigation Council (NIBS/MMC) is grateful to all those who took two days out of their demanding schedules to participate the October 2006 Workshop on Unified Data Collection. In particular, the ALA thanks the keynote speakers for their leadership in setting the tone for the workshop discussions:

- Michael Buckley of FEMA's Mitigation Division and
- Brent Woodworth of the IBM Worldwide Crisis Response Team and the NIBS/MMC chair.

The ALA also extends its gratitude to the workshop speakers for sharing their knowledge and experience:

- Steve Cauffman of the National Institute of Standards and Technology,
- Thomas Holzer of the U.S. Geological Survey,
- Angela Kamrath of the San Diego Supercomputer Center and NEES Cyberinfrastructure Center,
- Timothy Reinhold of the Institute for Business and Home Safety, and
- Alan Springett of FEMA-DHS.

The ALA is pleased to have had the opportunity to organize and conduct this workshop as part of its ongoing effort to advance lifelines safety and reliability and promote efforts to resolve the critical risk issues facing the nation's utility, communication, and transportation systems.

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EXECUTIVE SUMMARY

Capturing engineering, scientific, and socioeconomic performance data immediately after a severe natural hazard event and preserving those data are vitally important and have long been recognized as essential components of any national effort to reduce economic loss and social disruption from natural hazard events. Despite this recognition, no mechanism is currently in place in the United States to ensure that necessary data are systematically collected and archived for future use. Further, those data actually collected are essentially lost relatively soon after they have been assembled rather than being maintained in an accessible way over the decades between severe natural hazard events.

To stimulate the national discourse needed to improve the collection, archiving, and distribution of data related to the performance of the built environment in natural disasters within the United States, the American Lifelines Alliance (ALA) held a Workshop on Unified Data Collection in Washington, D.C., on October 11-12, 2006. The workshop served as a forum for open and candid discussion of the common needs of the infrastructure community and possible opportunities for cooperation and collaboration in addressing those needs.

Invited to the workshop were representatives of the lifeline/infrastructure/utility community. Each participant was assigned to one of four working groups that focused on the following topics:

- Mechanisms and procedures for post-disaster data collection,
- Cooperative data collection between and within the public and private sectors,
- Information technology (IT) management (archiving, exchange), and
- Long-term administration and maintenance of a data archive.

Each group formulated a vision concerning its topic and identified obstacles and realistic “next steps” toward implementing a practical system of post-disaster data collection and archiving. Some of the proposed actions included:

- Building on and improving what already exists (e.g., the Earthquake Engineering Research Institute’s data collection protocol and the earthquake information clearinghouses),
- Developing similar protocols/procedures for other natural disaster situations,
- Stimulating cooperation between the public and private sectors as well as within the public sector,

- Identifying and leveraging multidiscipline/cross-discipline data, and
- Developing a prototype or demonstration data collection/archive/exchange program.

Based on discussions of the conclusions reached by the four working groups, action items were identified for immediate or near-term implementation. They included:

- Coordination with federal emergency response exercises,
- Outreach to national earthquake consortia (e.g., Western States Seismic Policy Council, Central United States Earthquake Consortium) and other policy organizations,
- Identification of IT hosts for a pilot data archive, and
- Outreach to professional organizations, public agencies, and private companies.

Since the October 2006 workshop, members of the ALA project team as well as workshop participants attempted to implement some of the near-term actions identified during the workshop:

- The need for national post-earthquake data management program has been recognized in the 2007 National Earthquake Hazards Reduction Program (NEHRP) strategic plan (http://www.nehrp.gov).
- ALA project team members have supported Western State Seismic Policy Council (WSSPC) efforts to establish a policy recommendation supporting the development of a national post-earthquake information management system. The purpose of such a system would be to provide for the permanent archiving of essential data related to the performance of the built environment in earthquakes within the United States and could be combined with similar systems to assemble and archive data from other natural hazards events.
- Following the October 2006 earthquake in Hawaii, ALA project team members discussed the collection of performance data with the electric power companies.
- The ALA project team has undertaken the collection of post-event data related to the April 30, 2007, McArthur Maze collapse in the San Francisco Bay area. This information on regional multimode transportation volume and the effectiveness of various post-event transporation control measures is expected to be valuable to other metropolitan areas nationwide trying to reduce the transportation

impacts of accidents or deliberate human threat and natural disaster events.

- The ALA is supporting the development of an online data repository for ice storm information by the U.S. Army Corps of Engineers Cold Regions Research Engineering Laboratory (CRREL).

- The ALA has funded the University of Illinois to conduct a detailed assessment of infrastructure and implementation requirements for establishing a post-earthquake inforamtion management system.

INTRODUCTION

Chapter 1

Future improvements in the ability to engineer construction that performs as needed in natural hazard and other extreme events will occur only when knowledge exists to permit a determination of which practices work and which do not. Capturing performance data immediately after a severe event and preserving those data are vitally important and have long been recognized as essential in any national effort to reduce economic losses and social disruption from hazard events. Unfortunately, however, no mechanisms are in place to ensure that appropriate data are systematically collected and archived for future use. Further, the data that are collected are essentially lost relatively soon rather than being maintained for the decades that may pass between severe hazard events. This absence of comprehensive and reliable data results in engineering practices and designs that are increasingly based on anecdotal observations, theoretical models, or trial-and-error means.

The American Lifelines Alliance (ALA) convened a workshop in Washington, D.C., on October 11-12, 2006, to stimulate the development of a framework for improving the mechanisms for the collection, management, and archiving of data related to performance of the built environment in natural disasters within the United States. Changing how disaster damage data are collected, managed, and archived will involve many challenges, and the ALA workshop was envisioned as the first of many steps to be taken in developing consensus on how to achieve improvements. Thus, the workshop was structured to:

- Identify issues that must be overcome to implement cooperative data collection activities within the public and private sectors,
- Identify the types of data that need to be considered when evaluating potential data management architectures,
- Identify research and development needs associated with implementing particular data management architectures,
- Identify alternative administrative concepts that can ensure long-term maintenance of data and minimize reliance on discretionary governmental funding,
- Prepare a preliminary plan of action for implementing the ideas and approaches identified by the workshop participants, and
- Identify individuals and groups that need to be involved in refining the key concepts as well as additional resources that could assist in this activity.

Those participating in the workshop are listed in Appendix A and the agenda is included as Appendix B. The workshop relied on discussions within subgroup discussions to generate “draft” recommendations for refinement by all workshop participants. Working groups were formed to address the following

specific topics:

- Improving mechanisms and procedures for post-disaster investigations,
- Improving cooperation among public and private organizations,
- Defining an information technology (IT) framework for data archiving and exchange, and
- Long-term administration of a performance data archive.

Following introductions by Michael Buckley of FEMA's Mitigation Division, MMC Chair Brent Woodworth of the IBM Crisis Response and ALA Project Team Leader Douglas Honegger, a series of presentations were made:

- Steve Cauffman of the National Institute of Standards and Technology and Alan Springett of FEMA discussed recent data collection efforts,
- Thomas Holzer of the U.S. Geological Survey discussed the recommendations from USGS Circular 1242,
- Angela Kamrath of the San Diego Supercomputer Center and NEES Cyberinfrastructure Center described recent database efforts and needs, and
- Timothy Reinhold of the Institute for Business and Home Safety provided the insurance industry's perspective.

Prior to the event, all those invited were assigned to a working group and sent background information that included questions that the working group might wish to consider. Working Group participants are listed in Appendix C with the suggested questions for each group. The remainder of the first day was devoted to concurrent working group discussions. Each working group was asked to generate:

- A vision for the ideal system,
- The major obstacles to achieving this vision,
- Practical solutions to perceived problems achievable in the short term and long term, and
- Initial steps that can be taken toward achieving long-term goals.

Each working group presented its answers to the above questions to the entire workshop group during the morning of the second day of the workshop. During the afternoon of the second day, the focus was on specific actions that could be taken in the near term (within the next 6 to 12 months).

The remainder of this report summarizes the discussions related to each working group topic and the recommendations for near-term actions.

WORKING GROUP ON IMPROVING MECHANISMS AND PROCEDURES FOR POST-DISASTER INVESTIGATIONS

Chapter 2

Vision

The vision for an improved approach to performing post-disaster investigations focused on four issues:

- Coordination to ensure that post-disaster investigations address specific data gaps,
- The availability of sufficient pre-event inventory information,
- Anticipated improvements in technology applicable to more effectively and efficiently documenting post-disaster observations, and
- Funding that is sufficient to ensure that activities address high-priority data needs.

Inventory information must be available at the time of a disaster for several reasons. This type of information is required to make a direct determination of statistical damage rates for similar components exposed to similar hazard levels. Knowing what components have been exposed to various hazard levels along with the physical and operational attributes of these components allows an assessment of the degree to which the knowledge gained by post-disaster investigations will help to bridge gaps in current understanding. Such assessments are necessary to make decisions regarding the scope and level of detail of post-disaster investigation efforts as well as the specific disciplines that may need to be involved in reconnaissance or detailed investigations. Access to inventory data that would otherwise be restricted because of concerns related to privacy, security, or commercial value could be enabled through pre-disaster data-sharing agreements that would control levels of access and use of the data.

Post-disaster investigation teams ideally should have open access to any sites within the region affected by the disaster, including private property and areas that may be cordoned off from general public access. Such open access would be based on pre-disaster agreements with private parties or, possibly, new local ordinances that would require access to be granted and supporting information to be provided to pre-approved investigators collecting performance data.

Obstacles

Several significant obstacles were identified to achieving the vision described at the workshop. Organizationally, there is currently no “champion” or lead organization for implementing change. This is a significant obstacle when considering the need to overcome established cultures and practices for post-hazard data collection and the challenge of coordinating the actions of

numerous individuals and organizations typically involved in data collection. In terms of the data that need to be collected, the following issues have to be adequately addressed:

- Prioritization of the diverse data to be collected will be difficult.
- Inventory data, which would likely be collected from and maintained by a variety of sources, may include proprietary or sensitive information and information related to intellectual property that would need to be protected.
- Increasing the ability of post-disaster investigators to access sites and facilities of interest requires that consideration be given to adequate safety training, vetting and credentialing of individuals who may be collecting sensitive data, and protecting facility owners from potential liability for injuries to post-disaster investigators.

What Is Realistic

Determining what may be realistic to achieve in the near term (next five years) was based on two key assumptions. First, new funding sources necessary to establish an organizational structure for overall coordination of post-disaster performance data collection are unlikely to be available during the near term. Second, any changes need to be implemented initially within the existing framework of post-disaster investigations, which requires the cooperation of the numerous organizations and individuals with disparate interests and needs who typically are involved in post-disaster data collection.

In the near term, initial steps to define improved protocols for the type and format of post-disaster data collection can be developed by leveraging the interests and activities of existing public and private organizations that have a vested interest in the availability of improved performance data for their particular area of expertise or discipline. The goal of these initial steps would be to limit the loss of performance data from all future disasters. In many cases, existing organizations have taken some steps to improve data collection and building on these efforts might be done voluntarily; however, coordination of these efforts would be facilitated substantially if some nominal financial support was available (e.g., travel expenses to bring parties together for face-to-face discussions).

Rather than trying to tackle all hazards and all types of infrastructure, efforts should focus first on one or two protocols as demonstration efforts that could be used both as models for subsequent protocols and a basis for seeking financial support for additional protocol development. Such demonstration efforts should focus on hazards that occur relatively frequently in order to increase the likelihood for actually testing the protocols in the near term. Initial protocol developments need to recognize the need for performance data for assessing practices related to mitigation, response, and recovery efforts. Given the fact that obtaining sufficient inventory data will be difficult, separate protocols are needed that are specifically aimed at collecting inventory

data and that can be implemented by those without any specialized knowledge or expertise. With such protocols and sufficient training, a relatively large number of individuals could be mobilized to collect inventory information in targeted areas.

Next Steps

Actions identified as next steps for improving post-disaster investigations focused on two types of activities:

- Improving the quality of information resulting from post-disaster investigations through agreed-upon data collection protocols and
- Providing a mechanism for funding post-disaster investigations.

Recognizing that near-term improvements in data collection protocols likely will be developed through the cooperative efforts of several public and private organizations, there is a need to make these organizations aware of the important role they have in improving current practice. One mechanism for raising awareness is to widely distribute the findings from this workshop to these organizations with a request for feedback on opportunities for collaboration and cooperation on protocol development. Another suggested mechanism is to develop a concept paper to expand upon the vision and to provide preliminary plans and budgetary estimates for actions necessary to achieve the vision. This planning document must clearly convey the benefits that will be derived from federal investment in a national performance data repository.

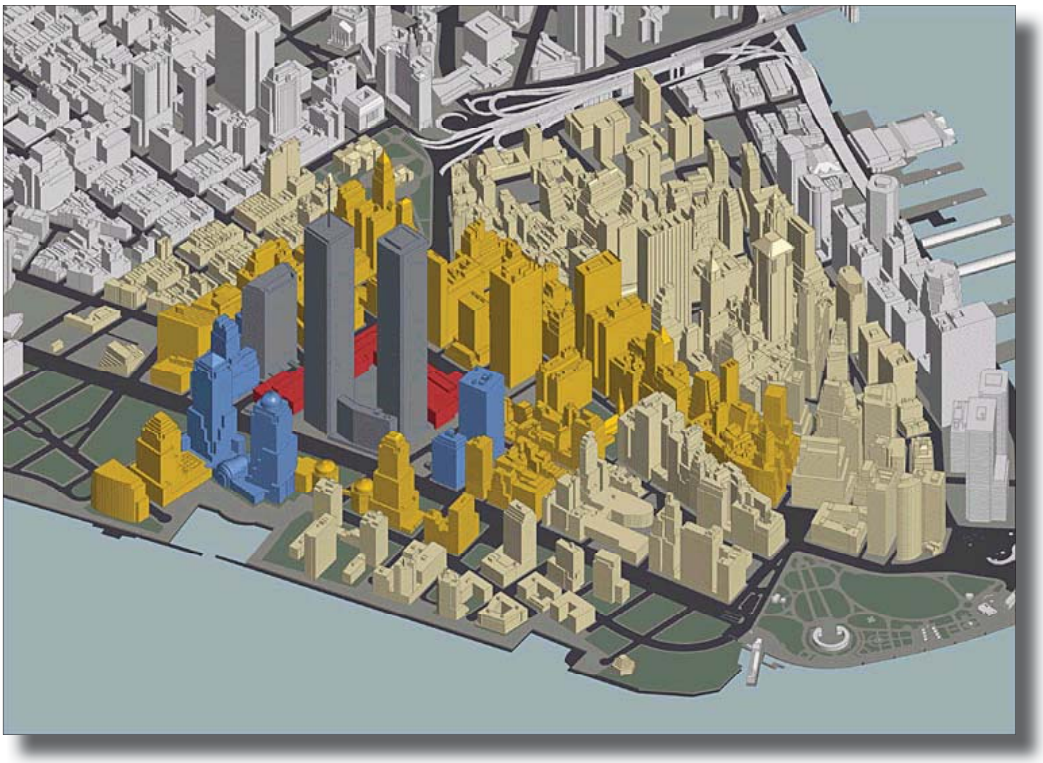
Workshop participants and their peers should keep abreast of ongoing inventory and performance data collection activities within government agencies as well as the private sector. Three examples noted during the workshop were the Hurricane Katrina and Hurricane Rita data clearinghouse at Louisiana State University, the critical infrastructure database effort within the Department of Homeland Security (DHS), and the interstate pipeline database maintained for the Department of Transportation. It also was noted that inventory information has been collected for specific purposes such as the location of facilities with hazardous materials, evacuation routes, and multihazard risk assessment studies. Particular attention should be given to identifying opportunities for developing cooperative data archiving and inventory sharing relationships.

With respect to providing the funding needed to properly conduct post-disaster investigations, there may be an opportunity to work with state emergency planners to incorporate focused investigations into individual state emergency response plans as a means for facilitating post-disaster recovery and future mitigation efforts. If sufficient justification can be provided regarding the value of these efforts, funding may be available through federal assistance provided through Stafford Act funding requests. A precedent for such an approach is the use of Stafford Act funds to support the recording of high-water marks following flood disasters.

Example 1

ADAPTING EXISTING TOOLS AND METHODS

Many established methods for collecting some types of performance data can be adapted to other applications. An example is the application of rapid visual inspection methodology (based on ATC-20, Procedures for the Postearthquake Safety Evaluation of Buildings) to map building damage states of more than 400 buildings in lower Manhattan following September 11, 2001.



The color code for the map is based on the following Building Inspection Tag codes -

Grey	total destruction
Red	partial collapse/in danger of collapse – no entry
Blue	major damage, but repairable – no occupancy
Yellow	moderately damaged/structurally stable – restricted entry
Buff	needs cleaning
Green	slightly damaged/no damage – unlimited entry (not on map ~ to light gray areas)

GUIDELINES ARE NEEDED TO FACILITATE NATURAL DISASTER INVESTIGATIONS

Example 2

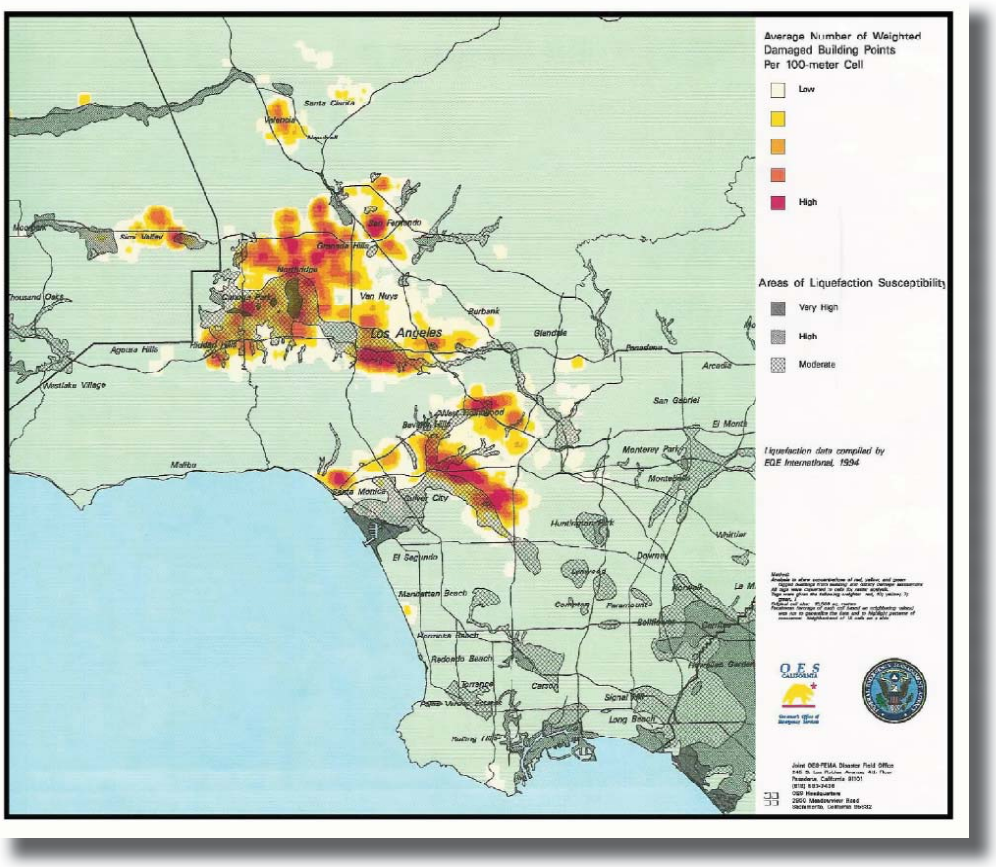
Guidelines that promote focused and consistent data collection efforts following a natural disaster are a key tool for improving the quality and quantity of performance data. Examples of such guidelines include the Post-Earthquake Investigation Guide first published by the Earthquake Engineering Research Institute in 1996 and the Guide to Post-Earthquake Investigation of Lifelines prepared by the Technical Council on Lifeline Earthquake Engineering of the American Society of Civil Engineers in 1997.

These guidelines are similar in that they emphasize the need for careful advance planning, outline procedures for team coordination, describe responsibilities of project participants, and provide guidelines for the collection of specific data in the field. Both contain forms, international information sources and contact names, pre-departure checklists, and recommendations for further research. Similar post-disaster data collection field guides do not exist for other types of natural disaster.

While providing a model for how such guidelines can be organized, both of the post-earthquake investigation guides focus primarily on preparation of a general reconnaissance report and do not adequately address collection and retention of detailed performance data.

Example 3

CENTRALIZED DATA CLEARINGHOUSES ARE EFFECTIVE IN FACILITATING THE COLLECTION AND PRESERVATION OF DATA



Immediately following the 1994 Northridge earthquake, the Geographical Information System Group of the Governor's Office of Emergency Services (OES) established a data collection office within the FEMA Disaster Field Office in Pasadena. While the data collected did not comprise a complete inventory, the Northridge data collection effort represents the most comprehensive U.S. effort to collect post-earthquake data to date and was among the first efforts to organize data within a geographical information system (GIS).

Also, association with the FEMA Disaster Field Office was extremely beneficial in facilitating the collection of building inventory data in the form of assessor's data. A data collection report published by EQE International and OES provides a summary of Northridge damage statistics based on the data collected. Much of the Northridge data collected by OES is maintained on that office's GIS platform and CDs of the data are available from OES.

CONSISTENT DATA COLLECTION REQUIRES ADEQUATE PRE-DISASTER PREPARATION

Example 4

A clearinghouse at the University of Washington facilitates the collection, dissemination, and archiving of data describing the Nisqually earthquake that occurred on February 28, 2001 (http://www.ce.washington.edu/~nisqually/index.html). This clearinghouse was established on an ad hoc basis and was not associated with the operations of the FEMA Disaster Field Office. Without official status and FEMA assistance, collection of building inventory and damage data similar to what was collected following the 1994 Northridge earthquake did not occur.

Several lessons were learned from the efforts to establish the Nisqually earthquake clearinghouse:

- Predefined data collection forms and procedures to be used by investigators are crucial to consistent cataloging of data.

- The collection of nonperishable data (e.g., building inventory, engineering drawings, repair costs) requires staffing commitments that may extend several months, if not years, following the event.

- Coordination with governmental agencies is critical in gaining access to the damage and inventory information necessary to assess performance.

- Long-term funding at a dedicated data clearinghouse is necessary to ensure an adequate level of preparedness to learn from future disasters.

  A unique aspect of the Nisqually clearinghouse effort is that the data collected are archived within the library system at the University of Washington, which ensures that the raw data will be maintained in an accessible format. However, the lack of thorough documentation of the data likely will limit their long-term value for future research efforts.

WORKING GROUP ON IMPROVING COOPERATION BETWEEN PUBLIC AND PRIVATE ORGANIZATIONS

Chapter 3

Although the majority of performance data collected following a natural disaster is obtained though initiatives supported by federal, state or local government agencies, the private sector also expends significant effort to collect such data. Most private data collection efforts are carried out by and for a specific business entity (e.g., an investor-owned utility or pipeline company) or by individuals and companies affiliated with the insurance industry. The private sector appears to believe that the cost of these performance data collection efforts is balanced by the perceived benefits of gaining the knowledge that can lead to reduced physical damage, reduced business interruption, and/or reduced insured losses. Having expended funds to collect and use the data, private sector entities have little incentive to share their information. A possible exception is the case in which a regulated private industry is compelled to share the data it collects to some degree with a regulator. The basis for future cooperation between the public and private sectors must be based on demonstrating added value associated with the sharing of information.

Vision

To obtain private-sector cooperation, it will be necessary to implement clearly defined agreements and memoranda of understanding (MOUs) prior to a natural disaster. These agreements should identify the types of data to be shared, how the data are to be used, what restrictions will be placed on access and use of the data, and what benefits will accrue to the private entity for supplying the data.

Obstacles

The primary obstacle to improving cooperation between the public and private sectors stems from the fact that the private sector is not necessarily concerned with undertaking activities for the general good of society. It is often difficult to define a linkage between the goals of the public sector (e.g., protecting life, property, economy, and environment) and the priorities of the private sector even though the private sector often is adversely affected when public sector goals are not achieved.

There also exist legal and organizational barriers to cooperation such as protection of privacy rights, potential adverse political consequences from outside scrutiny of performance data, and financial risks associated with the loss of unique information that could provide a business advantage to a competing private organization. The potential benefits to a private entity of information sharing typically will limited to avoiding costs associated with long-term data archiving and maintenance and gaining improved knowledge through access to a more complete set of relevant data from similar private entities and, therefore, also are something of an obstacle to cooperation.

What is Realistic

The working group that focused on this topic was not optimistic about increasing cooperation between the public and private sectors. Realistic options for improving the status quo rely on increasing the level of public/private sector discussion related to data collection and sharing as well as exploiting opportunities to combine data collection efforts with emergency response and recovery efforts.

Next Steps

A prerequisite for improving cooperation between the public and private sectors is to have a clearly defined set of information gaps that the private sector may be able to assist in filling. Knowing what information is needed provides a basis for negotiations on data sharing. Steps need to be taken to identify both a limited number of high-priority information gaps and the private sector organizations that have a need to obtain the same type of data. Once a common interest is identified, efforts should focused on developing an appropriate agreement on a cooperative data collection and sharing arrangement in the hope that such an exploratory effort will provide a template for broader outreach to private sector interests in the future.

In addition to developing public/private partnerships for data collection, attention also should be given to public/public partnerships. Public assistance programs under the Stafford Act address the restoration of public infrastructure damaged in disasters, and damage survey reports can provide a wealth of nonproprietary information about the performance of public buildings and infrastructure during earthquakes and other disasters. The U.S. Geological Survey (USGS), for example, is instrumenting a number of federal and state buildings as part of the Advanced National Seismograph System (ANSS), the U.S. Geological Survey (USGS) is instrumenting a number of federal and state buildings to better understand building performance during earthquakes.

WORKING GROUP ON DEFINING AN IT FRAMEWORK FOR DATA ARCHIVING AND EXCHANGE

Chapter 4

The overall conclusion from the discussions of an appropriate information technology (IT) framework for archiving and exchanging data was that current technology is fully capable of meeting the needs identified in the workshop. The primary challenges to implementing the desired IT framework are related to the need to provide a basic description of how the data should be organized and to coordinate the efforts of data providers, data users, and data custodians (i.e., "people" issues).

Vision

The vision for the IT framework for data archiving and exchange is illustrated by the hierarchical organization of a distributed data network shown in Figure 1.

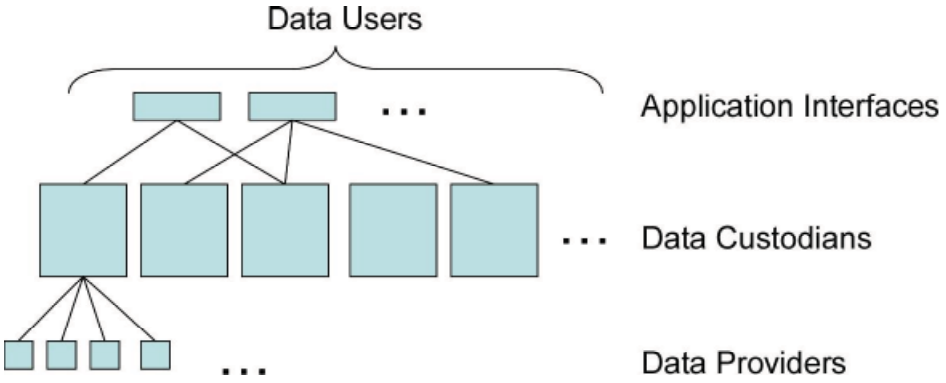


Figure 1
Vision for organization of IT framework.

This framework relies on a coordinated group of data custodians that would each collect, manage, and archive data from various data providers. The number of custodians is finite. Each would be bound by agreements and memoranda of understanding (MOUs) that would ensure compatible data exchange services and data formats, and each would enforce policies for uploading data and controlling access to proprietary or sensitive data and guarantee long-term preservation of data. An overall organizing entity would coordinate the creation and maintenance of application interfaces that would provide users with access to multiple data custodians. Such an overall organizing entity also would be responsible for coordinating the efforts of various data custodians through the mechanisms provided for in agreements and MOUs.

Although details concerning the structure of the overall organizing entity were not discussed, several key characteristics were noted. The organizational entity needs to have a mechanism for considering the interests of data providers, data custodians, and data users, perhaps through membership in some type of advisory committee. The organizational entity also needs to have clear authority to demand compliance on the part of data custodians with respect

to meeting the requirements of agreements or MOUs. This enforcement requirement likely requires that the organizing entity have clear legal standing.

Obstacles

Obstacles to implementing the vision for an IT framework identified during the workshop were all related to achieving consensus among the various entities identified in Figure 1. Data providers must be convinced that there is value in sharing their data and that this value warrants additional efforts to conform to the requirements necessary to upload their data to the archive (e.g., level of annotation, format) and the loss of opportunities that may otherwise be available from privately holding their data. Gaining the cooperation of data providers would be stimulated by the availability of funds to at least partially support the additional efforts imposed on data providers to permit the uploading of their data. The Federal Geographic Data Committee is one example of how the geographic community has worked together to share geographic data, maps, and online services through on online portal – goedata.gov – that searches metadata held within the National Spatial Data Infrastructure (NSDI) clearinghouse network.

Data custodians must be willing to make changes to their current systems to comply with standards established by the organizing entity. As with data providers, data custodians must be convinced that the benefits of becoming part of an integrated data archiving system outweigh the perceived drawbacks associated with additional efforts to comply with uniform standards and operating procedures. In some cases, data custodians also may have ownership of their data, in which case they face the same cost-benefit decisions as data providers.

In many cases, there is a feeling of pride and ownership associated with existing data custodian practices and policies at both the individual and organizational levels, particularly when existing practices have been in place for a substantial period of time. These feelings generally result in bias against change and may be a substantial obstacle.

What is Realistic

Options for what can practically be implemented in the near term (within five years) focused on maximizing tools and resources that currently exist. In particular, there is a need to systematically identify potential data custodians in order to explore the structure of potential agreements and MOUs. Issues that need to be explored with a broad group of data custodians include standards for data storage and data exchange formats, requirements that data custodians would be expected to enforce with respect to data providers, and techniques for ensuring and maintaining the quality of data maintained by data custodians.

Near-term efforts should start small, perhaps initially focusing on individual disaster events and individual infrastructure components. These initial efforts most likely will be "proof-of-concept" efforts and will provide an opportunity to determine what works and what does not. It is expected that initial efforts will be based on an incomplete metadata structure and will involve relatively incomplete data. However, they will be useful in priority ranking future development efforts, particularly with respect to the collection and control of potentially sensitive or proprietary inventory data. The issue of how to implement mechanisms that will maximize flexibility in transitioning initial data structures into a more complex tiered metadata structure also requires consideration.

Severe natural disaster events are relatively infrequent. As a result, consideration needs to be given to what steps should be taken to ensure the long-term integrity and usefulness of the data archive framework. For discussion purposes, a time frame of at least 100 years was envisioned. The challenges of providing for long-term data maintenance affect all data custodians, and near-term efforts should focus on actively monitoring and participating in research activities in this area.

Next Steps

Short-term activities need to focus on implementing a demonstration data archiving and exchange system as soon as possible. This will require prototype application interfaces for uploading data and data structures. However, this developmental effort requires coordination with data providers and data custodians.

A demonstration project will serve two key purposes:

- It will provide a means to assess the data management and exchange process and

- It will provide a "sales tool" to use in expanding the pool of data providers and data custodians willing to participate in the new system.

Implementation of a demonstration project could be carried out using data collected on a past disaster such as hurricane Katrina. Testing the system with existing data could begin almost immediately, thus increasing the likelihood that some type of system will be in place before the next disaster.

WORKING GROUP ON LONG-TERM ADMINISTRATION OF A PERFORMANCE DATA ARCHIVE

Chapter 5

In planning this workshop, it was envisioned that discussions of long-term administration of the performance data archive would focus on the advantages and disadvantages associated with housing its administration within the federal government, within existing organizations responsible for long-term archival of other types of data, or within a new private nonprofit organization established for the purpose. Working group participants strongly felt that the continuity necessary for long-term administration would require that the administration be within the federal government. Other factors in favor of a federal administrative body included:

- The need to reach multiple federal agencies in implementing a new data archival system,
- Most of the funding for post-disaster investigations is provided by the federal government, and
- Existing infrastructure within the federal government provides the necessary management framework.

As a result, much of the workshop discussion focused on the group's vision of the desirable characteristics of such a federal administrative body and on actions that could be taken to realize this vision.

Vision

Ideally, the administrative oversight for a national performance data archive should be provided by a consortium of representatives from federal and state agencies with missions that directly or indirectly include collecting and evaluating natural disaster performance data. The administrative body should have a separate budget and some level of authority to compel federal agencies that collect post-disaster performance data to comply with data collection protocols, data exchange standards, and other requirements established to support the archiving and exchange of data. The existence of the administrative body should be established through legislative action similar to that which established the National Geological and Geophysical Data Preservation Program (Section 351 of the Energy Policy Act of 2005). Ideally, the administrative body also will be capable of creating incentives to encourage data custodian and provider participation.

Obstacles

Three primary obstacles to achieving the vision were cited: cost, disincentives to coordination among existing federal agencies, and indifference.

Additional funding would be necessary to establish and operate the administrative body and support the maintenance and operation of the data archive

system. It is likely that the costs of administering and operating the data archive system would increase over time commensurate with increases in the amount of data and number of data custodians and providers. Workshop participants did not discuss whether the additional funding needed should be separate from or supplemental to the federal agencies represented in the administrative body. There also was no discussion of possible mechanisms for offsetting the level of funding (e.g., fees for membership, access, or services).

Participation by state governmental agencies is considered essential since the states have important roles in facilitating data collection. However, state participation should not be an unfunded federal mandate that imposes a burden on the states.

Successful coordination among various federal and state agencies, each with existing mission statements and responsibilities, is an obvious obstacle. It is not clear how such coordination can be achieved or how the organizing entity would assign specific tasks to various agencies.

While participants in the workshop clearly recognized the need for long-term archiving and access to natural hazard performance data, this is only one of many needs competing for attention by the federal government. While the importance of capturing performance data is widely accepted by the public and politicians in the immediate aftermath of a natural disaster, this attention is short lived and is quickly replaced by issues that have a more immediate impact.

What is Realistic

Recommendations for realistic near-term activities focused on mobilizing support for the data archiving concept. Suggested activities include reaching out to policy groups that regularly provide recommendations to Congress, mobilizing the engineering community, and identifying other groups that share an interest in learning from performance data.

In reaching out to the private sector, consideration should be given to leveraging concerns about ensuring the survival of businesses following natural hazard events. It also was suggested that consideration be given to amending the Stafford Act to allow post-disaster funds to be used to support performance data collection and archiving activities. The goal of such outreach efforts is to lay the groundwork for actions that could be implemented following the next natural disaster when attention and interest are high. Needed are narrowly focused efforts that can demonstrate and document progress in gathering and archiving performance data and a concise “white paper” that defines the need for and benefits of long-term federal leadership in the administration of the desired data archive.

Next Steps

In addition to outreach activities, steps should be taken to identify one or more state emergency response agencies or regional policy agencies that may be willing to discuss changing their emergency response and mitigation plans to include post-disaster data collection and archiving activities. Such changes could be implemented as part of the regular plan updating process.

Regarding potential uses of Stafford Act funding, an effort should be made to explore how this might be done and to develop a template for state use in requesting Stafford Act money for data collection efforts.

WORKSHOP ACTION PLAN

Chapter 6

Discussion of the working group conclusions resulted in the following action items being identified by the workshop participants for immediate or near-term attention:

- Determining if there is an opportunity to participate in a data gathering role during the Spill of National Significance (SONS) exercise scheduled for June 2007. This exercise is based on occurrence of a large magnitude New Madrid earthquake and is intended to provide a platform for evaluation of: the nation's ability to implement the National Incident Management System/National Contingency Plan/National Response Plan; the effectiveness of interagency coordination to conduct long-term recovery and restoration; the adequacy of national, regional, and local response resources; and the effectiveness of communication systems. Major participants include the Department of Homeland Security, U.S. Coast Guard, U.S. Environmental Protection Agency, Federal Emergency Management Agency, Central U.S. Earthquake Consortium, the American Petroleum Institute, the U.S. Army Corps of Engineers, the Pipeline and Hazardous Materials Safety Administration/Department of Transportation, and the U.S. Geological Survey.

- Appearing on the agenda for the next meeting of the Western States Seismic Policy Council (WSSPC) to present an overview of the workshop recommendations. WSSPC is a regional earthquake consortium organized as a nonprofit corporation headquartered in Sacramento, California. Its members are the state geological survey and emergency management directors of 13 western states, 3 territories, a Canadian territory, and a Canadian province.

- Identifying existing database platforms that are candidates for uploading and archiving of future natural hazard performance data. Potential candidates identified at the workshop include the San Diego Supercomputing Center, NEESinc, Louisiana State University, and the framework currently used for updating FEMA flood maps under the map modernization program.

- Approaching the state of California as a possible candidate to modify its emergency preparedness plans to incorporate coordinated and funded post-disaster performance investigations.

- Identifying professional organizations, public agencies, and private companies that have an interest in improving the collection and retention of performance data and work with them to develop interim protocols and formats for collecting post-disaster data. Some examples include the American Society of Civil Engineers, the Earthquake Engineering Research Institute, the Multihazard Mitigation Council of the National Institute of Building Sciences,

- the AAWE, the National Geophysical Data Center, and the Natural Hazards Center at the University of Colorado.
- Beginning the process of identifying and contacting potential data custodians.

POST-WORKSHOP DEVELOPMENTS

Chapter 7

Following the workshop, the ALA efforts focused on activities to support the action plan developed during the workshop. The following highlights some of these efforts.

Collection of Post-Earthquake Performance Data


The Honolulu Advertiser

HAWAI'I'S NEWSPAPER

WHY IT TOOK SO LONG TO RESTORE POWER

HOSPITALS, HOMES, HOTELS DAMAGED

GOVERNOR SEES BOULDERS FALL INTO SEA

IS YOUR HOME SAFE? WHAT TO LOOK FOR

10 PAGES OF EARTHQUAKE COVERAGE

Hawai'i rattles, then loses power

Automated system cut power to all

We're all shook up, but no fatalities and few injuries

ALA members attending the October 2006 ASCE Electrical Transmission Conference in Birmingham, Alabama, were contacted by a representative of the Hawaii Electric Company (HECO) with questions regarding what efforts they could undertake to document the performance of the electric power system in the earthquake that struck Hawaii three days after the ALA Workshop. HECO and Hawaii Electric Light Company (HELCO) representatives were initially very interested in volunteering their inventory data along with documentation of damage to the electrical system. This interest was partly related to criticism directed at the utility by local government officials regarding the duration of power outages in some areas. During these discussions, ALA became aware of a time constraint on obtaining HELCO data because of the impending retirement of a key HELCO employee who had first-hand knowledge of the damage sustained by HELCO and post-earthquake restoration efforts.

An ALA member had an opportunity to meet with HECO and HELCO representatives in Kona, Hawaii, to discuss the inventory information and post-earthquake observations of interest. ALA followed up after this meeting with a set of draft data collection worksheets that could be used by HELCO. Additionally, ALA contacted Cliff Roblee and John Lea of NEES Inc. regarding whether it would be possible to use their computer system for secure storage of HELCO data. Both Cliff and John were supportive and agreed to provide storage of the electronic data.

In the end, the level of interest within HECO and HELCO diminished with time and the performance data were not obtained. However, several important lessons were learned:

- The window of opportunity to collect the level of data necessary to assess overall performance (inventory and damage data) is very short. It is criti-

cally important to contact owners as soon as possible following an event while interest in understanding the performance of their facilities is high.

- Many owners will need assistance in identifying the types of inventory and damage information that needs to be collected.

- An on-site presence to support and coordinate with facility owners in data collection is very important. In retrospect, it is believed the chances of success with HECO and HELCO would have been greatly improved if an ALA representative had been present to work with HELCO staff at the site of the earthquake.

Western States Seismic Policy Council (WSSPC) Policy Recommendation

ALA members supported WSSPC in efforts to establish a policy recommendation supporting the development of a national Post-Earthquake Information Management System. The Management System would provide permanent archiving of essential data related to the performance of the built environment in earthquakes within the United States, and could be combined with similar systems to assemble and archive data from other natural hazards events. A copy of WSSPC Policy Recommendation 07-6 is provided in Appendix E. Key aspects of this policy statement include the following:

- Support for the use of federal funding through NEHRP and/or the Stafford Act to support these activities for significant events

- Development of a pilot or demonstration Post-Earthquake Information Management System project as soon as possible

- Encourage the development of public and private partnerships and memoranda of understanding with owners and regulators for the purpose of ensuring that earthquake performance and damage information would be collected and made available for future use

- Support operation of a standardized national Post-Earthquake Information Management System

Collection of Post-Event Data from Macarthur Maze Collapse In San Francisco Bay Area

During the early morning of April 30, 2007, a tanker truck carrying 8,600 gallons of gasoline overturned and burst into flames on the 50-foot high ramp connecting westbound Interstate 80 to southbound Interstate 880 in Oakland, California. The inferno caused the collapse of this connector as well as the ramp above it that connects the San Francisco Bay Bridge (eastbound Interstate 80) to eastbound Interstate 580. These structures are critical components of one of the Bay Area's busiest highway interchanges, the MacArthur Maze, which merges the East Bay's three major highways: Interstates 80, 580, and 880. The loss of the collapsed sections of the

Maze has resulted in major congestion and disruption of travel within the East Bay and between the East Bay and the City of San Francisco.

In order to document the effect of the event on Bay Area traffic flows and travel times and the effectiveness of emergency response and detour measures, regional and state transportation and emergency-response agencies are collecting considerable data. These data, if compiled, managed, and archived within a centralized and accessible repository as discussed during this workshop, can be invaluable to other major metropolitan areas nationwide that are involved in planning to reduce transportation impacts of an accidental or deliberate man-made event as well as of a natural event such as an earthquake, flood, hurricane, or tornado.

In view of this, the ALA initiated an effort to collect available post-event data from the MacArthur Maze collapse. This was expected to involve interfacing with state and regional agencies involved in compiling these data in order to establish:

- What pre-event (inventory and baseline) data are available and what post-event data are being compiled;
- The form and format of these data; where the data are being stored and plans for data maintenance;
- Plans for future use of the data for risk-reduction and emergency-response planning; and

- Steps to be taken to work with each agency in order to facilitate cooperative collection of the data.

Results thus far have been disappointing in terms of the difficulty in identifying the appropriate data custodians within various agencies and a general lack of interest in cooperating with ALA without clear direction from agency management or a regulatory requirement.

Establishing an On-Line Data Repository for Ice Storm Data

Since the late 1940s, the U.S. Army Corps of Engineers Cold Regions Research Engineering Laboratory (CRREL) CRREL has mapped damaging ice storms in the lower 48 states, Alaska, and the southern tier of Canada. CRREL has identified possibly-damaging storms using modeled ice thickness from freezing rain storms at weather stations and obtained information on these storms from newspaper reports, FEMA mitigation reports, NOAA's Storm Data, and a tower failure database to determine the severity and extent of damage to trees, overhead lines, and communication towers. In conjunction with recent work performed for ALA and others, CRREL as obtained additional ice storm data that have been used to generate ice hazard maps for building and electric power standards. To ensure that this database is maintained and remains readily available, ALA is funding CRREL to develop an online database to be hosted and maintained by CRREL. The database will be configured for public access and will include mapping capabilities to allow users to display base map information (e.g., water bodies, political boundaries) and have the ability to link to specific storm information, including photos associated with the storms from the map, and pan, zoom, and print map information.

ALA Project To Develop Infrastructure and Implementation Requirements for a National Post-Earthquake Information Management System (PIMS)

As a follow-on to the workshop, the ALA decided to proceed with the next step of developing the requirements for an integrated data compilation and archiving system that would successfully address the long-term needs of society to provide the data needed to systematically and strategically improve the performance of buildings and lifelines in significant natural hazards events. The decision was made to focus on earthquake-related data as a model for other natural hazards events.

The project, which is being conducted for the ALA by the University of Illinois, is intended to involve an assessment of both the infrastructure requirements (e.g., data system architecture, technological needs and issues) and implementation requirements (e.g., facilities, expertise, policies, and funding) for

establishing a National Post-Earthquake Information Management System (PIMS) as envisioned in the NEHRP Strategic Plan. The result is expected to be a "road map" document that:

- Identifies requirements and delineates the steps that need to be taken to create the needed information management/archive system,
- Estimates likely costs and levels of effort required for each step, and
- Provides an implementation schedule with milestones.
- The road map document will incorporate the topics and issues raised in the October 2006 ALA workshop as well as various characteristics identified in subsequent ALA discussions.