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.

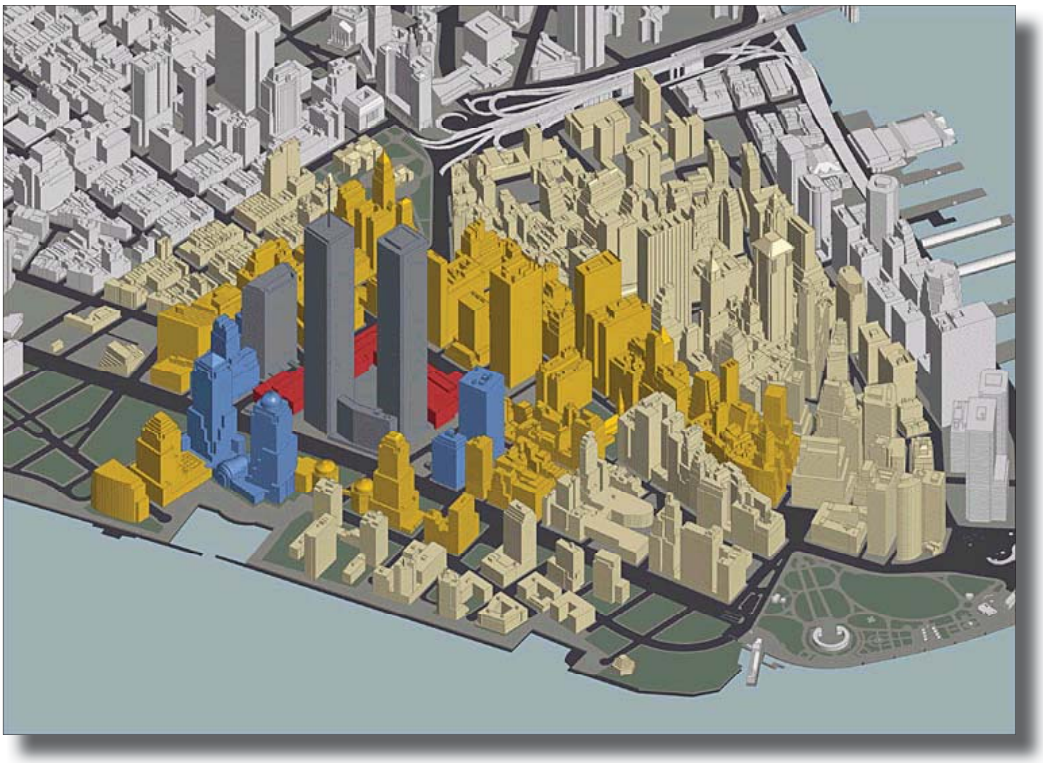
Workshop participants and their peers should keep abreast of ongoing inventory and performance data collection activities within government agencies as well as the private sector. Three examples noted during the workshop were the Hurricane Katrina and Hurricane Rita data clearinghouse at Louisiana State 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

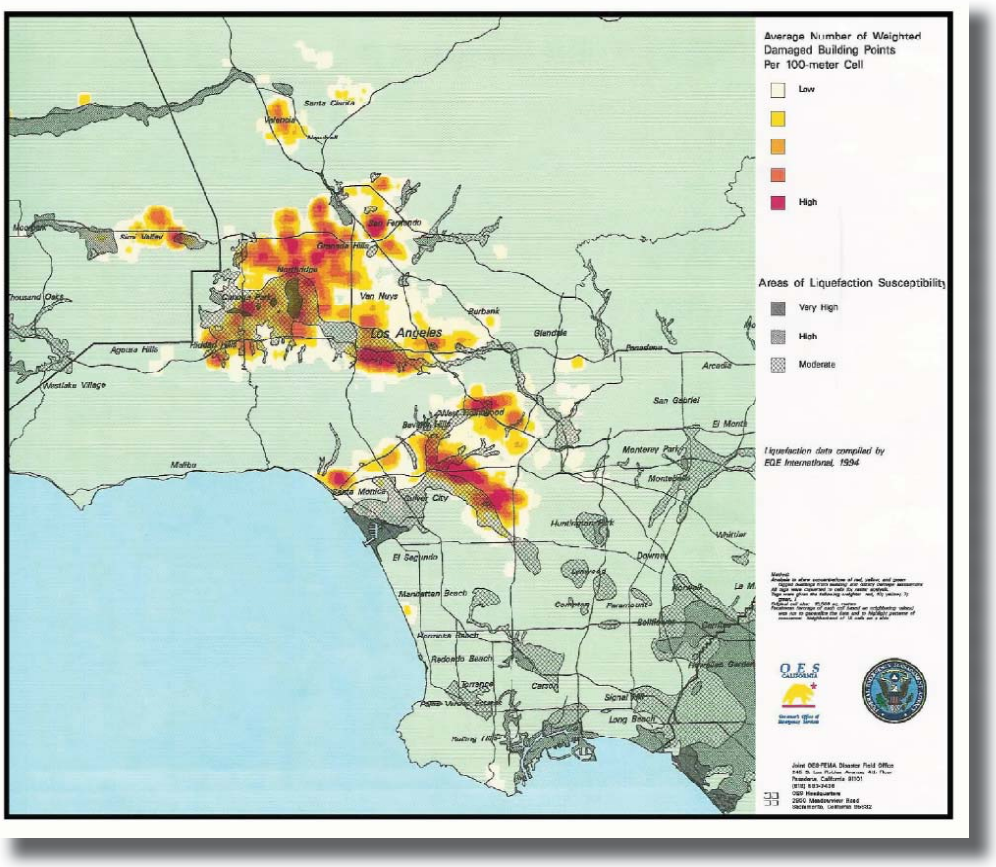
Guidelines that promote focused and consistent data collection efforts following a natural disaster are a key tool for improving the quality and quantity of performance data. Examples of such guidelines include the Post-Earthquake Investigation Guide first published by the Earthquake Engineering Research 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.

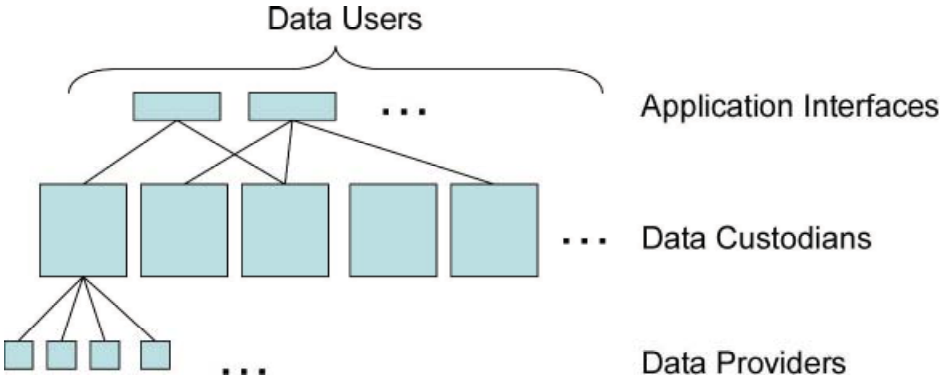


Figure 1
Vision for organization of IT framework.

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.

LIST OF WORKSHOP PARTICIPANTS

Appendix A

David Applegate, U.S. Geological Survey, Reston, Virginia

Kira Brooks, Michael Baker Jr., Inc., Alexandria, Virginia

Michael Buckley, Federal Emergency Management Agency, Washington, D.C.

Stephen A. Cauffman, National Institute of Standards and Technology, Gaithersburg, Maryland

David Chadwick, First American RE Services, Arlington, Virginia

Nell C. Codner, National Oceanic and Atmospheric Administration, Silver Spring, Maryland

Daniel Cotter, Department of Homeland Security, Disaster Readiness Caucus, Washington, D.C.

Michael P. Gaus, PhD, Professor Emeritus, Williamsburg, Virginia

David A. Harris, FAIA, National Institute of Building Sciences, Washington, D.C.

John R. Hayes, Jr., PhD, PE, National Institute of Standards and Technology, Gaithersburg, Maryland

Claret M. Heider, National Institute of Building Sciences, Washington, D.C.

Thomas L. Holzer, U.S. Geological Survey, Menlo Park, California

Douglas G. Honegger, D.G. Honegger Consulting and ALA Team Leader, Arroyo Grande, California

Christopher Hudson, PE, Federal Emergency Management Agency, Washington, D.C.

Kathy Jones, U.S. Army Corps of Engineers, Hanover, New Hampshire
Angela R. Kamrath, NEES Cyberinfrastructure Center, San Diego Supercomputing Center, La Jolla, California

Brian King, FM Global, Norwood, Massachusetts

Charles Kircher, PE, Charles Kircher and Associates Consulting Engineers, Palo Alto, California

Edward M. Laatsch, PE, Federal Emergency Management Agency, Washington, D.C.

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Christopher W. Letchford, BE, Dphil, MIEAust, Texas Tech University, Lubbock

Alan R. Lulloff, PE, CFM, Association of State Floodplain Managers, Madison, Wisconsin

Scott McAfee, Federal Emergency Management Agency, Washington, D.C.

Thomas McLane, Applied Technology Council, Arlington, Virginia

David Mendonca, New Jersey Institute of Technology, Newark

Bernard F. Murphy, PE, National Institute of Building Sciences, Washington, D.C.

James K. Murphy, Michael Baker, Jr., Inc., and ALA Project Team member, Alexandria, Virginia

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Timothy A. Reinhold, PhD, PE, Institute for Business and Home Safety, Tampa, Florida

Claire Lee Reiss, JD, ARM, CPCU, Public Entity Risk Institute, Fairfax, Virginia

Clifford J. Roblee, PhD, PE, NEES, Inc., Davis, California

Linda R. Rowan, American Geological Institute, Alexandria, Virginia

William U. Savage, PhD, U.S. Geological Survey and ALA Team member, Menlo Park, California

Philip J. Schneider, AIA, National Institute of Building Sciences, Washington, D.C.

Alan Springett, Federal Emergency Management Agency, Washington, D.C.

Susan K. Tubbesing, Earthquake Engineering Research Institute, Oakland, California

Loren L. Turner, PE, Caltrans, Sacramento, California

Stuart D. Werner, Seismic Systems and Engineering Consultants, Oakland, California

Brent H. Woodworth, IBM Crisis Response Team, Woodland Hills, California

T. Leslie Youd, Brigham Young University, Provo, Utah

WORKSHOP AGENDA

Appendix B

AMERICAN LIFELINES ALLIANCE (ALA) WORKSHOP ON UNIFIED DATA COLLECTION
October 11-12, 2006
American Institute of Architects Headquarters Board Room
Washington, D.C.

October 11, 2006 (Wednesday)

8:00 - 8:30 am	Continental Breakfast
8:30 - 8:50 am	Welcome -- Brent Woodworth, IBM Crisis Management Team and MMC Chair, and Mike Buckley, FEMA)
8:50 - 9:15 am	Introduction and Overview of Workshop -- Doug Honegger, ALA Project Team Chair
9:15 - 10:00 am	Keynote Speakers on Recent Data Collection Experiences Steve Cauffman, NIST, and Alan Springett, FEMA
10:00 - 10:30 am	Keynote Speaker on Perspectives from the Insurance Industry -- Tim Reinhold, IBHS
10:30 - 10:45 am	Break
10:45 - 11:15 am	Keynote Speaker on Recommendations from USGS Circular 1242 -- Tom Holzer, USGS
11:15 - 11:45 am	Keynote Speaker on Recent Database Efforts and Needs Anke Kamrath, SDSC
11:45 am -12:10 pm	Discussion and identification of working group topics
12:10 - 12:45 pm	Lunch
12:45 - 1:00 pm	Assign working groups
1:00 - 4:00 pm	Working group meetings
4:00 - 5:00 pm	Summary of working group meetings/discussion

October 12, 2006 (Thursday)

8:00 - 8:30 am	Continental Breakfast
8:30 - 9:30 am	Overview from working group summary
9:30 - 10:30 am	Identify needs
10:30 - 10:45 am	Break
10:45 - 11:15 am	Identify barriers
11:15 am - 12:00 pm	Identify approaches to overcome barriers
12:00 - 12:45 pm	Lunch
12:45 - 2:00 pm	Plan for action
2:00 - 2:15 pm	Closing remarks

WORKING GROUP BACKGROUD INFORMATION

Appendix C

Working Group 1

Improving Mechanisms and Procedures for Post-Disaster Investigations

Working Group 1 Lead: Doug Honegger

Working Group 1 Participants:
Andrew Bruzewicz, Stephen Cauffman, Nell C. Codner, Thomas L. Holzer, Christopher W. Letchford, William U. Savage (secretary), Alan Springett, Susan K. Tubbesing, T. Leslie Youd

- What shortcomings in present approaches need to be addressed?
- Distinguishing between perishable and non-perishable data.
- Is there too much emphasis on short-term data collection efforts (e.g., a primary goal is to publish a reconnaissance report)?
- Unrealistically short periods to conduct investigations given broad data collection needs, access to facilities, and availability of key facility personnel.
- How can the need for uniform data collection guidelines be addressed without sacrificing the flexibility to capture modes of damage that may not have been previously identified?
- Are we maximizing the use of current technology to provide the accurate location and description of damage?
- How to best accommodate collection of both perishable and non-perishable data?
- Multiphase data collection process that begins with the capture of perishable data and ends with the addition of supporting data that may be made available weeks or months after the collection of perishable data.
- Prioritization of damage data collection efforts to address known deficiencies in knowledge.
- Segregation of data collection efforts to avoid duplication of efforts.
- What organizational structure characteristics/changes would improve timely post-event deployment of field investigators?
- Flexible funding mechanisms.

- A pre-identified pool of individuals and/or organizations from which to populate field reconnaissance teams.
- The capability to provide the level of training necessary to ensure consistent, efficient, and complete data collection.
- Resources that can be devoted to post-event analysis of damage data and the formulation of recommendations to improve future performance.

Working Group 1 Reporting:

- Vision for improving mechanisms and procedures for post-disaster investigation
- What can we realistically expect to achieve and how over both the short term and the long term

Working Group 2

Improving Cooperation Among Public and Private Organizations

Working Group 2 Lead: Ed Laatsch

Working Group 2 Participants:
David Chadwick, Michael P. Gauss, Claret Heider (secretary), Kathy Jones, Brian King, Charles Kircher, Alan R. Lulloff, Thomas McLane, Timothy A. Reinhold, Brent H. Woodworth

- Characteristics necessary to assure new approaches are viewed as mutually beneficial as measured by perceived value of access to much broader data sets compared to the costs associated with collection of data being donated to the system.
- Removing data “embargos” by academic investigators who wish to hold data as leverage for soliciting future research funds or publishing research findings.
- Emphasize comprehensive data collection in addition to a focus on very narrow topics. For example, efforts focused on collecting wind-blown debris damage may miss other opportunities to collect other important performance information related to the adequacy of roof tie-down systems, anchorage of roof-mounted equipment, and damage to non-building structures.
- To what degree does private sector ownership of unique information on performance create a potential for a competitive advantage and reduce the incentive to share data?
- What types of cooperative agreements for post-event investigations may be needed?

- How can coordination among other federal agencies, federally funded initiatives (e.g., WindHRP), and private organizations currently involved in post-event damage data collection (e.g., professional organizations, industry groups) be improved? What cooperative frameworks are possible (from a legal and/or practical view) among various federal agencies and between federal agencies and the private sector?

- To what degree can federal agencies "direct" the use of uniform guidelines for post-disaster earthquake investigations activities that they fund?

Working Group 2 Reporting:

- Vision for improving cooperation among public and private organizations

- Obstacles to achieving that vision

- What can we realistically expect to achieve and how over both the short term and the long term

Defining an IT Framework for Data Archiving and Exchange

Working Group 3

Working Group 3 Lead: Anke Kamrath

Working Group 3 Participants:
Kira Brooks, John Lea, Scott McAfee, David Mendonca, Philip Schneider, Loren Turner, Stuart D. Werner (secretary)

- Should database protocols be established first or should they evolve to accommodate the types of data?

- Access and preservation of data:

- User access to be as open as possible via internet.

- Virtual system with transparent access to multiple data housing sites.

- Centralized storage of all data to assure preservation and migration of data to new data storage technologies.

- Types of data to be managed
  - Digital images.
  - GIS databases.
  - Text and spreadsheet files.
  - PDF files.
  - Digital audio.
  - Digital video.

- Should provisions be made to store supplemental data from detailed research investigations conducted in a time frame of 1 to 5 years after an event?
- Identification of current frameworks that could be adapted (e.g., NEESit, Library of Congress, other).

- What research is needed to develop procedures, software, and hardware to facilitate the collection and dissemination of field data?

- What security requirements are necessary to control access to potentially sensitive data?

Working Group 3 Reporting:

- Vision for defining an IT framework for data archiving and exchange

- Obstacles to achieving that vision

- What can we realistically expect to achieve and how over both the short term and the long term

Working Group 4

Long-Term Administration of the Data Archive

Working Group 4 Lead: Jim Murphy

Working Group 4 Participants:
David Applegate, Michael Buckley, Daniel Cotter, David Harris, John Hayes, Stuart Nishenko (secretary), Joy Pauschke, Claire Lee Reiss, Clifford Roblee, Linda Rowan

- Efforts to collect, disseminate, and evaluate data for the purposes of improving the resiliency of the built environment need to be maintained over a period of time that can be considered “indefinite” relative to typical federal initiatives (e.g., 50 to 150 years).

- To what degree should administration plan be based upon the assumption that that existing federally supported centers and institutions will continue to function over the long term as they are now?

- Can one federal agency serve as the lead for administration, setting research objectives, and reporting to Congress on the data collection program? If not, is there a need for a new entity or new cooperative structure among agencies?

- Is an alternate model that relies on achieving a self-sustaining funding mechanism (e.g., annual personal and organizational subscriptions, fees

for service) possible and/or practical? What restrictions or limitations could exist with respect to taking data largely derived from federal funding?

Working Group 4 Reporting:

- Vision for long-term administration of a data archive
- Obstacles to achieving that vision
- What can we realistically expect to achieve and how over both the short term and the long term

SPEAKER PRESENTATIONS

Stephen Cauffman, NIST

Appendix D

Collection of Perishable Data Following Hurricane Katrina and Hurricane Rita

ALA Natural Disaster Data Collection Workshop
October 11, 2006

Stephen A. Cauffman
Leader, Structures Group
Building and Fire Research Laboratory, NIST
stephen.cauffman@nist.gov

NIST

Overall Approach

- Multi-organizational reconnaissance of the performance and damage to physical structures.
  - 26 experts drawn from 16 private sector, academic, and government organizations.
- NIST-led reconnaissance was a cooperative effort from its very launch.
  - Data and information openly shared between NIST, other federal agencies, and private sector participants.
  - While findings and recommendations are those of NIST, the report and its recommendations have been reviewed by the participating organizations.
  - Interagency cooperation is continuing as agencies plan and carry-out follow up actions in response to recommendations.
- Complements other completed and ongoing studies of the performance of structures in the Gulf region.
- Only study to take a broad look at damage to physical structures (major buildings, infrastructure, and residential structures) and its implications for the Gulf Coast and other hurricane-prone regions.

NIST

Why Reconnaissance?

- Catastrophic events provide an unfortunate but important learning opportunity to improve standards, codes, and practices that will reduce losses in future events.
- **NIST undertook a broad-based reconnaissance rather than a detailed investigation since much has already been learned from past hurricanes.**
- **The reconnaissance was intended to identify new technical issues for:**
  - **Repair and reconstruction in the devastated regions.**
  - **Improving building codes, standards, and practices.**
  - **Further study of specific structures or research and development.**
- The 26 experts were deployed in 3 sub-teams to conduct reconnaissance in:
  - Mississippi Gulf Coast (Hurricane Katrina) – Oct. 17-21, 2005
  - New Orleans (Hurricane Katrina) – Oct. 17-21, 2005
  - Southeast Texas (Hurricane Rita) – Oct. 10-14, 2005
- Each of the three teams was further subdivided to focus on major buildings, infrastructure, residential structures.

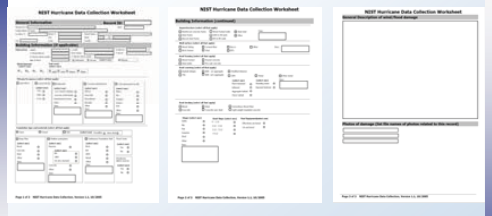
NIST

Scope of Reconnaissance

- Collect and analyze:
  - Perishable field data (e.g., first-hand observations, photographic data) on performance of physical structures.
  - Environmental data on wind speed, storm surge, and flooding, and relate environmental data to observed structural damage.
- Review and analyze relevant data collected by other sources (e.g., government agencies, academic and research organizations, industry groups).
- Document field observations, environmental conditions, and data gathered from other sources, and make recommendations for:
  - Repair and reconstruction in the devastated regions.
  - Improving building codes, standards, and practices.
  - Further study of specific structures or research and development.

NIST

Data Collection Approach



- Patterned after ATC-23; modified based on NIST past experience
- Attempted to standardize data collection
- Established a database and data entry form
- Forms could be completed on computer or by hand.
- Limited to buildings; not suited for other types of structures

NIST

Data Collection Approach (2)

- Identified key data
  - Description of structure (e.g., structure type and use, construction type, materials used, approximate age)
  - Location (latitude and longitude)
  - Written observations (type and extent of damage, measurements)
  - Photographs
- Data collected in handwritten form, matched with photographs at a later time.
- This approach was most efficient in the field since equipment (GPS, still cameras, camcorders, computers, communication equipment) was not integrated.

NIST

ALA Workshop on Unified Data Collection

Issues

- No easy system existed to compile data, so
  - We spent hours copying, pasting, transcribing, etc.
  - Few photos have precise geolocation attached.
  - Photos not always linked with written observations.
- No place to store data not used in the report, so
  - 100s of photos and notes were never centrally stored
  - These images, locations, descriptions, etc. were not bound together.
- Individuals on team used different methods for storing and compiling data
  - Additional work required to integrate data from different sources into final report.

NIST

Other Considerations

- Objective was to document findings in a final report and develop recommendations for improvements.
- As the key technical issues became clear, observations that illustrated those issues were selected for report and centrally stored.
- Photographs were matched with written observations during drafting of the report. Draft sections centrally stored; other data stored locally by team members.

NIST

Where is the Data Now?

- NIST Technical Note 1476 (selected data)
- Additionally, some data stored centrally and accessible by the NIST Reconnaissance Team via the internet
- Large amount of data and photographs are stored locally by the NIST Reconnaissance Team members.

NIST

Doing it better: efficient reconnaissance

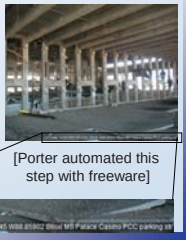
Snap photos with Smartphone & dictate observations. Bluetooth GPS provides lat/lon, software embeds it in jpg metadata

[L: Treo 700p w/5 MPix camera, text & voice caption capability
R: Garmin GPS 10 12-channel receiver]

Email to recon organizer; staff transcribe voice caption, add to metadata, & forward to NEED, which serves it securely to organizer, team (and posterity)

[Google Earth w/Porter's Katrina KML database of GPS track and photos]

Key metadata automatically watermarked onto images for later reference



[Porter automated this step with freeware]

NIST

How Does This Experience Compare to Earlier Events?

- Hurricane Andrew (1992)
  - Film camera
  - Paper maps
  - Handwritten observations
  - Manual data compilation
- Jarrell, TX Tornado (1997)
  - Digital camera
  - First generation GPS-based computer maps
  - Handwritten observations
  - Manual data compilation
- Hurricane Katrina
  - Vastly improved digital cameras
  - Enhanced GPS-based computer maps
  - Handwritten observations
  - Partially automated data compilation and storage

NIST

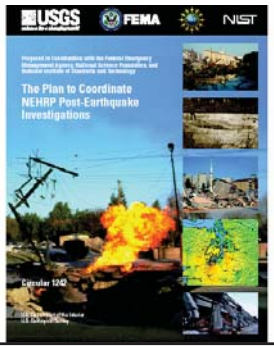
Thank you

NIST

ALA Workshop on Unified Data Collection

Thomas Holzer, USGS

"The Plan to Coordinate NEHRP Post-earthquake Investigations"



The Plan to Coordinate NEHRP Post-Earthquake Investigations

Available at:
http://geopubs.wr.usgs.gov/circular/c1242
and
http://www.atcouncil.org

Circular 1242

The Plan

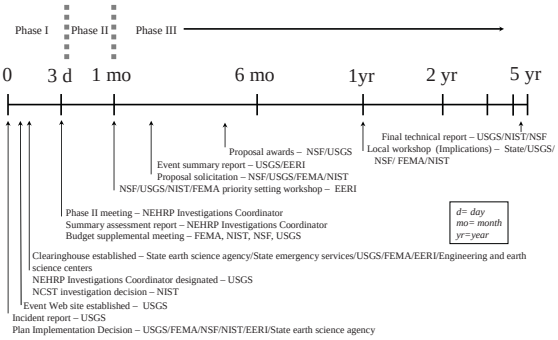
Coordinate and schedule formal and *ad hoc* post-earthquake activities

TLH1

Who were we trying to coordinate?

- **Federal (NEHRP)**
  - **USGS**
  - **NSF (Engineering and Geosciences Directorates)**
    - **EERI LFE program**
    - **SGER**
    - **Earthquake Centers, NEES**
    - **Individual investigators redirection**
    - **GEER**
  - **NIST (NCST)**
  - **FEMA (MAT)**
- **State (Earth science agencies)**
- **Others (Professional organizations, government agencies, private sector…)**

Plan Timeline



Process

- **Prepared under aegis of Applied Technology Council**
- **Formal preparation**
  - **Seven-member *multidisciplinary* committee appointed to write plan**
  - **Nineteen member *multi-institutional* oversight committee appointed to review plan**
- **Invitational workshop with EERI to solicit community input (March 2001)**

Major Issues Identified at Workshop

- **Structural and nonstructural damage data are not systematically collected**
- **Social science aspects are not addressed**
- **Earth-science investigations have been done relatively well**

ALA Workshop on Unified Data Collection

TLH2

Who were we trying to coordinate?

- Federal (NEHRP)
  - USGS
  - NSF (Engineering and Geosciences Directorates)
    - EERI LFE program
    - SGER
    - Earthquake Centers, NEES
    - Individual investigators redirection
    - GEER
  - NIST (NCST)
  - FEMA (MAT)
- State (Earth science agencies)
- Others (Professional organizations, government agencies, private sector…)

The Plan's Recommendations for further action

1. Broaden coverage and comprehensiveness of earthquake impacts
   a. Built environment
   b. Socioeconomic environment
2. Encourage use of information technology
3. Formalize data management and archiving (NEED - National Earthquake Experience Database)

Strategy involves a series of actions to achieve a goal

Aspirations are not a strategy

NEHRP Goals

1. Broaden coverage and comprehensiveness of earthquake impacts
   a. Built environment
   b. Socioeconomic environment
2. Encourage use of information technology
3. Formalize data management and archiving (NEED - National Earthquake Experience Database)

Strategy involves a series of actions to achieve a goal

Elements of a strategy:

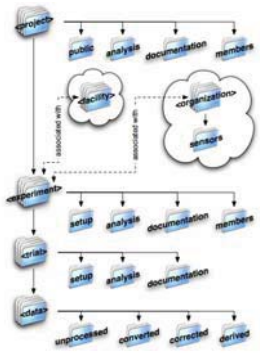
- What is going to be done?
- By whom?
- When?
- How?

Status Report

- NEESit & NEEScentral
- Google Earth
- Virtual technical clearinghouse
- SEAOC
  - Ad hoc post-disaster performance observation committee
- ALA effort

ALA Workshop on Unified Data Collection

NEEScentral



Data repository for managing, sharing, storing, and publishing data

http://it.nees.org

Google Earth

GIS platform and Google Earth

Under Development by USGS
NEHRP Virtual Technical Clearinghouse

- Data repository
- Damage descriptions
- Investigation teams
- Collaboration opportunities
- Research recommendations

SEAOC

Post-earthquake observations of performance by practicing structural engineers

Bottom Line

- NEHRP needs to create and assume responsibility for NEED
- NEHRP needs to provide leadership for coordinating grass roots efforts

Strategy involves a series of actions to achieve a goal

Elements of a strategy:

- What is going to be done?
- By whom?
- When?
- How?

ALA Workshop on Unified Data Collection

Angela Kamrath, UCSD

Data and Disasters – Predicting, Analyzing, and Responding to Catastrophe

Presentation at American Lifelines Alliance Workshop; Oct 11-12, 2006

Anke Kamrath

Division Director, San Diego Supercomputer Center

Strategic Advisor, NEES Cyberinfrastructure Center

Cyberinfrastructure and SDSC

Enabling science and engineering discovery through Cyberinfrastructure

More capable and/or higher capacity **computational resources**

Access to community and reference **data collections**

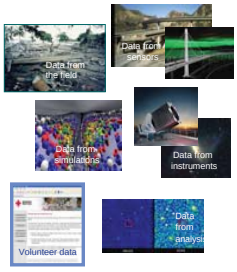
Professional-level Multi-disciplinary **expertise**

Cyberinfrastructure = **resources** (computers, data storage, networks, scientific instruments, experts, etc.) + **"glue"** (integrating software, systems, and organizations).

Community codes, middleware, software **tools** and **toolkits**

Data is a key driver for SDSC's Cyberinfrastructure

- **Data comes from everywhere**
  - Field Data
  - "Volunteer" data
  - Scientific instruments
  - Experiments
  - Sensors and sensornets
  - Computer simulations
  - New devices (personal digital devices, computer-enabled clothing, cars, …)
- **Data-oriented science and engineering involves an unprecedented level of IT integration, interoperability, scale, and use**
- ***Deluge of Data….***
  Turning the deluge of data into usable information for the research and education community requires an unprecedented level of integration, globalization, scale, and access



Data Cyberinfrastructure for Two Recent Events

- **Sumatran Tsunami**
  - Collect and manage data from NSF-funded Recon Teams
- **Katrina Hurricane**
  - Disaster Response – Supporting Red Cross with Data Management

NEES Tsunami Reconnaissance Data Repository

- **Partnership:**
  - UCSD:
    - SDSC (San Diego Supercomputer Center)
    - NEESit
  - Oregon State University
    - Harry Yeh, Ben Steinberg, Cherri Pancake
- **Project includes three primary elements**
  - Focus on the 2004 Great Sumatra Tsunami Event
    - Coordination with NSF SGER Recon Teams & EERI Recon Teams
      - Work with teams to upload data
  - Creating Data Upload Environment
    - Metadata structure
    - File hierarchy for upload
  - Query/Browsing Environment
    - Google Maps (maps.google.com) as catalog browser (all data geo-referenced)
- **Based on NEESit Data Repository (it.nees.org)**

Repository Features

- **Upload Environment**
  - Flexible, easy-to-use secure area for data entry and management
  - Flexible file hierarchy and file type support
- **Download Environment**
  - Search by keyword, location
- **Infrastructure**
  - Redundant Data
  - Data preservation (multiple copies, relying on longevity of NEES and SDSC)
- **Beta-version:**
  - http://tsunamirepository.nacse.org
  - Guest Login:
    - Login: harry
    - Password: harry123

Challenges

- **Broadly multidisciplinary (and interdisciplinary) data**
  - Seismic Data
  - Hydrodynamic data
  - Engineering data
  - Geological data
  - Biological data
  - Social science data
- **Data Formats and Preservation Concerns**
  - Multi-media and variety data formats
    - Tables (DB)
    - Photos/videos
    - Audio
    - Documents
    - Maps/illustrations
  - Preservation Issues (file conversion)
  - Who's going to manage the data 50 years from now?
- **Acquiring adequate metadata**
  - No prior data/metadata standards & data quality disparity
  - Field teams reluctant to spend time and effort
  - Not experienced in using tools, systems, metadata standards
  - Labor Intensive -- $$$ needed to make data useful to others (e.g. annotation, translation, structuring)
  - Many survey teams without prior experience
  - International survey efforts: India, Indonesia, Thailand, Sri Lanka, Japan, Korea, Australia, New Zealand, England, Greece, Russia, Turkey, and the US
- **Intellectual property and data piracy issues**
  - Proper credit is given to the original data owner, e.g. copyright/citation information being inserted into the data.
  - Human Subjects issues
  - Competitiveness (e.g., timeline for publications)
- **Increasing Value for Long-term Research via the Data**
  - Need to add other tools and resources to increase overall research value.
  - Need other related data resources (e.g., international)

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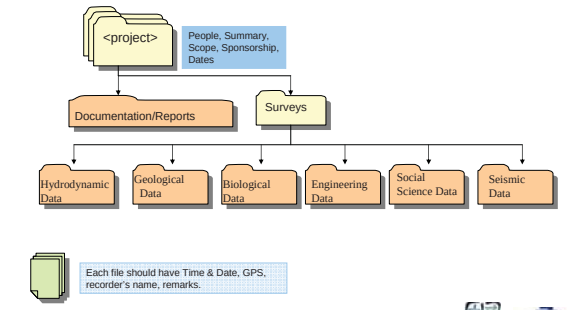
Anke Kamrath

Tsunami Repository Prototype File Hierarchy

*Orange folders include subfolders as needed



Each file should have Time & Date, GPS, recorder's name, remarks.

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Metadata for survey categories

1) General Site Configuration
- Description
- Topography
- Bathymetry
- Maps, Sketches, and Other Visuals

***2) Social Science Data*:**
- Background Information
- Human Impact
- Communication
- Individual Response
- Community Response
- Organizational Response
- Damage & Loss

3) Hydrodynamic Data:
- Run-up Heights
- Extent of Inundation
- Tide-Gauge Data
- Flow
- Wave Structure
- Conditions at Time of Tsunami

4) Seismic Data
- Local Seismographs
- Macroscopic Intensity Assessment
- Post-Event Measurements

5) Geological Data:
- Surface Fault
- Tectonic Displacement
- Tsunami Deposits & Clast/Boulder Movement
- Geomorphological Changes
- Earthquake Induced Liquefaction
- Submarine & Subaerial Landslides
- Paleo-Tsunami Data

6) Engineering Data
- Event Data
- Structural Damage
- Lifeline Damage
- Geotechnical Damage
- Pre-event Hazards and Mitigation

7) Biological Data
- Flora
- Fauna
- Marine Biology

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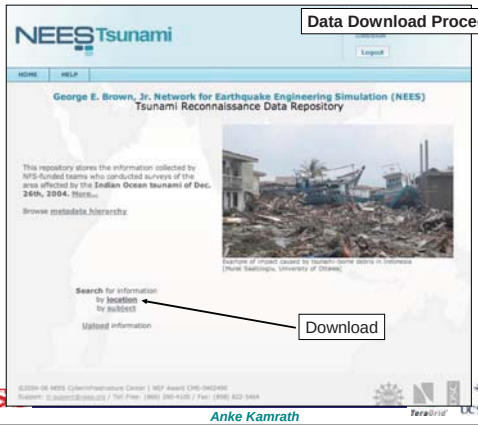
Data Download Procedure



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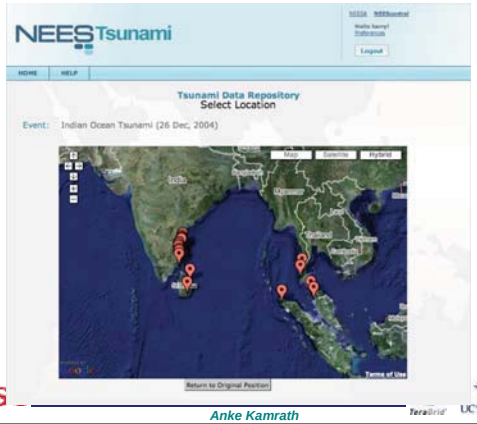

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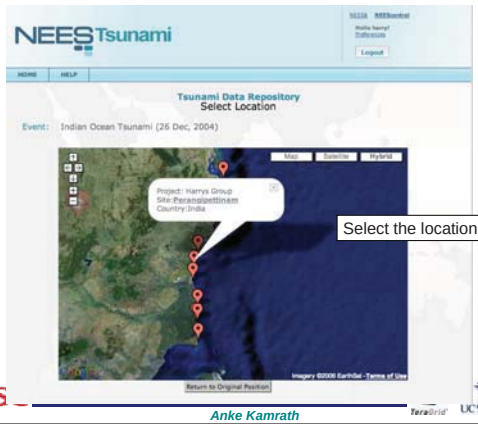

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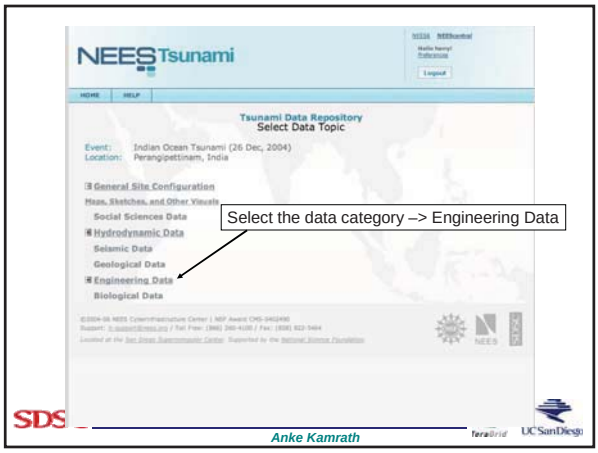
NEES Tsunami
Tsunami Data Repository
Select Data Topic
Event: Indian Ocean Tsunami (26 Dec, 2004)
Location: Perangipettinam, India
General Site Configuration
Maps, Sketches, and Other Visuals
Social Sciences Data
Hydrodynamic Data
Seismic Data
Geological Data
Engineering Data
Biological Data
Select the data category –> Engineering Data
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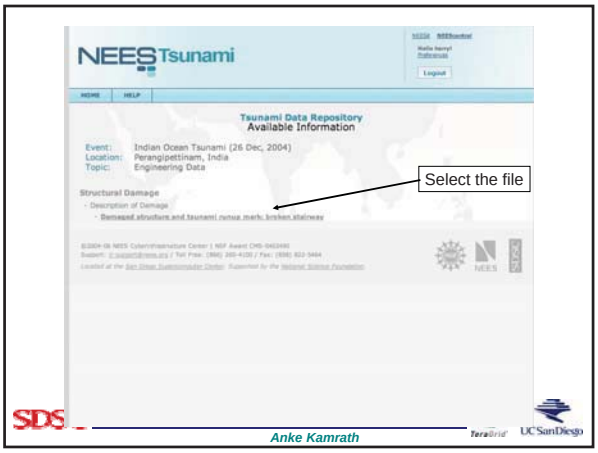
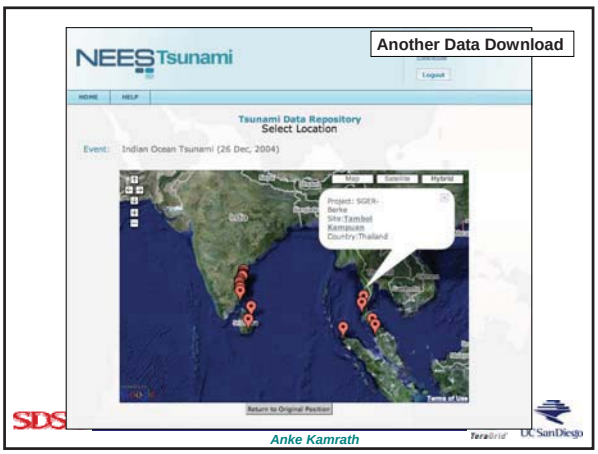
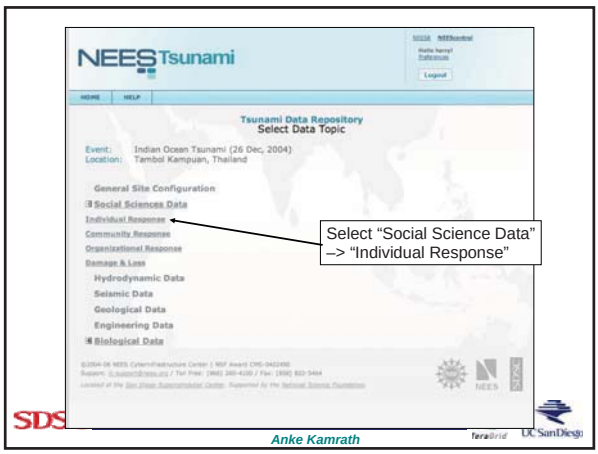
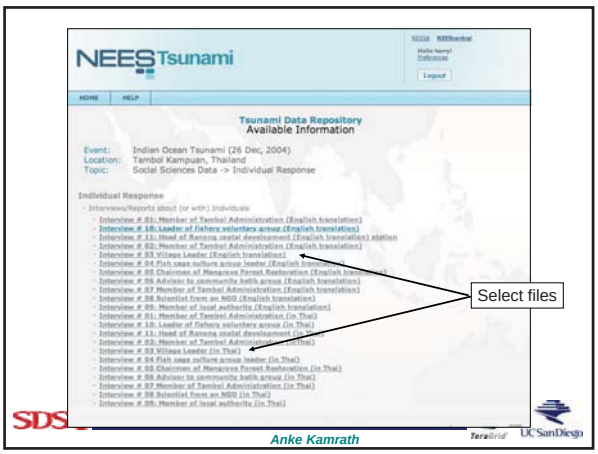
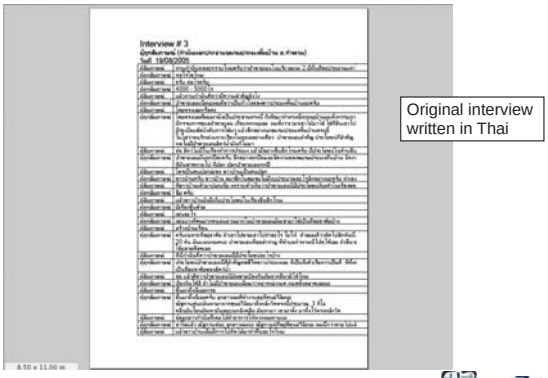

NEES Tsunami
Tsunami Data Repository
Available Information
Event: Indian Ocean Tsunami (26 Dec, 2004)
Location: Perangipettinam, India
Topic: Engineering Data
Structural Damage
Select the file
Anke Kamrath

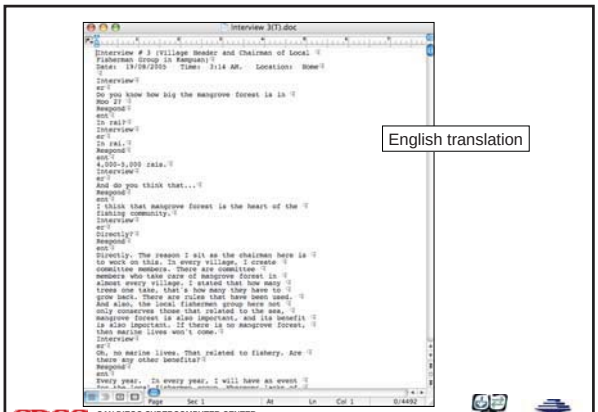

Tsunami Data Repository
Archive Photo
Credit, time, georeference, title, and short description are shown
Anke Kamrath


Another Data Download
NEES Tsunami
Tsunami Data Repository
Select Location
Event: Indian Ocean Tsunami (26 Dec, 2004)
Anke Kamrath


NEES Tsunami
Tsunami Data Repository
Select Data Topic
Event: Indian Ocean Tsunami (26 Dec, 2004)
Location: Tambol Kampuan, Thailand
General Site Configuration
Social Sciences Data
Individual Response
Community Response
Organizational Response
Damage & Loss
Hydrodynamic Data
Seismic Data
Geological Data
Engineering Data
Biological Data
Select "Social Science Data" –> "Individual Response"
Anke Kamrath


NEES Tsunami
Tsunami Data Repository
Available Information
Event: Indian Ocean Tsunami (26 Dec, 2004)
Location: Tambol Kampuan, Thailand
Topic: Social Sciences Data -> Individual Response
Individual Response
Select files
Anke Kamrath





Next Steps

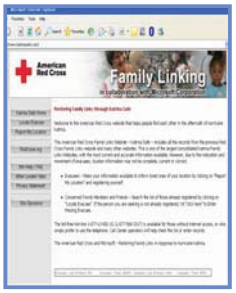
- **Drivers for Success**
  - Motivate data providers to upload his/her data (e.g., Minimize time and effort for upload)
  - Weed out unnecessary data by requiring proper metadata in the upload process
  - Value Added -- Effective and efficient queries and data utilization
- **General Comments**
  - Provides framework of field data repository for other natural and manmade hazards, e.g. earthquakes and hurricanes.
  - Support for long-term repository is essential to preserve data
- **Where next:**
  - Repository could readily be extended for international research community in a variety of disciplines.
  - For real research value needs be expanded to accommodate other tsunami survey data collected by both national and international survey team

Hurricane Katrina:
Data Cyberinfrastructure and Disaster Response

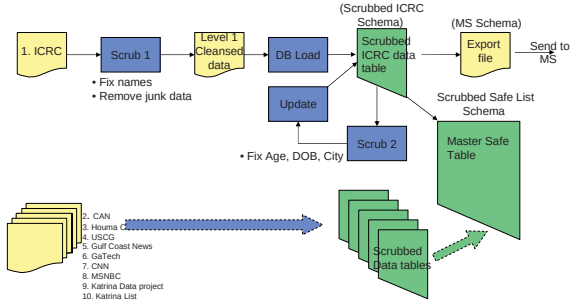
- **The Problem: integrate information about survivors and missing people across the Web**
- **Many Web sites developed "virally"**
  - Need to create a single, consolidated, definitive list of names to support searching for missing people and determine status of individuals
  - Example: Katrina.com was private site – owner converted to a website to support community need.
- **Challenges:**
  - data entered/collected rapidly in the field
  - Data had to be cleaned and merged on a daily basis ("in real time")

SDSC Katrina Project

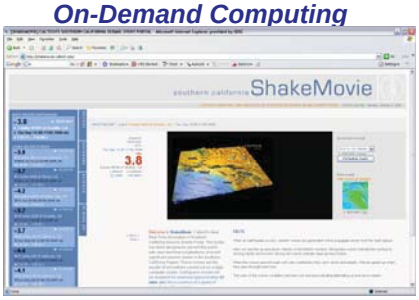
- **Background**
  - Were approached by National Institute for Urban Search and Rescue (NIUSR) to help create consolidated list of names
  - Partnered with Red Cross to create such a list for survivor names and "looking for" names
- **How:**
  - Collected data from some websites, by "scraping" websites
    - CNN, MSNBC, Times Picayune, Gulf Coast News, Katrinalist, Katrina.com, Katrina Data Project
  - Received data from Red Cross
    - ICRC
    - Data from shelters (e.g. Houma Civic Center)
    - Red Cross Coordinated Assistance Network (CAN)
    - US Coast Guard
  - Did data cleaning
  - De-dup
    - Acquired commercial software packages



SDSC Katrina Safe List Data Flow



Supporting Disaster Prediction: On-Demand Computing



- **Sample On-Demand Applications**
  - SoCal Earthquake Analysis (Jerom Tromp, Caltech)
  - Tsunami Path Prediction (Jerom Tromp, Caltech)\
  - Real-time storm path prediction (Droegemeier, U. Oklahoma)
  - Bio Terriorism (Charturvedi, Purdue)

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SDSC Data Central

- **First program of its kind to support research and community data collections and databases**
- **Comprehensive resources**
  - ***Disk:*** 400 TB accessible via HPC systems, Web, SRB, GridFTP
  - ***Databases:*** DB2, Oracle, MySQL
  - ***SRB:*** Collection management
  - ***Tape:*** 6 PB, accessible via file system, HPSS, Web, SRB, GridFTP
- **Data collection and database hosting**
  - Batch oriented access
  - Collection management services
  - **Collaboration opportunities:**
    - Long-term preservation
    - Data technologies and tools

New Allocated Data Collections

- Bee Behavior (Behavioral Science)
- C5 Landscape DB (Art)
- Molecular Recognition Database (Pharmaceutical Sciences)
- LIDAR (Geoscience)
- LUScID (Astronomy)
- NEXRAD-IOWA (Earth Science)
- AMANDA (Physics)
- SIO_Explorer (Oceanography)
- Tsunami and Landsat Data (Earthquake Engineering)
- UC Merced Library Japanese Art Collection (Art)
- NEES Data Repository (Earthquake Engineering)
- Terabridge (Structural Engineering)

Interested in a data allocation? Contact datacentral-allocations@sdsc.edu

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Anke Kamrath

Thank You

Contact Info:

- **Anke Kamrath** kamratha@sdsc.edu
- **SDSC Computational or Data Allocations** Consult@sdsc.edu

Thanks to:

- Tsunami Repository
  - **Oregon State (Harry Yeh, Ben Steinberg, Cherri Pancake)**
  - **NEESit/SDSC (Lelli Van Den Einde)**
  - **NSF-funded Recon Teams**
  - **EERI (Susan Tubbessing, Majorie Greene)**
  - **NSF (Joy Pauschke, ENG; Kevin Thompson, OCI)**
- Katrina Safe List
  - **SDSC (Jerry Rowley, Chaitan Baru and many others),**
  - **Red Cross**
  - **Microsoft**

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Tim Reinhold, IBHS

Insurance Industry Perspectives? Attempts to Become Data Driven

Tim Reinhold
Director of Engineering & VP

Institute for Business & Home Safety®

Some Insurance Perspectives

- Privacy Issues
- Largest companies feel they can do it all themselves – reluctant to release data
- Competitive Advantage
- Everybody wants the lowest risk portfolio
- Historical lack of information about what they are insuring – need for inspections
- Case History - Hail

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Understanding the Event

- Before the event – setup monitoring systems
- During the event – on line data reporting
- After the event
  - Analysis of event strength at various locations
  - Damage investigations
  - Damage assessments

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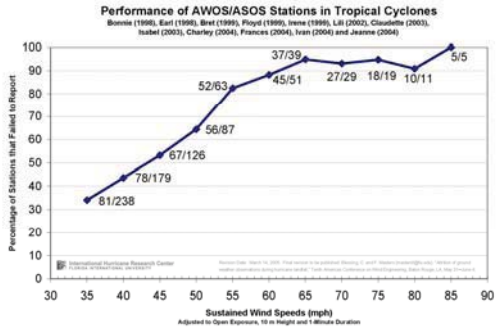
Performance of ASOS Stations – FIU Study



Portable Weather Stations

- Stiff 10-m Steel Lattice Tower
- Remain stable under dead weight in hurricane winds (200 mph)
- Self-powered for the duration of storm approach and landfall
- Meets DOT requirements for transport as a conventional trailer
- Quick setup to hasten retreat from approaching storm

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Instrumentation Deployment in Storms

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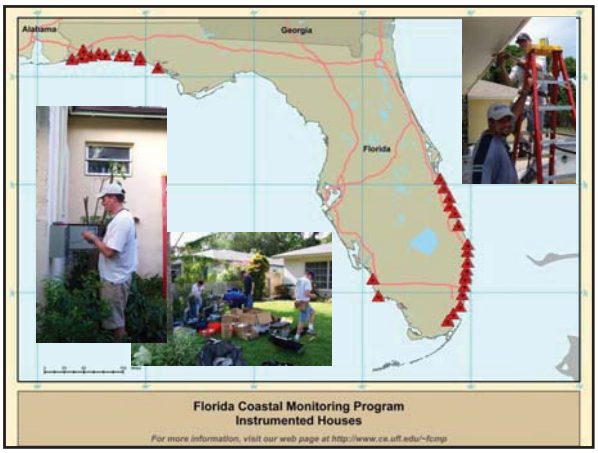

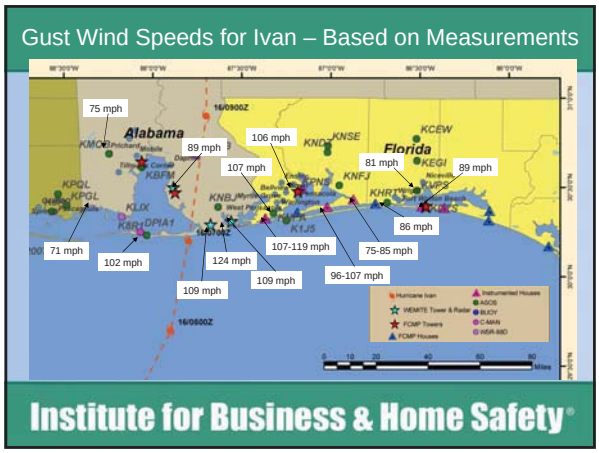

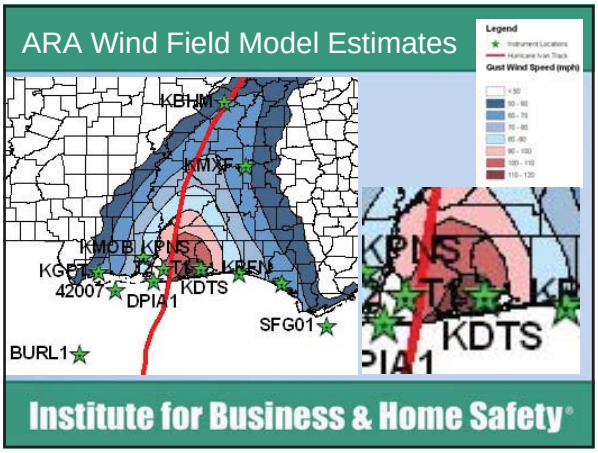

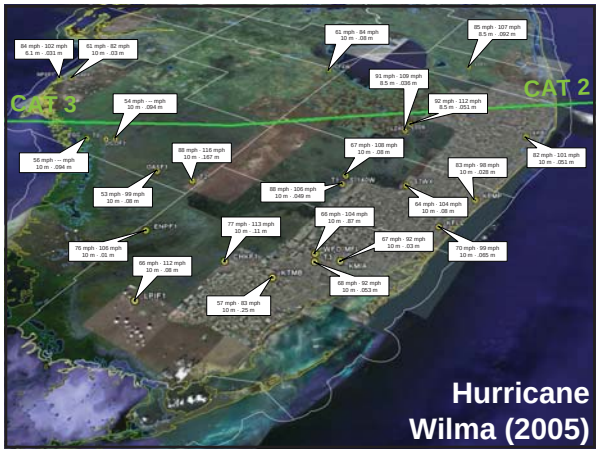

Hurricane Charley Experience: Residential Properties

- Immediate damage surveys
- Property appraiser's database
- Building permits
- Sampling and resultant home surveys
- Closed claim files
- Untapped resources - Damage estimation company files

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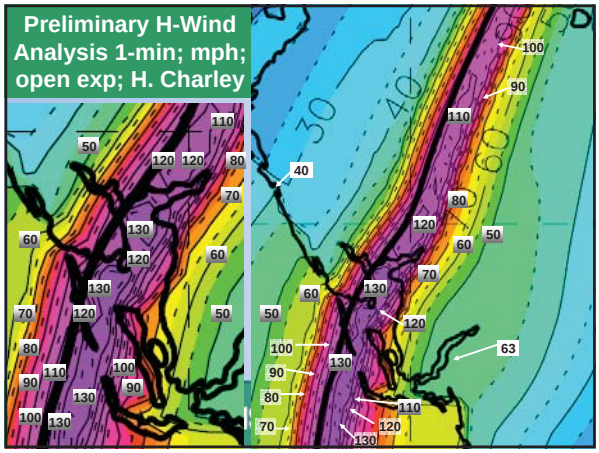

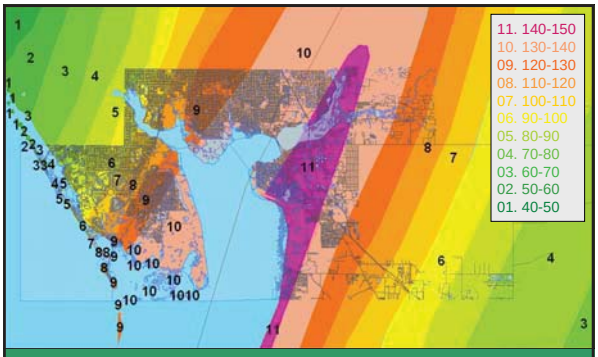

Applied Research Associates Wind Model:

11 separate swath categories **3-second gust metric**
140-150 MPH max. wind **10 MPH swaths**

Immediate Damage Surveys

- Tends to gravitate towards greatest damage areas
- Tends to be anecdotal
- Debris, debris sources and transport distances observations – require almost immediate access
- Failure modes – to the extent possible from general surveys
- Generally less complete information on event strength

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Property Appraiser's Database

- Depends on local jurisdiction
- No standards for capture of building characteristics (Charlotte County versus City of Punta Gorda)
- Age of property but no age of roof cover
- Does not handle complex situations very well
- Locating property and correlation with other databases

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82 Charlotte County Building Permits:

Tile
Shingle
Dimensional shingle
Garage door
Residential cage
Internal/external demolition and remodel

20 Punta Gorda Permits types:

Roof
Demolition
Remodel

Contractor Estimate Value

Estimate probably lower than normal
Data set at 8 months post event
Data lacks unpermitted replacements

Application Date

Building Permits

- No standards for capturing information
- Permit offices overloaded after an event
- Tend to enter a single permit when multiple failures exist
- $ estimates may be biased downward because fees are based on estimated costs
- Lots of types of damage are not captured in permits

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Aggregate Losses for Charlotte County and Punta Gorda

- All Permits: $1.8 Billion
- Residential Garage Doors: $2.6 Million
- Shingle Roofs: $114 Million
- Tile Roofs: $87 Million
- Residential Screen Enclosures: $16 Million

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Demolition Permits

- There were 130 demolition permits pulled in Charlotte County after Hurricane Charley struck
- None of those permits were for homes built after Hurricane Andrew struck South Florida in 1992

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IBHS Garage Door Permit Study

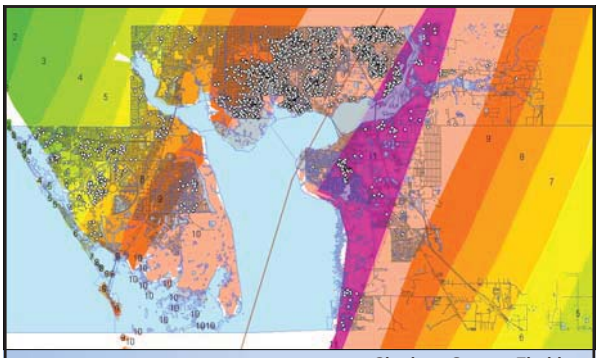
Population Studied:
57,308 Single Family Units

Post Charley Garage Door Permits Issued:
2,147

Aggregate Average Replacement Ratio:
3.75%

Aggregate Average Replacement Estimate:
$1,240.82

Aggregate Garage Door Replacement Estimate:
$2,628,051.27



Post Event Garage Door Permits — Charlotte County, Florida

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Garage Door Failures

- Failed primarily due to lack of reinforcement and track bracing for design pressures
- Some were also damaged by windborne debris

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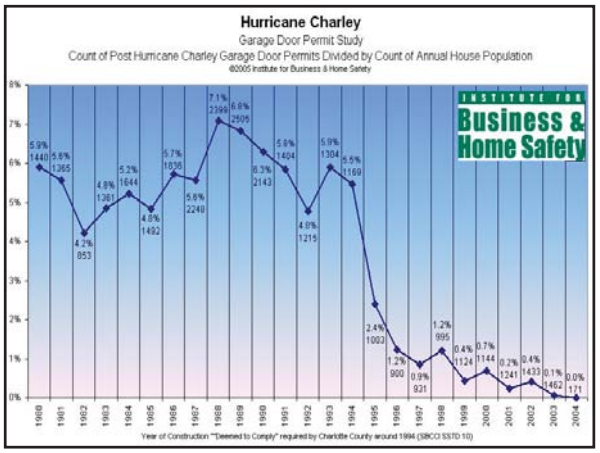

3-Tab Shingle Permit Study

Population Studied:
29,383 Single Family/Shingled Units

Population with Post Event Roof Permit:
9,741

Population Mean Replacement Cost:
$6,993.01

Population Replacement Value:
$68,118,951.32

Roof Covering and Soffits

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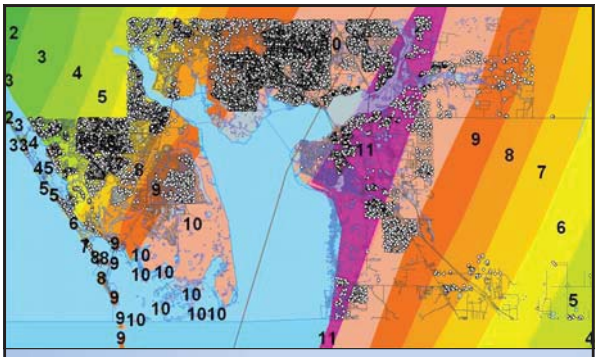

3-Tab Shingle Permit Study Total Population

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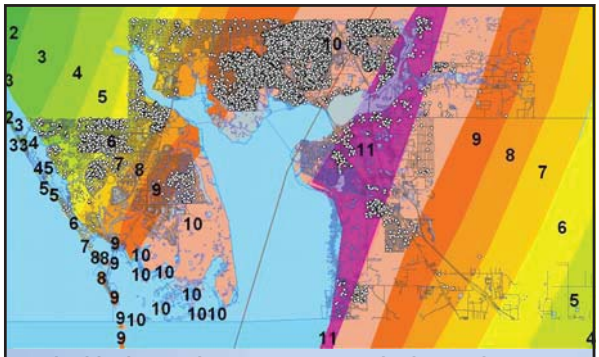

3-Tab Shingle Permit Survey Post Charley Replacement

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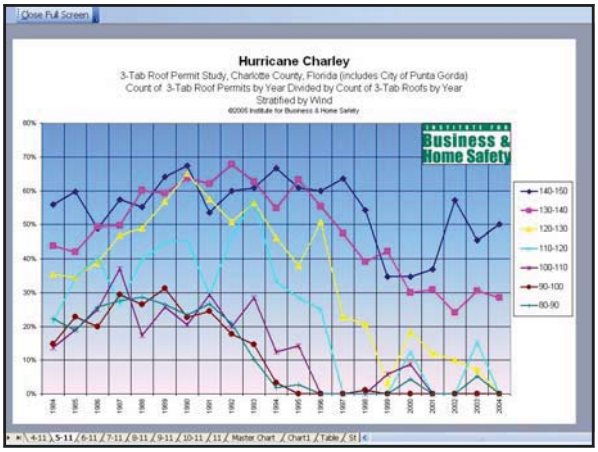

Sampling and Resultant Home Surveys

- Used property appraiser's database to stratify population by:
  - Age of home
  - Type of roof cover
  - Estimated maximum wind speed at location
- Random sample but required homeowner willingness to participate (~1:10 success rate) probably biased results

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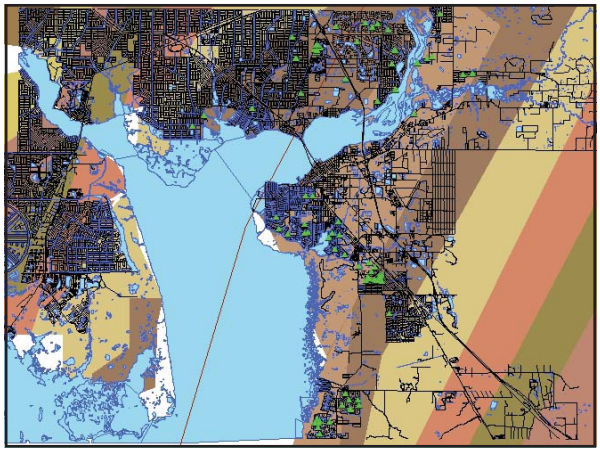
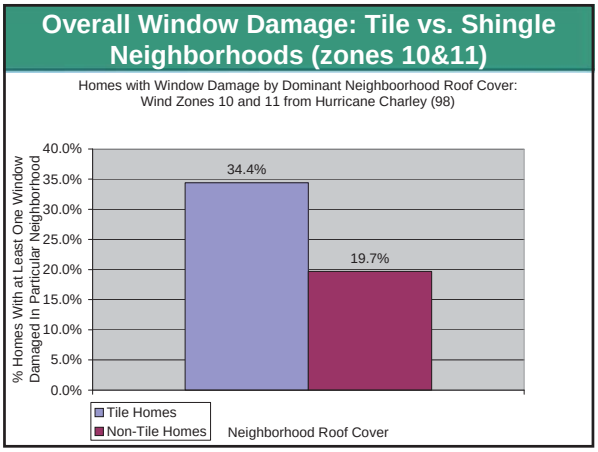
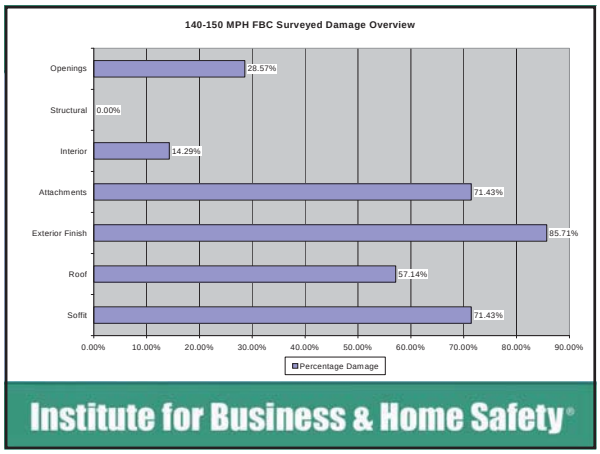
UF / IBHS DCA Survey Breakdown

Storm	Ivan	Frances / Jeanne	Charley		
# of samples	36	33	126		
Wind Speed	110-120	110-120	110-120	130-140	140-150
Zone	8	8	8	10	11
Old Code 1994–2002	20	17	10	45	24
New Code 2002-2004	16	16	12	12	23




Overall Window Damage: Tile vs. Shingle Neighborhoods (zones 10&11)
Homes with Window Damage by Dominant Neighboorhood Roof Cover:
Wind Zones 10 and 11 from Hurricane Charley (98)
% Homes With at Least One Window Damaged In Particular Neighborhood
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
34.4%
19.7%
Tile Homes
Non-Tile Homes
Neighborhood Roof Cover


140-150 MPH FBC Surveyed Damage Overview
Openings 28.57%
Structural 0.00%
Interior 14.29%
Attachments 71.43%
Exterior Finish 85.71%
Roof 57.14%
Soffit 71.43%
0.00% 10.00% 20.00% 30.00% 40.00% 50.00% 60.00% 70.00% 80.00% 90.00%
Percentage Damage
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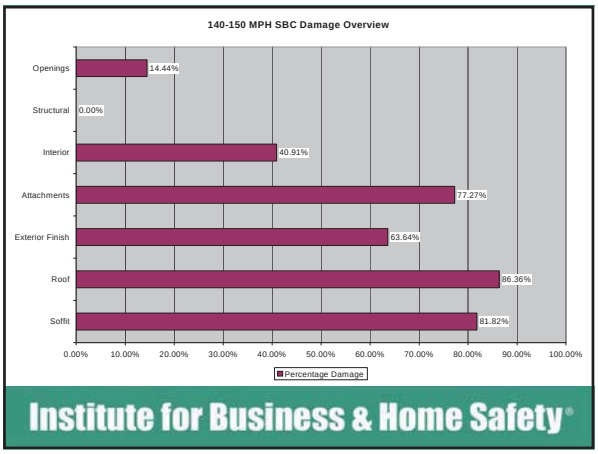
140-150 MPH SBC Damage Overview
Openings 14.44%
Structural 0.00%
Interior 40.91%
Attachments 77.27%
Exterior Finish 63.64%
Roof 86.36%
Soffit 81.82%
0.00% 10.00% 20.00% 30.00% 40.00% 50.00% 60.00% 70.00% 80.00% 90.00% 100.00%
Percentage Damage
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Interior
interior
100
90
80
70
60
50
40
30
20
10
0
Old
New
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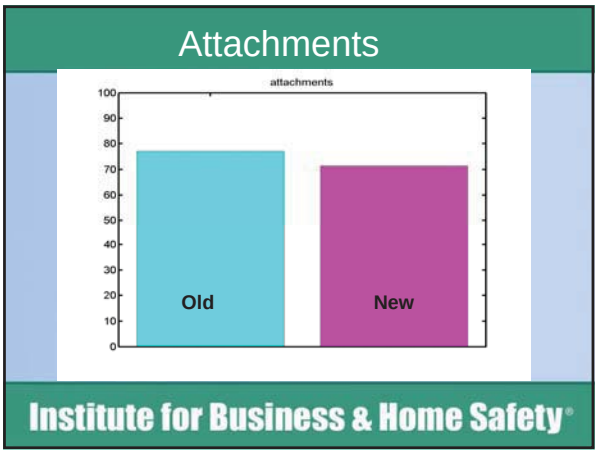
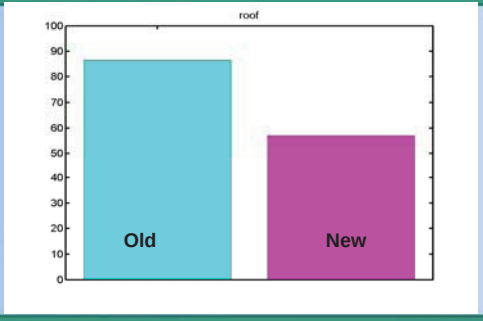

Attachments
attachments
100
90
80
70
60
50
40
30
20
10
0
Old
New
Institute for Business & Home Safety®

Roof



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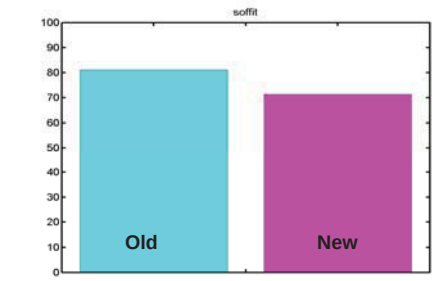
Soffit



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Closed Claim Files

- Probably the best source of data on extent of damage and types of damage
- No insight into failure modes
- Sample limited to properties with enough damage to create claim
- No data on age of roof cover
- No details on building components or construction
- Damage estimation programs

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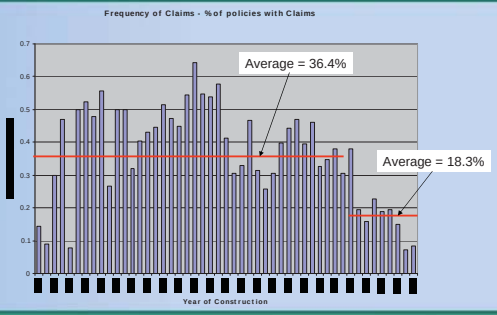
Claim Frequency by Age of Home



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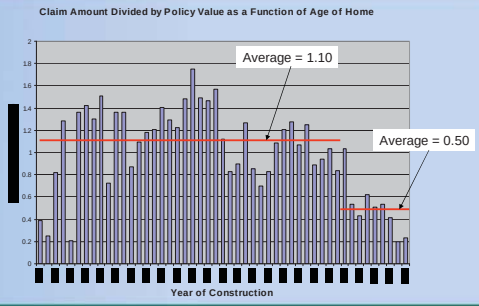
Relative Amount of Claim by Age of Home



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Effect of Building Codes on Claim Frequency and Severity

Pre 1996:
$24/sf

-42%

1996 - 2004:
$14/sf

Pre 1996:
41 claims/100 policies

-60%

1996 - 2004:
17 claims/100 policies

Pre 1996:
4453 Policies
1,843 Claims

1996 – 2004:
1151 Policies
192 Claims

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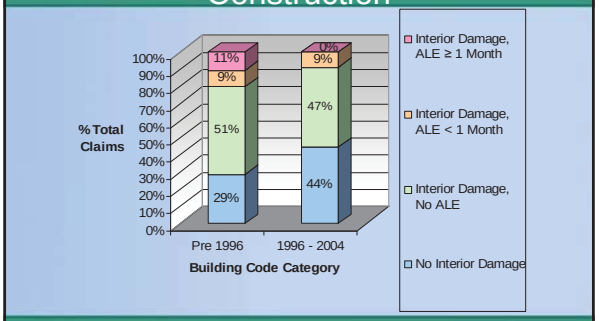
Interior Damage and ALE by Year of Construction



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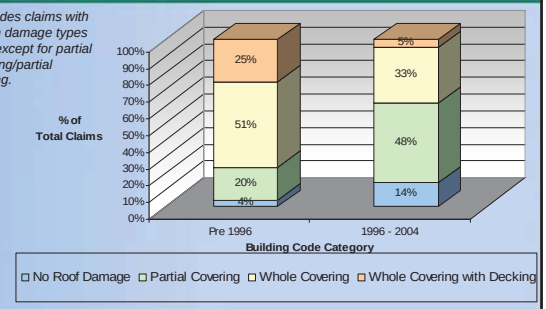
Amount of Roof Damage

** Includes claims with known damage types only, except for partial covering/partial decking.*



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Additional Issues

- Need to understand details of construction
  - Regional differences
  - Norms versus age of construction
  - Not as simple as "X year model with Y options"
- Understanding of code requirements
- Understanding the event
- Understanding underlying issues and national debates
- Consensus reports (pros and cons)

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Challenges

- Need to move beyond anecdotal
- Need statistics
  - What works
  - What doesn't work
- Need to capture data in a way that allows future correlation with new event data, analyses and modeling
- Experienced but open mind
- Develop cause and effect relationships

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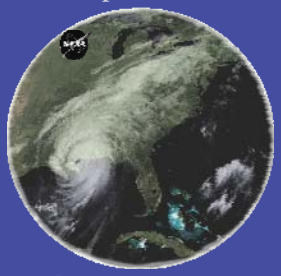
	event phase		
Changes in …	Before	During	After
Where you build	➢Land use planning ➢Protective barriers ➢Understanding risks ➢Laws & regulations ➢Incentives/disincentives	➢Event magnitude ➢Evacuation ➢Communication	➢Access to services ➢Access to property ➢Power availability ➢Community planning ➢Risk mitigation
How you build	➢Code adoption ➢Adequacy of code ➢Test standards & ratings ➢Code plus construction ➢Code enforcement ➢Education & certification ➢Public awareness ➢Incentives	➢Life safety ➢Shelter ➢Continued operation ➢Property damage	➢Recovery time ➢Extent of damage ➢Emergency repairs ➢Use of property ➢Rebuilding better ➢Code improvement ➢Community resiliency ➢Recovery costs
How well you maintain	➢Incentives/disincentives ➢Public awareness ➢Education	➢Extent of damage ➢Scale of damage ➢Loss of function	➢Recovery time ➢Recovery costs

Alan Springett, FEMA

Katrina & Rita
Data in Response to Disaster

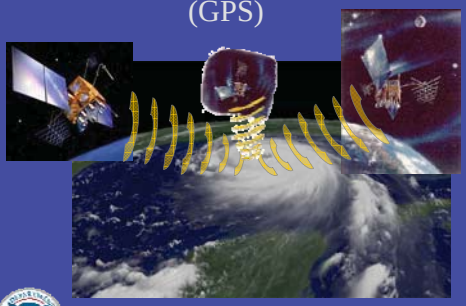


FEMA

Alan Springett, FEMA Headquarters October 2006

Imagery – A Foundation for Response

Geographic Positioning Systems
(GPS)



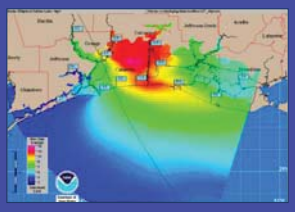
FEMA

Lidar Elevation Data

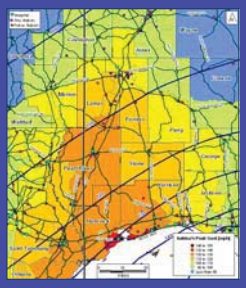
Lidar Courtesy of the USGS

FEMA

Data Gathered from Models



Storm Surge (Rita)



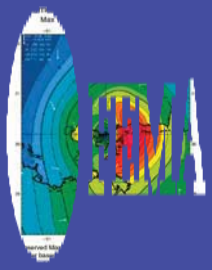
Wind Field (Katrina)

FEMA

Data Gathered by Direct Observation

FEMA

Data Gathered by Direct Observation



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Wind Damage

The Long Beach Police Station was severely damaged by high winds

Wind damage to the New Orleans Fire Department 3rd District Headquarters

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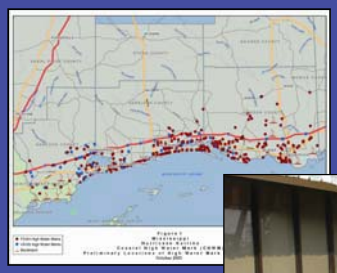
Data Collection – Katrina High Water Marks



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Mitigation Disaster Response

Wind/Water/Debris Line Determination

FEMA

Mitigation Disaster Response

Inland Wind Damage Studies

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Mitigation Disaster Response

Residential Substantial Damage Estimation

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Where is the Data Now?

FEMA

Where is the Data Now?

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Harrison Co., MS Coastal ABFE Map

- Pre-Disaster Imagery
- Katrina Inundation Limits
- Preliminary High Water Mark Elevations
- Wind/Water Line Information
- Estimated 1% Annual Surge Elevations

FEMA

FEMA

Elevation Worked in Pascagoula

Before Katrina

After Katrina

Where Do We Go From Here?

- Partnerships for Data Retention
- Common standards for data acquisition, sharing and retention

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Questions

?

FEMA