Exploring the LFE Resilience Reconnaissance Framework in the Context of the Puebla-Morelos Earthquake
Housner Fellows
Today’s discussion

- Building on EERI’s tradition of leadership in earthquake reconnaissance
- Challenges and opportunities of resilience reconnaissance
- Tools in development
- Test case: Resilience reconnaissance in Jojutla, Mexico
- Discussion:
  - Feedback on opportunities for integration into EERI processes
To get your gears turning...

- Why do people do post-earthquake reconnaissance?
- Why do YOU do reconnaissance?
- What is the value of reconnaissance?
Our project: Tools for resilience reconnaissance
Building on EERI’s tradition of leadership in earthquake reconnaissance

300 EARTHQUAKES, 50 COUNTRIES
increasing community resilience through earthquake investigations

For over 70 years, the EERI Learning from Earthquakes Program has promoted lessons for reducing earthquake losses and increasing community resilience. Learn more about the Learning from Earthquakes Program on the About Page.
Building on EERI’s tradition of leadership in earthquake reconnaissance

Resilience Observatory: *Framework for Resilience Reconnaissance*

- Observe, document, and measure community resilience following an earthquake... over TIME

Example Timeline:

- A time window identifies when data collection can or should take place. The color and hatching of this window identifies how frequently data collection should be repeated:
  - **Solid orange** = high data collection frequency or as often as reasonably possible
  - **Dashed orange** = low data collection frequency or a few times depending on user expertise
  - **Solid white** = single data collection effort needed once within this window

The time bar shows generic time ranges and the three phases a community faces after an earthquake.
Resilience Observatory: 

Resilience Reconnaissance Field Guide

- Resilience = the ability of a community to maintain functionality (SERVICES & FUNCTIONS) in the face of a wide range of stresses and shocks.
- INTER-DEPENDENCIES

*Figure 1* Basic structure of a community
Vision for resilience reconnaissance

• **Concept**
  • Evolution of resilience over time
  • Imperative to understand pre-event conditions, whether physical, political, or social

• **Purpose**
  • Develop a storyline that can be researched and shared
  • To understand the changes in social, political, and physical context, and identify needs/gaps become clear 1-2 years after a disaster

• **Why is this Important**
  • Highlights impact of earthquakes
  • Identifies needs/challenges
  • Leads to effective mitigation efforts and programs

Photos: Courtesy of EERI Clearinghouse
Challenges of resilience reconnaissance

- Extended duration -- How to keep people engaged?
- Volume of data -- How to decide what to study?
- Complexity of systems -- How to find the common thread?
- Broad, theoretical concepts -- How to make it even more practical?
Project goals

• Make resilience concepts **accessible and practical** to EERI members and other organizations conducting post-earthquake reconnaissance

• Encourage technical professionals to **think broadly** about how communities respond to earthquakes

• Encourage **connections** and information-sharing between EERI and other organizations studying similar topics.
Project Development Phases

- **Project Definition**: Summer 2017
- **Stakeholder Interviews**: Fall 2017-Spring 2018
- **Refine Objectives and Vetting**: Summer-Fall 2018
- **Literature Review**: Fall 2017
- **Mexico City & Jojutla Case Studies**: March 2018 & January 2019
- **Development of Tools to Share**: Spring-Summer 2019

and then...
Project Objective

- Develop a **toolkit** that:
  - Promotes the integration of resilience concepts into post-earthquake reconnaissance work and longitudinal studies.
  - Encourages users to highlight topics for future resilience reconnaissance studies.
Context Packet: Purpose

- To provide **pre-event contextual information** on the physical, social, political and environmental history and characteristics of the impacted city/region prior to the earthquake.

- It identifies characteristics that may be related to the community’s resilience, and it aims to **encourage technical professionals to think more broadly and holistically** about how communities respond to and recover from earthquakes over time.
Primer

- To provide **high-level guidance** and **best practices** related to resilience concepts for reconnaissance teams.

- It aims to **introduce or refresh** technical professionals on these topics in order to **encourage the implementation of resilience concepts** in reconnaissance work and the corresponding conclusions/results.
Primer

• The Resilience Reconnaissance Primer is envisioned as a brief document and/or powerpoint slides.

• It is envisioned that reconnaissance team members would review the Resilience Reconnaissance Primer on their way to the impacted city/region.
Primer - Draft Sample Content

**Context**
- Put damage/impact numbers in context to pre-event conditions

**Understanding Impacts**
- Aim to understand how social, political, or economic factors may contribute to the situation

**Collaboration**
- Contact local research institutions who may have data needs or could benefit from the data you plan on collecting. Coordinate your research and share your data, if you can.
Quick Notes

• A fillable form(s) and a printable graphic.

• To provide guidance in identifying interconnections between the built, human, and natural environment.

• To prompt technical professionals to ask questions that reveal how different categories are linked.

• Reconnaissance team members could use the Quick Notes in the field.
  – The graphic = field cheat sheet
  – forms -> field or soon after field
# Resilience Recon. Quick Notes

## Built Environment

1. Housing/Shelter
2. Transport and Mobility
3. Infrastructure/Utilities (water, waste, telecom, power, food, etc.)
4. Schools/Education
5. Hospitals/Healthcare
6. Business/Jobs/Economy
7. Government Services (building and land use regulation, policy, funding, etc.)

## Human Environment

8. Funding, finance and insurance
9. Civil Society (NGO’s, churches, community organizations/networks)
10. Equity and Vulnerable Populations
11. Demographics and population impacts
12. Social issues (e.g. psychological impacts, crime, violence)
13. Disaster Risk Management (hazard awareness including other hazards, preparedness, mitigation)
14. Ecology and environment

<table>
<thead>
<tr>
<th>Pre-Event Condition (characteristics, challenges)</th>
<th>Immediate Consequences and Response</th>
<th>Cascading Impacts and Longer-term Consequences</th>
<th>Transformation and 'Resilience Dividends'</th>
</tr>
</thead>
<tbody>
<tr>
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Jojutla, Morelos, México
Case Study
M 7.1 CENTRAL MEXICO EARTHQUAKE

EPICENTER
Sept 19, 2017 – 18:14:38 UTC

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# Context Packet Overview

## Reconnaissance Context Packet for Jojutla, Mexico

**Date Created:** December, 2018  
**Purpose:** The Context Packet is a report, prepared in advance of deployment of reconnaissance teams, that provides contextual information on the physical, social, political and environmental history and characteristics of the impacted city/region prior to the earthquake. It identifies characteristics that may be related to the community’s resilience, and it aims to establish encourage technical professionals to think more broadly and holistically about how communities respond to and recover from earthquakes over time.

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Response</th>
<th>Resources (links or tips on where to find the requested information)</th>
<th>Resilience Connection (why this question matters or how it relates to resilience)</th>
</tr>
</thead>
</table>
| 1 | Population of city and/or metropolitan region | Town (Jojutla de Juárez): 19,000  
Municipality (Jojutla), which includes towns of Jojutla de Juárez, Tiquiquequetango, and Huautla: 60,000  
State (Morelos): 1.5 million  
(60% of the municipal population of Jojutla is about 3% of the population of the state of Morelos.) | [www.urbanpopu](https://www.urbpop.org)  
[www.city-data.com/world_cities](https://www.city-data.com/world_cities)  
[www.citypopulation.de](https://www.citypopulation.de) | Size of city may affect complexity of resilience issues. City governance vs. regional governance may also pose organizational challenges. |
| 2 | What is the average annual rate of population increase or decrease? | In the state of Morelos, population growth has been about 1.5% per year average from 2000 to 2015. However, much of the remainder of the city, which has been growing in places, is over 2% per annum) are more likely to have high levels of informality, traffic congestion, inequality, etc. which will impact their resilience in the face of natural disasters. | [www.city-data.com/world_cities](https://www.city-data.com/world_cities)  
[www.citypopulation.de](https://www.citypopulation.de) | Rapidly growing cities |
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</tr>
<tr>
<td>2</td>
<td>What is the average annual rate of population increase or decrease?</td>
<td></td>
<td></td>
<td>Rapidly growing cities (over 2% per annum) are more likely to have high levels of informality, traffic congestion, inequity, etc which will impact their resilience in the face of natural disasters.</td>
</tr>
<tr>
<td>3</td>
<td>Do available resources point to any clear demographic trends? (Is the population young or aging? Growing or shrinking? Is the economy growing or declining?)</td>
<td></td>
<td></td>
<td>Young and growing population may be helpful for rebuilding. Aging or shrinking population may indicate vulnerability. Shifting economic conditions may present opportunity or risk.</td>
</tr>
<tr>
<td>4</td>
<td>Size of city and/or metropolitan area (physical footprint)</td>
<td></td>
<td></td>
<td>Urban area vs. city area can be an indication of sprawl, informality, potential transportation challenges.</td>
</tr>
<tr>
<td>5</td>
<td>Gross Domestic Product (GDP) per year. (Specify whether the provided number is for the city, region, or country.)</td>
<td></td>
<td></td>
<td>Provides an indication of level of economic development and resources available.</td>
</tr>
<tr>
<td>6</td>
<td>What are the main sources of industry? Describe any major changes to the economy over the past 30 years or so.</td>
<td></td>
<td></td>
<td>Sources of industry indicate possible vulnerabilities or opportunities for reconstruction. (E.g. tourism industry may have secondary impacts on economy.)</td>
</tr>
<tr>
<td>7</td>
<td>What percentage of the urban population lives in slums?</td>
<td></td>
<td></td>
<td>Construction in informal settlements tends to be more vulnerable to earthquake damage preventing communities from recovering quickly. Informal communities may also exhibit better resilience in specific ways due to their lack of reliance on public services.</td>
</tr>
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**SECTION 1: Demographics, Socio-Economics and Quality of Life**
Context Packet Overview:

SECTION 1: Demographics, Socio-economics and Quality of Life, e.g.:

- Population of city and/or metropolitan region
- Demographic trends (e.g. growing or shrinking)
- GDP – city, state, region
- Sources of industry
- Utility services (water, wastewater, electricity)
- Formal vs. informal settlements
- Insurance & financial systems
- Economic disparity/distribution
- Pre-existing challenges/stressers
Commercial Area Damage

October, 2017

January, 2019
Economic Context

Artisanal Rice Industry
“Best Rice in the World”

Tourism Industry

Mexico City Residents’ Housing Investments
Context Packet Overview:

SECTION 2: Natural Hazards

- Main hazards
- Previous earthquakes; Other disasters?

1985 M8.0 Intensity Map (UGSG)
Context Packet Overview:

SECTION 3: Built Environment & Social Systems, e.g.:

- Urban vs. rural
- Building types & construction practices
- Building codes & enforcement
- Utility Systems
- Housing
- Healthcare
- Education
- Development/investments
- Economic system
Context Packet: 
Built Environment

- **Characterization:**
  - Small Town/Rural

- **Buildings:**
  - Typically 1-2 story (some 3-4 story)
  - Typically URM, Nonductile RC, CM

- **Bridges:**
  - 2-3 across river in city center
Context Packet: Built Environment
Context Packet Overview:

SECTION 4: Governance
• Current President & term
• Current Governor & term
• Current mayor & term
• Government structure
  - national
  - regional
  - municipal
• Agencies relevant to reconstruction & resilience

Welcome to Jojutla.gob.mx

Through this portal and during this administration we will keep in communication. Transparency and mutual cooperation is essential to achieve our goals, we will work hand in hand, we will advance in the reconstruction of the municipality. I appreciate your confidence and I guarantee that all the team that makes up the City Council of Jojutla will give their best effort.

“reborn with strength”
Government Transition - Community Meeting
Our Experience...
Resilience Reconnaissance: Observations
Pilot Application of Resilience Reconnaissance Tools
Jojutla, Mexico
January 7-9, 2019
Resilience Reconnaissance: Process Observations

- Context Packet provides a foundational understanding to build off of
- Primer detailed questions are not practical
- Planning vs. Serendipity & Improvisation
- Partnership with locals is critical
  - Informed perspectives
  - Access/connections
  - Items lost in translation?
- Longitudinal study is critical
  - Information availability
  - Individual openness
  - Larger opportunity for reciprocal benefits
Emerging Storylines
Development of Resilience ‘storylines’ – exploratory NOT empirical

Pre-Event Context → Event → Immediate Consequences → Cascading Impacts → Transformation
Development of Resilience ‘storylines’ – exploratory NOT empirical
Planned Government Transition
Lack of Land Titles
Gov't Transition + Lack of Land Titles

Housing Damage

Land tenure

Politics

Housing Damage
Unregulated Volunteers and Aid

Role of Foundations and Inequity

Gov’t Transition + Lack of Land Titles

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Gov’t Services

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Recovery a central focus of new gov’t
Lack of Land Titles
Housing Damage
Politics
Equity
Gov’t Services
Funding
Land tenure
Housing Damage
Gov’t Transition

Governance

Housing

Land tenure

Politics

Equity

Funding
Project Life after Housner

Potential for Integration into existing EERI Programs
- Coordination of Context Packet with VERT
- Sharing of Primer & Quick Notes between LFE and other teams/orgs doing reconnaissance

Field Testing
- EERI members doing reconnaissance test approach and products

New Value from Reconnaissance
- New ways of thinking about reconnaissance provide value to new communities, including the academic community, community where disaster occurred

Refinement
- Tools are refined and improved based on field usage and value added

Lessons Learned back to EERI
- Reconnaissance teams debrief with other teams and share lessons learned with LFE
Key Take-aways

- Resilience reconnaissance: valuable but challenging

- Housner project seeks to prototype tools to help implement resilience reconnaissance.

- Focus on storylines as a means for identifying topics to study

- Opportunities for EERI to collaborate with other organizations through resilience reconnaissance
Key Questions Revisited

• Why do people do reconnaissance?
• Why do YOU do reconnaissance?
• What is the value of reconnaissance?
Discussion

01 What are the benefits and challenges of these tools?

02 How could these, or other tools, incorporate into existing EERI practices around reconnaissance?

03 What ideas do you have for what reconnaissance could or should do in the future?
Thank you!