



# LEARNING FROM EARTHQUAKES ENDOWMENT

## Case Statement

February 2019

*Your contribution is needed to ensure the continuation of a robust and dynamic LFE program for generations to come*

The Earthquake Engineering Research Institute's Learning from Earthquakes (LFE) program has been the hallmark of the Institute for more than 70 years. Following more than 300 major earthquakes in 50 countries across the globe, LFE-sponsored post-earthquake reconnaissance teams of engineers, geoscientists, architects, planners, public officials, and social scientists have traveled quickly to the scene in order to investigate the impacts and accelerate learning on earthquake risk reduction and community resilience through their technical briefings, reports and *Earthquake Spectra* journal contributions.

In recent years, a number of factors have significantly affected the LFE program. A large reduction in federal funding limited LFE's ability to respond robustly to major seismic activity around the world. At the same time, more and more groups have followed LFE's lead and begun conducting earthquake reconnaissance, leading to a rapidly evolving earthquake reconnaissance landscape with more data and team deployments than ever before.

In 2016, the EERI Board of Directors considered these factors and unanimously agreed that the LFE brand remains unmatched in its multi-disciplinary emphasis following earthquakes and tsunamis, and that EERI should continue the core LFE elements—sending reconnaissance teams and sharing multidisciplinary findings through reports and briefings, while also exploring new ways to expand and evolve the program. EERI then launched a strategic initiative to “recommit and refresh” the LFE program.

As a result, an exciting new series of programs has emerged, engaging broader segments of the EERI membership and the earthquake reconnaissance and research communities. EERI has expertly stepped into a central “clearinghouse” role for the collection and curation of earthquake reconnaissance data, and has also taken on an overarching reconnaissance coordination responsibility to help teams from many organizations to collaborate and share data from the field. The Virtual Earthquake Reconnaissance Team (VERT) utilizes tech-savvy members and web-based tools to collect and share real-time data with our members immediately following an earthquake. The LFE Travel Study program provides weeklong field-based reconnaissance training for young professionals and students at sites of recent, major earthquakes. Our Resilience Observatory is exploring how LFE can measure resilience over time with new tools and strategies for reconnaissance teams to use.

These are new and vibrant programs that reflect EERI's unique character and are engaging a much broader swath of the EERI membership, particularly younger members. Even with these new programs, however, outside funding sources for LFE remain scarce. To meet the need, the EERI Board of Directors has launched a major fund-raising campaign to secure LFE for the future. A **Learning from Earthquakes Endowment Fund of \$4 million** would provide restricted support to LFE of approximately \$200,000 annually to fulfill its core mission of multi-disciplinary field reconnaissance, data gathering and sharing, as well as supporting continued program innovation and expansion. The campaign seeks cash pledges over a 5-year time frame and estate/testamentary pledges to achieve the \$4 million target.

### The LFE Advantage

1. The longevity and permanence of EERI
2. Proven impact
3. Multidisciplinary approach
4. Respected publication vehicles with broad reach
5. Experienced role as coordinator to serve community
6. Established international network
7. Cohort of young EERI members seeking training and reconnaissance opportunities
8. Vast group of expert members to share knowledge and train the next generation
9. Enthusiastic committees looking to advance reconnaissance
10. Passionate and dedicated members willing to contribute to the LFE Endowment Campaign

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## **BACKGROUND**

Earthquake reconnaissance has been at the heart of EERI since the Institute's beginning in 1948 and EERI has been an international leader in demonstrating the value of rapid, in-person surveys of earthquake impacts. EERI investigations and reports have been crucial to advancing the science and practice of earthquake engineering in the United States and beyond. As the Institute and the fields of earthquake engineering and reconnaissance matured, EERI investigations were formalized into the Learning from Earthquake (LFE) program in 1973. EERI's LFE website continues to be *THE* trusted source for reconnaissance information and data following earthquakes.

## **FUNDING HISTORY**

Recognizing the value of the LFE program and EERI's role as a leader in reconnaissance science, the National Science Foundation (NSF) provided significant funding to the program for over 40 years. With this generous support, EERI responded to over 200 earthquakes – uncovering lessons that have increased our fundamental understanding of earthquake ground motions and fault mechanics, and led to vital changes in building codes and construction practices and improved procedures in disaster preparedness, response and recovery in the U.S. and internationally.

In 2010, after decades of steady funding from NSF, the LFE program was launched into financial independence. While the loss of this external funding source posed challenges for the program, it also forced EERI to look inward and reflect on the value of the program and its future.

## **RECOMMIT TO LFE AND REFRESH IT FOR THE FUTURE**

Despite the funding challenges, there was still great interest in the LFE program from EERI members and the broader community. Many EERI members attribute their dedication to seismic safety to the transformational impact that participation in LFE reconnaissance trips had on their perspectives and careers. With EERI's growing student membership, many younger members are eager to engage in the LFE program so they too can achieve the same level of learning and professional transformation. Major earthquakes in recent years have also demonstrated that there is still much to be learned and shared.

Taking all of these factors into consideration, when the EERI Board and staff considered its strategic priorities in 2016, it was clear that the LFE program was as important and relevant as ever. Understanding its value, the Board resolved to recommit to the LFE program, allocating operational funds to continue the core elements of the program and provide the flexibility to continue innovating and evolving the program through new activities.



*M7.5 February 18, 1955 Quetta, Pakistan Earthquake. (Photo: PEER, NISEE Karl V. Steinbrugge Collection)*

## **BUILD UPON LFE STRENGTHS AND EXPERIENCE**

Reflections upon LFE make several things clear. First, EERI's LFE Program has longevity and history on its side. With the Institute's existence for more than 70 years and an LFE program formalized in 1973, EERI has demonstrated unwavering leadership and commitment to earthquake reconnaissance over time. A secure funding source, as envisioned by this endowment, will allow this to endure. A list summarizing the products from more than 300 LFE earthquake investigations can be found at the LFE website: [www.learningfromearthquakes.org](http://www.learningfromearthquakes.org).



Second, LFE has had an extraordinary impact nationally and internationally over many decades. The influence and value of LFE has been well documented in the 2004 report *LFE: A brief Synopsis of Major Contributions* and elsewhere. Some key impacts are summarized here.

Advances in Structural Engineering ranging from basic engineering knowledge (including the vulnerabilities of structural irregularities, soft stories, corner columns and short columns, the critical nature of horizontal diaphragm connections, and needs for ductile detailing), to key building code developments (including changes to seismic zonation, structural overstrength design of columns, site class coefficients, building separation requirements, and wall anchorage provisions, as well as special requirements for the design of near-fault structures) and new building safety evaluation procedures (including the American Society of City Engineers ASCE-41 standard and its predecessors).

Advances in Earth Sciences and Geotechnical Engineering including improvements to the physical understanding and dynamic modeling of fault rupture, creation of extensive databases of liquefaction and landslides from follow-up subsurface investigations, an increased understanding of ground motion attenuation relationships and the effects of site conditions, changes to the procedures and criteria used in designing for soil-structure interactions, and advances in real-time tsunami warning systems.

Advances in Lifeline Systems and Networks, Social Sciences, and Information Technology have also resulted from LFE reconnaissance studies. Broad societal impacts in earthquake risk reduction and increased community resilience can be demonstrated from the continuous supply of knowledge generated by LFE reports and data, including the political support for numerous seismic retrofit programs that have drawn upon LFE findings about the causes of building failures, and the global network of former LFE team members and experts collaborating to improve earthquake risk reduction and increase capacity-building in developing countries.

Third, LFE has a unique multidisciplinary approach. By crossing disciplinary boundaries, we learn more and can better advance the science and practice of earthquake engineering, risk reduction, and resilience. Our teams provide a unique multidisciplinary lens on specific topics in such a way that EERI often fills gaps and connects the work of other, more disciplinary-specific reconnaissance groups.

Fourth, EERI has a strong ability to disseminate knowledge through several well-respected publication vehicles including our technical journal, *Earthquake Spectra*, and our prominent website. EERI posts reports, briefing recordings, and reconnaissance data on our website, and often produces special issues of *Earthquake Spectra* to document findings from important earthquake investigations. EERI's dissemination approaches are also evolving to take advantage of new technologies. Our briefings are provided via webinar and we work to involve presenters from the LFE teams as well as other reconnaissance organizations so that we can bring the best knowledge to EERI members and the broader community.

## **SERVE THE BROADER EARTHQUAKE RECONNAISSANCE COMMUNITY**

In recent years, more groups have been conducting reconnaissance including teams from the discipline-specific natural hazards engineering research centers funded by the NSF as well as specific engineering firms. Also, many international organizations and partners are active in this sphere. To serve this broader community, EERI has taken on an overarching coordination responsibility for all responding reconnaissance teams and which is enhancing collaboration and sharing among the teams. This naturally builds upon EERI's expertise as a forerunner in the earthquake reconnaissance arena, its rich network of international organizations and connections, and EERI's federally-defined responsibility to host earthquake reconnaissance clearinghouses for information sharing following major U.S.

### **The LFE Advantage**

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earthquakes in support of the National Earthquake Hazards Reduction Program. It also puts EERI in a unique service role for the good of the broader earthquake engineering and risk reduction communities.

With more teams responding to earthquakes, there are also more possibilities to advance reconnaissance approaches and for LFE to take a more nuanced role that fills gaps left by others. The 2017 Puebla Earthquake in Mexico offers a good example of how LFE chose to deploy a topic-specific multidisciplinary team to document the use of earthquake early warning systems and public notifications. This filled an important reconnaissance gap as many other teams conducted traditional surveys of structural and geotechnical damage. EERI also facilitated data sharing and regular coordination calls to ensure that findings from all the reconnaissance teams were disseminated and shared in comprehensive LFE briefings.

## **TRAIN YOUNG MEMBERS THROUGH NEW ACTIVITIES**



Creating more LFE opportunities beyond the traditional reconnaissance team participation, especially for younger career members, has become a major new focus for the LFE program and activities.

The **LFE Virtual Earthquake Reconnaissance Team (VERT)** was initiated after the 2015 Nepal earthquake, and is led by enthusiastic younger members who coordinate volunteers to rapidly summarize earthquake impacts using online news sources and social media reports. This rapidly growing group of 60 volunteers has greatly improved the information that the LFE Committee has at hand to make earthquake response and reconnaissance deployment decisions. They have also engaged the next generation and bolstered their understanding of earthquake impacts. VERT is developing into a sophisticated virtual reconnaissance arm of the LFE program with many additional ideas for engaging members and supporting earthquake reconnaissance efforts.



*2017 LFE Travels Study participants learn about adobe construction practices in Chile (top) and with Farzad Naeim who gave a remote presentation as part of the program (bottom).*

The new **LFE Travel Study Program** provides learning opportunities for graduate students and early career academics and professionals to visit earthquake-impacted areas several years following a major earthquake. Visiting these areas later avoids the chaos of post-earthquake emergency operations, and offers new lessons on disaster recovery and community resilience. The LFE Travel Study Program was initiated in 2016 with a tremendously successful pilot trip to Santiago, Chile in 2017. A group of 16 participants connected with international colleagues, advanced their technical knowledge, and documented findings.

On the heels of this great success, planning for the next LFE Travel Study trip is already underway. The 2019 New Zealand trip will investigate areas impacted by major earthquakes from 2010 to 2016, including Christchurch, Kaikoura, and Wellington. It will also include presentations on a vast range of technical topics including liquefaction and landslides impacts, building safety evaluations lessons, structural damage to midrise buildings in Wellington, and community impacts and resilience, including the native Maori populations.

**The LFE Advantage**

**7. Cohort of young EERI members seeking training and reconnaissance opportunities**

**8. Vast group of expert members to share knowledge and train the next generation**

**9. Enthusiastic committees looking to advance reconnaissance**

**EXPAND THE DEFINITION AND SCOPE OF RECONNAISSANCE**

Alongside these exciting new programs, **new reconnaissance approaches** are emerging. With sophisticated near real-time news reporting, a growing number of reconnaissance teams, and great advances in earthquake engineering, the LFE Committee has recognized the need to reassess the traditional reconnaissance approach. Sending a large multidisciplinary team is no longer the only option. Instead, the LFE Committee has begun a two part approach: first, to coordinate and curate preliminary data, photos and news from many teams on the LFE website; and second, to carefully consider the impacts of an earthquake, identify specific topics for new learning, take stock of other teams responding, and ultimately recommend informed, targeted and sophisticated reconnaissance efforts.

In addition to a more deliberate approach, LFE is also expanding the timeline for learning from earthquakes. Through its **Resilience Observatory** project, LFE has developed a resilience reconnaissance framework and tools to identify lessons for community resilience that can be captured through initial reconnaissance and follow-up earthquake investigations.

An example of this new approach is the development of a **Business Resilience Survey** that was started after the 2014 South Napa Earthquake. This new approach pairs engineers and social scientists in immediate field surveys to systematically evaluate structural damage and business continuity impacts through oral surveys with business owners, followed by electronic surveys repeated during the months and years of the recovery process. This approach draws upon EERI's multidisciplinary strengths to correlate physical impacts with the many other social, political, and economic factors that influence business recovery and community resilience after earthquakes.

This new LFE subcommittee stands ready to train more members on its methods and deploy its tools after future earthquakes so that EERI can bring new research findings and observations to our community. Additional survey topics that integrate engineering with other disciplines (i.e. public health systems) are also being considered and offer the promise of engaging new and important stakeholders into EERI.



*Left: EERI LFE Business Resilience Survey Reconnaissance Team Members meet with Steve Spears, the Cushing, Oklahoma City Manager, before beginning their field work (November 2016). Team Members: Jim Taylor, Armin Masroor, Ezra Jampole, Yu Xiao, Mehmet Celebi, Evan Wilson, Steven Melton, Alex Greer, Derek Norton (not pictured), and Nicole Paul (not pictured).*

*Right: Team member Alex Greer observes step cracks in brick at numerous locations that were previously repaired.*



**THE CAMPAIGN FOR AN LFE ENDOWMENT**

There are so many opportunities to continue learning from earthquakes and develop the next generation of seismic safety advocates. With the support of the EERI Board of Directors, the LFE program has been reinvigorated and now includes an exciting suite of new activities. To ensure the continuation of a robust, dynamic, and innovative LFE program, EERI is turning to our members to help secure the program’s future for generations to come.

**The LFE Advantage**  
**10. Passionate and dedicated members willing to contribute to the LFE Endowment Campaign**

The longevity of the Institute over many decades puts EERI in a unique position to sustain an important focus on earthquake reconnaissance and learning for many years to come. An LFE Endowment will ensure that this important emphasis doesn’t waiver even as other organizational priorities or external funding streams fluctuate over time. The \$4 million target would provide an estimated annual income of \$200,000 that would be dedicated to the core activities of the LFE program as well as innovations for the future.

The LFE Endowment Campaign has two sub-targets: \$2 million in cash donations with pledges spanning over five years, and \$2 million in estate planned/testamentary gifts. It will take some time to build up the cash portion, as payment terms will extend over five years. The timeline for maturation of estate gifts is unknown. Thus, the restricted LFE Endowment will be frozen until a \$500,000 balance is achieved, and the EERI Board of Directors are committed to using operational funds to support the LFE program until that time.

The LFE Endowment will be overseen by the Finance/Investment Committee of the EERI Board of Directors in the same manner that all other endowments and specialty programs are monitored.

<b>DONATION LEVELS</b>		
<b>Category</b>	<b>Annual Contribution</b>	<b>5-year Total Cash Donation</b>
Elite Sustainer*	\$50,000+	\$250,000+
Sustainer*	\$20,000+	\$100,000+
Underwriter*	\$5,000+	\$25,000+
Partner*	\$2,500+	\$12,500+
Supporter	\$1,000+	\$5,000+
Friend	<\$1,000	<\$5,000

The distinction of "LFE Endowment Founding Benefactor" will be given to all early donors who make a cash pledge by July 2019. Donors at the Partner level or above (indicated by \*) will be added to the “LFE Benefactor's Circle."

**As of February 2019, 14 donors have donated more than \$645,000 in cash pledges to be paid over five years, and over \$800,000 in pledges of testamentary support.  
 Will you join them?**

**Donate today at [www.learningfromearthquakes.org](http://www.learningfromearthquakes.org)**