

## Learning from Earthquakes

# The Great Sumatra Earthquake and Indian Ocean Tsunami of December 26, 2004

**Editor's Note:** In the March and April issues we presented the first three reports of the many teams that observed the effects of the earthquake and tsunami in many countries around the Indian Ocean. Below is a report on the human impacts of the disaster in India and Sri Lanka. Publication of this report is supported by funds from the National Science Foundation through EERI's Learning from Earthquakes Program under grant #CMS-0131895.

## Report #4

### A Preliminary Assessment of Societal Impacts and Consequences

Within a month of the Sumatra earthquake and tsunami, social science researchers from the University of Delaware's Disaster Research Center (DRC) and the Emergency Administration and Planning Program (EADP) at the University of North Texas traveled to some of the most affected areas in India and Sri Lanka. The team was in the field for two weeks gathering data on disaster preparedness, response, and recovery. The team included Havidán Rodríguez, director; Joseph Trainor, Ph.D. student and project coordinator; and Tricia Wachtendorf, core faculty, Disaster Research Center, University of Delaware; and James Kendra, faculty member, Emergency Administration and Planning Program, University of North Texas. Two additional members formed part of the field team: A. Subramanian, political science, Madras Christian College, Chennai, India; and Ram Alagan, Department of Geog-

**Table 1.** Preliminary estimates of tsunami impacts in four countries

	Indonesia	Sri Lanka	India	Thailand
<b>Death Toll</b>	166,760	30,974	10,872	5,305
<b>Missing Persons</b>	127,773	4,698	5,752	3,498
<b>Displaced Persons</b>	811,409	553,287	647,556	8,500

(Source: <http://www.e11th-hour.org/resources/timelines/tsunami.2004.countries.html>, March 23, 2005.)

raphy, University of Peradeniya, affiliated with the International Center for Ethnic Studies in Kandy, Sri Lanka.

## Introduction

Very few natural hazards in historical times have had such widespread, catastrophic consequences as the Sumatra earthquake and resulting tsunami. Preliminary estimates show the death toll at over 200,000. In addition, there are more than 141,000 "missing" persons, over 2 million people displaced, and economic impacts in the billions of dollars. Although it will be extremely difficult, if not impossible, to count all those affected, the preliminary numbers give us a sobering indication of the extensive loss of lives, the amount of damage, and the societal disruption. Entire communities were devastated, and tens of thousands of families were shattered by death and loss of their livelihoods. Twelve countries were affected, but Indonesia, Sri Lanka, India, and Thailand had the largest numbers of deaths and displaced people (see Table 1).

## Field Research

The team had a number of preliminary reconnaissance interests:

- The absence of integrated warning systems in countries around the Indian Ocean

- Transnational coordination and collaboration in the provision of response assistance
- The distribution of disaster relief aid and supplies
- Disaster vulnerability and the social and economic impact/consequences of the tsunami in the different nations
- Differences in disaster response and protective action
- Community resiliency

The reconnaissance trip served as an essential first step in developing long-term collaborative relationships that will contribute to a better understanding of the disaster's social and physical impacts; the complexities of disaster response and relief across many nations; and issues that will affect the physical, social, and economic recovery of the region in general.

In India, the field team traveled south of Chennai (January 23-27, 2005), spending time in eight fishing communities and one mixed fishing-urban community in the state of Tamil Nadu, the most severely affected region in India (see page 1 of the Special Earthquake Report in the April 2005 *EERI Newsletter* for a map of India showing levels of tsunami-induced damage). In Sri Lanka, the team arrived in Colombo and traveled to Kandy to meet with

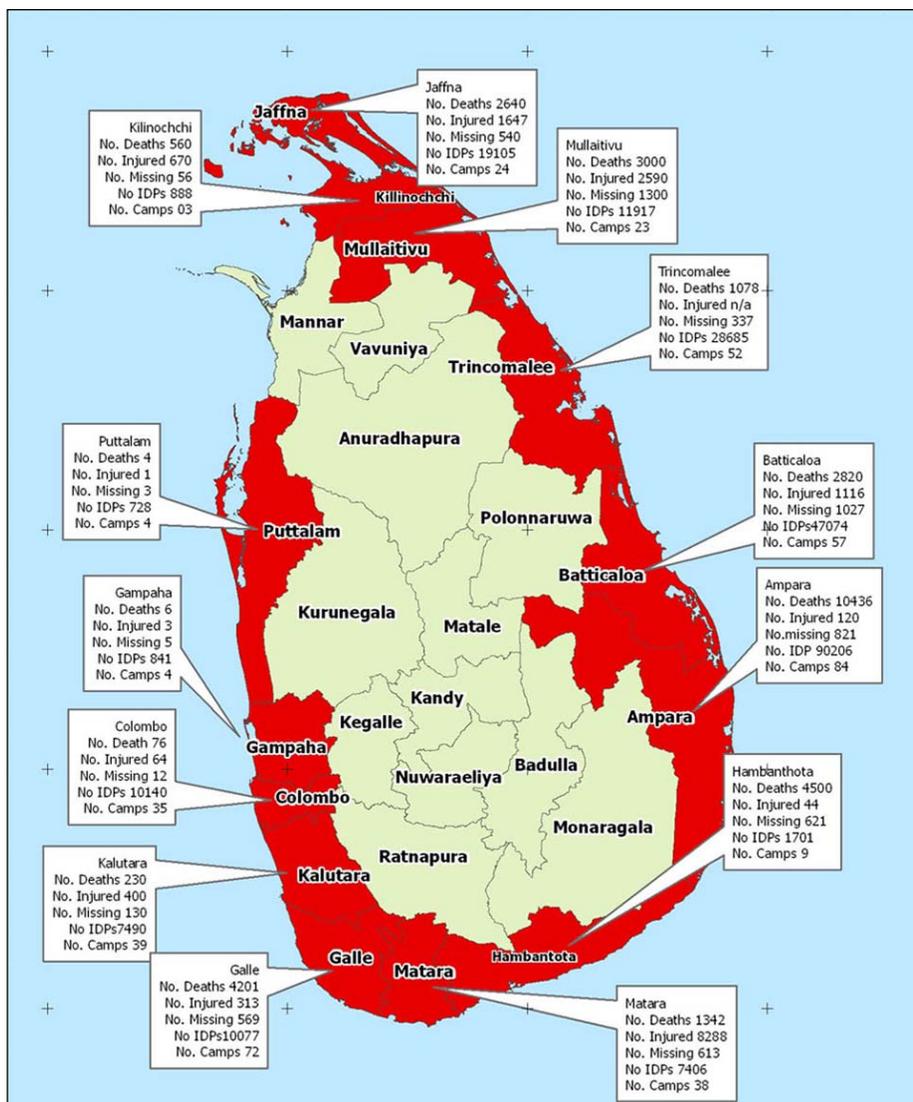
that parallel industrialized countries (see Table 2).

## Response and Recovery Issues

We were able to identify a number of core issues that merit future research and collaboration and are of primary concern in any effort to protect populations in coastal regions throughout the world, including the United States, from similar catastrophes. For example, we noted that community characteristics affected resilience to this disaster in a number of important contexts: small fishing villages, towns, urban areas, and fishing villages nested within more urbanized environments. Political and conflict conditions in the areas we visited varied, as did economic conditions, with some communities heavily reliant on one industry and others on several. All of these characteristics appeared to affect the ability of the communities to respond to and recover from the tsunami.

**Devastation and loss:** The loss of life and the destruction of property varied significantly from community to community in both India and Sri Lanka. While we visited a limited number of communities that suffered no deaths, many suffered substantial losses of life, the partial or total destruction of properties, and the loss of primary livelihood.

In most of the communities we visited, the housing infrastructure was all but demolished by the tsunami (see Figures 2 and 3). Some houses were reduced to rubble, particularly in Sri Lanka; those that remained standing had significant erosion at the base of the structure, appearing vulnerable to imminent collapse. In fishing communities in India and Sri Lanka, a substantial number of boats, catamarans, motors, and nets were lost or destroyed and rendered useless (see Figure 4). From our conversa-



**Figure 1.** Affected persons situation map of Sri Lanka as of January 13, 2005. The values shown are minimum values only (source: Centre for National Operations, Survey Department, Sri Lanka).

the ICES faculty and researchers. From Kandy, we traveled to a number of communities on Sri Lanka's eastern and southern coasts, including Trincomalee, Kinniya, Bala-pitiya, Kahawa, Relief Camp Pera-liya, Hambantota, Paiyagala, and Galle (see Figure 1). We had meetings with representatives from UNICEF, a local community-based organization (Social Service Edu-cational Development Organization — SSEDO), local residents oper-ating under the auspices of USAID, and organizers of relief camps and a field hospital. In both countries,

we talked to men and women, chil-dren, government representatives, local community leaders, and repre-sentatives from NGOs and private industry.

India and Sri Lanka are quite differ-ent demographically, socially, eco-nomically, politically, historically, and culturally. Although the population of India is fifty times that of Sri Lanka, both countries have a high-popula-tion density. Although both countries are primarily rural with extremely low per capita incomes, Sri Lanka has some demographic characteristics

**Table 2. Demographic Profile: India and Sri Lanka, 2004**  
(Source: 2004 World Population Data Sheet, Population Reference Bureau, Washington, D.C.)

	India	Sri Lanka
Total Population	1.0866 billion	19.6 million
Total Fertility Rate <sup>1</sup>	3.1	2
Crude Death rate <sup>2</sup>	8	6
Infant Mortality Rate <sup>3</sup>	64	10
Life Expectancy at Birth	62	72
Percent Urban	28	30
GNI PPP Per Capita <sup>4</sup>	\$2,650	\$3,510
Population Density	856	772

<sup>1</sup>Total fertility rate: average number of children a woman would have assuming that the current age-specific birth rates remain constant throughout her childbearing years

<sup>2</sup>Crude death rate: number of deaths per 1,000 population

<sup>3</sup>Infant mortality rate: annual number of deaths to infants under the age of one per 1,000 births

<sup>4</sup>GNI PPP per capita: per capita gross national income in purchasing power parity (PPP), divided by the mid-year population

tions with fishermen and other community members, we learned that they were asking the government to provide them with boats, motors, and nets in order to renew their fishing activities. Generally, these communities and fishermen do not depend on the government; self-sustainability is their primary goal.

In some communities, schools, hospitals, and other critical infrastructure were also destroyed or badly damaged (see Figure 5). We visited communities that had no electricity and no potable water because wells had been contaminated by the salt water. In other communities, agriculture was severely affected because fields were contaminated with salt water; we were informed that restoration of productive capacity might take several years.

**Social dynamics:** In many communities one month after the disaster, there was significant social organization, community cohesion, and

participation of community members in the recovery process, and a strong sense of camaraderie among the individuals residing in the same area, marked by an eagerness to help members of the community. It is

noteworthy that, despite the extensive amount of damage, no one reported residents abandoning the villages we visited. Although on a couple of occasions we received information regarding antisocial behavior (e.g., looting), our observations confirm previous disaster research findings that such behavior is unusual and extremely limited; it is much more common to see community members engaging in altruistic forms of behavior.

**Relocation issues:** The extent to which relocation of communities and industries would be possible was in question; land acquisition, community acceptance, and industry feasibility were all issues. Pressures by industry, relocation distance, the difficulties of relocating communities reliant on the sea for their livelihood, zone enforcement, and lack of available land were reported as challenges to governmental relocation efforts.

In the communities we visited in Sri Lanka, residents were well aware of government discussions to “enforce” a 100-m buffer zone along the coast. We heard reports that the government had considered wider buffer zones, but was yielding to



**Figure 2. Destroyed housing in Sulerekuttukuppam, India (photo: Joseph Trainor).**



**Figure 3.** Damaged housing, south of Relief Camp Peraliya, Sri Lanka (photo: Tricia Wachtendorf).

pressures to keep the zone at 100 m. We were informed that the government was considering relocating an entire community (Hambantota) that had been destroyed by the tsunami. On the other hand, the Indian government was reporting that it would enforce its coastal regulation zone that prevents building construction 500 m from high-tide point. Government sources suggested that fishermen relocated inland would be provided transportation to the sea, but fishermen questioned how long such support would last and the impact such a move would have. Other reports suggested that the sites being considered would put households at greater risk to flooding during monsoon periods.

Other concerns we heard involved the feasibility of moving equipment away from the shore, the lack of community cooperation to draw in nets if the village were relocated, and the possibility that the government would sell appropriated land in the buffer zone to developers in a few years. While the residents we spoke with in the towns were afraid

of another tsunami, for the most part they wanted to stay where they were, along the sea.

Relocation, changing community settlement patterns, and maintaining the communities' livelihoods while

enhancing disaster preparedness will remain important issues and present significant challenges for local governments and the communities involved.

**Uncertainty:** Many of the residents in the communities we visited appeared to be living in a state of persistent uncertainty regarding when they would be able to resume their work, build new houses, resume "normal" community rhythms, and even determine whether or not it was safe to return to the shore. Rumors of the possibility of additional tsunami had spread widely and were reported to us by residents of many villages. While victims were beginning to engage in routine activities such as washing clothes, cooking, and gathering with others, many community members reported disturbed sleeping patterns and increased stress levels. While children in some communities had returned to school, others seemed far from a capacity to do that. To complicate matters, there was a high level of skepticism regarding the extent to which the government would fulfill promises regarding dis-



**Figure 4.** Fishing boats in Puddukuppan, India (photo: Tricia Wachtendorf).



**Figure 5.** District hospital, Kinniya, Sri Lanka (photo: Havidan Rodriguez).

aster relief aid. These feelings appeared to extend beyond areas of life directly affected by the tsunami. For example, with little cash for bus tickets, children in one village now walk to school along a heavily traveled road, a source of chronic anxiety to residents. Villagers throughout many of the communities we visited, both in India and Sri Lanka, reported a sense of frustration and despair and were quite uncertain about their futures and those of their children.

### Temporary Shelters

The construction of temporary shelters varied quite significantly from one community to another, and between India and Sri Lanka. The reconnaissance team observed diverse types of temporary structures, ranging from donated tents, makeshift tarp tents, thatched houses, and fiberglass or aluminum roofing (see Figures 6 and 7).

In several communities in India, we noticed that the tents donated by foreign governments or NGOs were generally not being used by the villagers due to the extreme heat inside and their limited ability to accommodate all family members. A few feet away, makeshift shelters constructed by community members were being used at full capacity. Further, relatively new (2003) regulations established by the government of India require

structures such as schools and gathering places to eliminate thatch roofs because of fire safety concerns. This impeded the construction of temporary shelters in many regions.

In other communities in India, local NGOs had found ways to meet the needs of the victims while meeting government safety recommendations. These observations confirm findings from previous disasters that relief and donations must above all meet the social, economic, or cultural needs of the affected populations.

In India, victims were staying in temporary shelters in areas away from the shore and the damage. In Sri Lanka, however, temporary shelters were often located in the midst of the

damage. Further research is necessary on the ways social organization and culture influence the acceptance of temporary shelters, particularly in situations of an unprecedented catastrophe where millions of people could be displaced.

### Disaster Relief

**NGOs:** In both India and Sri Lanka, NGOs were involved in a variety of recovery and relief activities, including the development of public-private partnerships to better assist tsunami victims; providing medical care, counseling, and addressing housing-related needs; long-term rehabilitation efforts; cultural, educational, and recreational programs; training; construction of shelters; repairing boats and catamarans or providing new boats and nets; distributing school kits and household kits; and engaging women in decision-making processes and in cleanup and recovery efforts.

In some instances, NGOs duplicated efforts or provided assistance not suited to the locale or to the varying population sizes. In others, some communities received a great deal of assistance, while nearby communities received little or none from either the government or



**Figure 6.** Makeshift shelters in Sulerekuttukuppam, India (photo: James Kendra).

NGOs. In Sri Lanka, the ongoing conflict between the government and the Liberation Tigers of Tamil Elam (LTTE, better known as the Tamil Tigers) generated a variety of concerns regarding how aid was being distributed. This made understanding the difference between political and disaster response issues more difficult than usual. Nevertheless, many communities indicated that the work and aid provided by NGOs were extremely important and met many of their basic needs.

**Government aid:** Both in India and Sri Lanka, the amount of compensation promised by the government for individual losses was far less than the replacement costs of boats, catamarans, nets, and other personal property. Although the disaster relief aid provided by the Indian government was insufficient to the short- and long-term needs of the communities, the process seemed much more coordinated and systematic than it did in Sri Lanka. In India, almost all communities had received some type of government aid (a “standardized” package); in Sri Lanka, it was very common for communities to report that they had received little or none. Indeed, some individuals questioned what the Sri Lankan government was doing with “all the external international disaster aid it had received.” In fact, communities seemed to be placing greater hope and confidence in the efforts of NGOs.

**Exclusion of some groups:** In the region of Karaikal (in the Union Territory of Pondicherry in India), we encountered a protest that paralyzed the traffic in all directions. Women were sitting on the street blocking traffic, and men were standing in the road (see Figure 8). We were informed that they had not received any government disaster relief aid following the tsunami because they were agricultural laborers (not farmers or fishermen). This situation, combined with the inequities in the distribution of aid among fishing communities, raises a critical question about the qualifications for disaster relief. Who should receive aid, based on what criteria? These issues merit further research.

### The Recovery Process

In some areas, the recovery process appeared to be well under way, but in other areas it was moving very slowly. Our observations in India and Sri Lanka support the findings of previous research showing a strong link between the ability to recover and existing social, economic, and political conditions in a community. For example, in some areas UNICEF had been working for years, and they were able to extend their usual activities to focus on tsunami-related issues. As noted above, the ongoing conflict and tensions between political groups in Sri Lanka were a detrimental factor in the recovery there.

In some communities we visited, women were playing a critical role in the recovery process. When fishing was a productive industry in these communities, there was “no need” for women to work. Under the circumstances, these women could be an important economic resource and help in the recovery process. We observed women gathering and burning debris (see Figure 9) as well as painting the asbestos sheets that were used in the construction of temporary shelters. We heard reports from government sources that women in some communities in India had negotiated that disaster relief funds be distributed to them so that they could ensure that the funds would go to meet family needs. In the Puddukuppam fishing community in India’s Tamil Nadu district, DMI personnel described their efforts to increase alternative livelihood possibilities by capitalizing on women’s skills. A group of women had also formed a self-help committee prior to the tsunami to save 50 rupees every month; in combination with a loan provided by a local bank, the funds were being used to help in the economic recovery process. Future research is needed to look at the extent to which women’s skills and activities may enhance a community’s disaster resiliency, and to what extent routine social patterns may have changed as a consequence of the tsunami.

### Warning Systems

Communities we visited in India and Sri Lanka lacked the necessary warning systems and knowledge to prepare for and respond to the tsunami. There were no preparedness efforts or disaster mitigation, nor was there any public or organizational training. More effective community capacity and effective early warning systems would have limited the catastrophic loss of lives and property. Beyond the appalling death toll, the tsunami also wrecked much of the community infrastruc-



**Figure 7.** Temporary shelters in Hambantota, Sri Lanka, where once stood dozens of houses and a market (photo: Havidan Rodriguez).



**Figure 8.** A protest of agricultural workers in Karaikal, India (photo: Havidan Rodriguez).

ture that could have assisted the survivors.

As a consequence of the Indian Ocean tsunami, the international community is now calling for the establishment of an early warning system there. However, the emphasis has generally focused on the technological aspects of such a system—sensors and buoys. While this technology is needed, we must emphasize that only an *integrated warning system* will save lives. That requires risk communication, education, training, and responding to the needs of the population at risk.

Poor populations disproportionately suffer the consequences of disasters for many reasons. Reducing their vulnerability requires not only education, but also substantial gains in the communities' economic capacities. This necessitates attention to such issues as poverty, inequality, and sustainable development. The earthquake and tsunami re-emphasize the need for long-term international commitment to this region, in terms of recovery assistance and social science research.

## Acknowledgments

Drs. Subramanian and Alagan conducted research in some of the communities in India and Sri Lanka, respectively, and were actively engaged in disaster relief work in some of the areas that the team visited. Their insights and the background information (cultural, historical, and political) they provided were extremely impor-

tant for this report. The EERI reconnaissance team also benefited from the extensive information and guidance provided by Dr. Stanley Samarasinghe and his colleagues at ICES, who presented an overview of disaster relief operations and background information on the political climate in Sri Lanka, especially regarding the impact of ethnic and religious divisions on disaster relief activities. Staff from the Disaster Mitigation Institute (DMI) provided extensive information and introduced us to a number of communities in India. Our work would have been extremely difficult or impossible without the help of Deepesh Sinha, Tejal Dave, and Jikesh Thakkar, all of whom were actively engaged in the DMI disaster relief operation efforts. The hospitality, time, cooperation, and information provided by many community members and governmental and nongovernmental organizations' representatives were critical to the success of our field research. However, the observations, findings, conclusions, and recommendations in this document are the sole responsibility of the authors.



**Figure 9.** Women engaged in the cleanup process in Pudukkuppam, India (photo: Tricia Wachtendorf).