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Rebuilding and Reconstruction in the Aftermath of the Tsunami

(JANUARY 2005)

2004 Echoing Green Fellow Elizabeth Hausler launched the Center for Earthquake Resistant Houses, to promote and implement methods of building low-cost, earthquake-resistant houses using locally available materials and skills in post-disaster reconstruction programs as well as new housing finance programs in India. An experienced brick, block and stone mason, Elizabeth earned her PhD in civil engineering from UC-Berkeley to study the theory and application of earthquake resistant design. But it was the sheer number of lives lost in the January 2001 Bhuj, India earthquake that compelled her to start her own initiative. In 2003, she spent eight months on a Fulbright Fellowship in the Bhuj area visiting dozens of villages to study and assist in the post-earthquake reconstruction. This profound experience, coupled with her long-term passion for fostering the development of earthquake-resistant housing, led her to found her organization.



Echoing Green recently spoke with Elizabeth to understand the impact of the tsunami that devastated several Asian countries on December 26, 2004. Keep reading to learn more about the lessons learned from this natural disaster and Elizabeth's critical work.

Echoing Green: Why did this tsunami cause such severe devastation? What factors contributed to the degree to which it affected the local populations of the region?

EH: One of the biggest factors is exactly what the media reported – there is no tsunami detection and warning system in the Indian Ocean region, so there was no way for people to know that the wave was coming and to get to higher ground. The other reason there was such a large loss of life was simply the high population density in the coastal areas of the countries that were affected. This is the result of tourism – these spots are so idyllic and attractive that tourist facilities have been built on the beaches. In other cases, the affected areas were in developing countries where much of the economic and social activity tends to center around the coastal areas. These areas are very heavily populated – lots of tiny houses on the beach, crowded streets and marketplaces. Compare this to the vast stretches of the West Coast of the US, for example, where there might be one huge house over several acres with one small family. In the event of a tsunami here, economic losses would be great but loss of life would no doubt be smaller.

It is ironic – the poorest of the poor tend to live in houses that are made out of very lightweight materials that may be able to resist earthquakes, or at the very least, are less deadly if they collapse. But these are in fact the worst houses for tsunamis, cyclones and other wind- or water-related disasters because they are so fragile and can be washed away so easily.

Echoing Green: From your perspective as an engineer and expert in reconstruction, what can we learn from this natural disaster?

EH: Clearly there is a need for tsunami detection and warning systems. The technology for tsunami detection is available and can be implemented if the funding is there. The warning system is more of a challenge, especially locating the civil authority that is capable of receiving a warning and then communicating the warning to the people. Many of the areas that were affected were remote areas that do not have a sophisticated civil infrastructure that would be able to respond quickly to warn

people about a coming tsunami. Lastly, there should be a public awareness campaign so that people know what to do when a tsunami warning is given. This is the perfect window of opportunity to institute something like this – while this disaster is fresh in the minds of people who could potentially be affected by a tsunami in the future.

Echoing Green: From your perspective as a social change innovator, what factors are critical in the reconstruction process, both in the short and long term?

EH: The relief phase is still ongoing. The authorities and various organizations are in the process of meeting people's critical needs with clean water, food, temporary shelter and sanitation. Once this is accomplished, a transition occurs between the relief phase and the reconstruction phase. This new phase starts with short term reconstruction consisting of debris removal and construction of critical infrastructure, which presents a real opportunity to start providing jobs for people who are ready to go back to work.

The next step in the reconstruction process is not housing reconstruction; generally people are resilient, resourceful and can cope with temporary shelter, or make something for themselves that may not be so comfortable, but will do for a while. What is really needed at that point is the restoration of economic infrastructure. Beyond a job, people need to regain their livelihoods. They need to be able to go back to work and start earning money again, and as we've heard in the media, a lot of these villages are highly dependent on fishing. People need boats, marketplaces for selling fish and roads to transport their goods and services. The tourist infrastructure needs to be restored and tourists need to be encouraged to come back into the region so that those people who depend on the service industry for their livelihoods can get back to work.

At the same time the economic infrastructure is being repaired, some kind of social infrastructure needs to be restored. This is especially crucial for kids. They need to get back to a normal way of life. Their schools need to be reopened. Also, adults and children alike may need psychological services.

At the very end is when we get to the housing reconstruction program. It is important to get people into secure houses that are resistant to future disasters and that they are comfortable living in.

I cannot emphasize enough how significant it is to get to the economic rehabilitation as soon as possible. There was a survey that was taken of people affected by the 2001 earthquake near Bhuj, India, and the majority of the respondents said they would have preferred more help in restoring their livelihoods, instead of assistance in building new houses. Once people get back on their feet economically, they can contribute more to the housing reconstruction process themselves.

One of the critical challenges in this reconstruction process is going to be managing that transition from relief into development. The agencies are usually different and their approaches virtually opposite. The relief stage is this intense, "get in get out" drive to provide goods and services as quickly and efficiently as possible, like an adrenaline rush. But the development stage is actually an exercise in restraint, patience and diligence in getting things right and in getting the right business models for the economic recovery to occur; in getting the materials and design for the houses right so that people will adapt the changes in construction practice permanently and will continue to build safe houses in the future, long after the reconstruction program is over.

Many lessons from past earthquakes and other disasters can be applied in this reconstruction. There is no need to rush a reconstruction process; it is better to take the people's needs into consideration and involve them in the process. For example, there have been situations where an organization has gone in with a relief mentality and built a huge number of identical houses extremely quickly, without considering whether the doors and windows should face the street or a courtyard; whether people wanted the toilet inside or outside; whether the people wanted a cooking area inside or outside; if the materials and architecture were appropriate for the local climate; if a permanent water source was available. As a result, people rejected those houses; money and time were wasted; and people went back to living in their houses that were damaged and vulnerable to future earthquakes.

In other situations, organizations have built houses using materials, contractors and masons from outside the city or village. They may not have trained or employed local masons and carpenters in the construction process. Or they may have used materials that are not available locally. Or they may have designed and built a structure that is simply too expensive to build without financial

assistance or a subsidy on the materials. The end result is that the local population does not have the skills and knowledge to build an earthquake-resistant house with locally available and affordable materials. And an ideal opportunity to change the construction practice permanently has been missed.

Echoing Green: Is this tsunami having an impact on your organization?

EH: We are sending a needs assessment/reconnaissance team to Indonesia and India this spring. We will look primarily at structures damaged by the earthquake shaking itself and identify the areas in which there is a need to rebuild houses that will resist future earthquakes, such as Sumatra, Indonesia and the Andaman and Nicobar Islands of India. These are the areas in which we can have the greatest impact. Our approach is to work with local masons, carpenters and homeowners to build earthquake-resistant houses using materials and skills that are available in the local private sector. During the first visit, we will look at the housing construction industry – what types of houses are typically built, how we can modify the design so that it is earthquake-resistant, what materials are available locally and how much they cost. We will also determine whether or not there are local engineers, masons and carpenters who are willing to be involved in the construction process. A key step in the process is to build relationships: identify local government and NGO partners, and interview future homeowners to determine their needs and architectural preferences.

This is precisely the situation in which we can apply and share the lessons that we have learned about successful post-disaster reconstructions. Over the next weeks, we will be meeting with UN and other organizations involved with or funding the reconstruction program to promote standards and approaches that will result in new, earthquake-resistant houses and a permanent change in construction practice.

Echoing Green: In simple terms, how does a structure become earthquake resistant? Do the elements change to make them water/tsunami-resistant?

EH: It may be risky to shift the construction practice toward tsunami-resistant construction, rather than earthquake-resistant construction. Earthquakes are rare, but tsunamis are rarer still. Heavy, reinforced concrete or masonry structures that may be capable of withstanding a tsunami have also proven quite deadly in past earthquakes if they are not built properly or have not been maintained over time. Aside from construction quality, there are some fundamental rules of design and layout that can make a structure more earthquake resistant. For instance, it is very important that the walls are connected to each other, and the roof is connected to the walls. In fact, one of the best ways to improve the earthquake resistance of a structure is to put on a roof that is lightweight, and connect it to the walls and foundation. Circular or box-type, symmetrical structures with small openings are best. A solid foundation that prevents settlement prior to the earthquake, which can cause cracking and make it easier for the building to collapse in an earthquake, is critical.

The key to changing construction practices permanently is to design and build houses that are resistant to earthquakes and that use local materials and skills to build, but most importantly, are competitive in cost to vulnerable building methods. It is critical to take a look at the housing construction sector – the skills used, the materials available, the architectural preferences of the people – and to work with local builders to build a house that is not only earthquake-resistant but also low-cost and culturally accepted.

Echoing Green: When you begin a reconstruction program, how do you disseminate this information to the local community? Are people generally receptive?

EH: The best way is to use a local engineer or senior artisan to be the lead trainer, who can then train unskilled or semi-skilled masons or builders up to a higher standard. Although some outside expertise is usually necessary, it is important to use a senior local person because that person usually has so much knowledge about the indigenous construction practices of a particular area, and he or she can communicate in the local language. Also, the person may already have the respect of the community. Hands-on training, where the local masons and carpenters learn through the process of building a house, works the best. It is a challenge to come up with visual examples of the process, of why it is important to have the walls connected or why it is important to have a wide, strong foundation. Sometimes it is like playing charades. For example, when we want to explain why it is important to have wide, solid foundations, we'll show people that when they stand on their flat feet, it is difficult for them to be pushed over, but when they stand on the tips of their

toes, it is much easier to be pushed over.

I have found that people are very open and very interested in learning how to protect themselves and their families from future disasters, as long as the suggestions are affordable. Reasonable modifications, that can be communicated to people so that they understand the value of making a change, have been received well.



EG: How is this tsunami's impact relevant to the future of your work?

We are planning on working in a part of India that lies along what is known in the scientific community as the "central seismic gap," an area that is highly prone to earthquakes, but that has not had an earthquake recently. Many seismologists agree that an earthquake in this area is quite overdue. We are going to be working in that area to help people build houses that will not collapse when the big one comes.

For more information regarding the Center for Earthquake Resistant Houses, please visit www.buildchange.org or contact Elizabeth Hausler at Elizabeth@buildchange.org.

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