Schadenspiegel

Exporting earthquake safety practices from California – A look at the work of GeoHazards International

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The earthquake that hit the border region between Pakistan and India in October 2005 triggered one of the worst human catastrophes of the last one hundred years. It only lasted 50 seconds, but more than 2,000 settlements were almost completely destroyed.

Earthquake disaster prevention

Exporting earthquake safety practices from California – A look at the work of GeoHazards International

Brian Tucker, President of GeoHazards International (GHI), Palo Alto, California, reports on how GHI's projects transfer knowledge and experience.

Guest article

Shored-up building in Quito, Ecuador. Many of Quito's adobe buildings were damaged in the March 1987 earthquake. Recommendations for improved earthquake safety included adopting and enforcing an effective building code.

Our approach begins with making people in vulnerable regions aware of their earthquake risk. The first method we used was pioneered in the 1980s by the California Geological Survey for developing and rehearsing emergency response plans: earthquake scenarios, a combination of reality and conjecture. Scenarios show the people and the authorities how a hypothetical recurrence of an earthquake that struck a city in the past would affect that same city today.

The Quito Earthquake Risk Management Project (Ecuador, 1992–1994)

Over the past 250 years, Quito has experienced several strong earthquakes, all of which occurred, however, when the city was significantly less populated. In September 1992, we launched an eighteen-month project to assess earthquake risk in the modern capital of Ecuador, to warn the community, and to design a programme aimed at long-term risk reduction. A multi-national group of seismologists, structural engineers, geoengineers, geologists, and city planners assembled and analysed the data describing Quito's demography, building inventory, soil conditions, and seismic history. This information enabled the group to estimate the damage Quito would suffer in each case from three plausible earthquake events. The results were then used to write an illustrative earthquake scenario. Written in non-technical language, the scenario appeared in local newspapers and was presented in radio and TV programmes. A committee comprising international and Ecuadorian specialists from business and industry and city government representatives then developed recommendations for reducing earthquake risk in Quito. At the project's conclusion, the Mayor held a press conference to describe Quito's earthquake risk and announce the plans to reduce it in the future.

Positive signs

An Earthquake Safety Advisory Board was established to develop and regularly update a comprehensive earthquake risk reduction programme for Quito and to monitor its implementation. The Quito School Earthquake Safety Project designed retrofits for a number of high-risk municipal schools in a process supported by local funding. These two projects attracted much public attention, which led to national legislation that significantly strengthened building codes for public and private structures and to the appointment of an Emergency Response Manager for the city of Quito.

GeoHazards International

GHI is a non-profit organisation that was established in 1991 with the mission of disseminating information and promoting disaster preparedness and loss prevention as a contribution towards reducing the suffering caused by natural disasters, especially in developing countries. This involves adapting the scientific, technological, and political measures that have been used successfully to reduce earthquake risk around the world to the needs of regions at risk. In effect, GHI "exports" the lessons learned in California – effectively and with success.

GHI's vision

A world of self-reliant communities that can continue their economic, political and cultural development unimpeded by natural desasters.

Partial listing of GHI partners

- North Atlantic Treaty Organisation (NATO)
- Organisation for Economic Co-operation and Development (OECD)
- United Nations Office for the Coordination of Humanitarian Affairs (UN/OCHA)
- United States Agency for International Development (USAID)
- World Health Organization (WHO)

GeoHazards International

The Kathmandu Valley Earthquake Risk Management Project (Nepal, 1997–1999)

When this project was launched in 1997, the 1.5 million people of the densely populated Kathmandu Valley faced a constantly growing earthquake risk. A quake had already caused devastation in 1934. A repeat of such a large event would be certain to cause significant human and material losses – with disastrous economic repercussions. The government had failed to enforce the existing building code and did not manage to control the Valley's rapid development. Technical information was not available in a form that the public or government officials could comprehend and put into practice.

Supported by the US Agency for International Development (USAID), GHI and its local partner, the National Society for Earthquake Technology – Nepal (NSET), convened a group of more than 80 government and non-government organisations to develop an earthquake scenario, based on a recurrence of the 1934 event in Kathmandu. The anticipated effects and the subsequent action plan developed by the group to reduce the risk were publicly announced by the Prime Minister of Nepal on the country's first Earthquake Safety Day in January 1999, an event conceived of and organised by GHI and NSET that continues to occur annually.

The success of GHI's work in Nepal

NSET has become a leader of earthquake risk management activities in the region. An action plan defined and implemented ten initiatives to improve national disaster management, raise awareness, establish building codes, and make school buildings earthquake-resistant. By analysing the vulnerability of state schools, we were also able to quantify the risk faced by the entire built environment. We retrofitted a number of schools, and this served as an example of how to conduct further earthquake risk mitigation projects in Nepal. The Nepalese masons we trained for the school retrofit project subsequently passed on their knowledge to masons in Gujarat, India. This cross-border transfer of knowledge was organised by NSET and GHI's Indian partner organisation, the Sustainable Environment and Ecological Development Society (SEEDS).

OECD project on school safety

In 1933, an earthquake in Long Beach, California, destroyed 70 schools and damaged a further 420 school buildings. Since children must attend school by law and yet school buildings performed so poorly in the earthquake, the State Legislature passed the Field Act on 10 April 1933, requiring that all publicly funded schools be made earthquake-resistant. The Field Act continues to be one of the most effective earthquake risk reduction measures undertaken by California, as the superior performance of California's publicly funded schools in recent earthquakes demonstrates.

This school in Quito has a "soft" first storey that lacks infill walls, an example of a common structural deficiency.

Kathmandu Valley: GHI's Nepali partner, the National Society of Earthquake Technology (NSET) trained masons to retrofit the school of Nankhel village.

We are currently working with the Organisation for Economic Co-operation and Development (OECD) in its Programme on Educational Building in an effort to export the Californian school earthquake safety practices to other parts of the world. On 21 July 2005, the OECD's governing council adopted Guidelines on Earthquake Safety in Schools, which were influenced by California's experience. Participating governments are assisting each other under a new OECD peer review process. The OECD Council also regularly reviews the progress made by the member countries. To date, Mexico, Greece, Turkey, New Zealand, Canada, and Japan have expressed interest in joining the programme. We are now working with the OECD to extend the programme to countries in the Economic Cooperation Organisation, including Afghanistan, Iran, Kazakhstan, Tajikistan, and Pakistan.

Sharing retrofitting experience

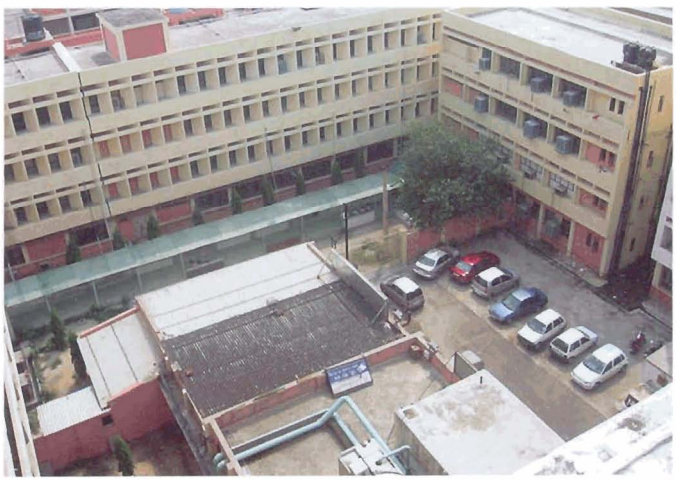
A USAID-funded project enables us to provide India with the expertise we have gained in retrofitting structures in California. In order to communicate this knowledge to the Delhi Public Works Department, we are working now with Indian experts and engineers to retrofit five significant building complexes in Delhi: the Delhi Secretariat, the Delhi Police headquarters, the Guru Tegh Bahadur Hospital, the Ludlow Castle School, and the Office of the Divisional Commissioner. In August 2005, a group of 14 Indian experts travelled to California for a discussion of their progress with Californian earthquake engineers and an exchange of experience. The Indian experts visited retrofitted buildings in Berkeley, Oakland, and San Francisco, and observed first hand, for example, how a hospital continued operating while it was being retrofitted with base isolation techniques to absorb vibrations. The group also saw various retrofit concepts at the University of California, Berkeley. In December 2005, the Californian engineers visited Delhi to see the progress that had been made in the project. The plan is to retrofit more buildings in Delhi and other cities in order to make them earthquake-resistant too.

What is the next move?

Global earthquake risk is growing rapidly. The urban population in developing countries has increased by one billion people over the last 25 years and it is likely to increase by two billion in the next 25 years. Many of these people will live in cities where there is an above-average earthquake frequency but where earthquake-resistant construction is decreasing. Construction is booming in the very cities that are particularly vulnerable. Poor cities with major social problems are faced with the task of creating safe accommodation, schools, and workplaces for two billion additional people.

If the new buildings were earthquake-resistant, a quarter of the world's population would have a safer place to live. Earthquakes would then no longer be inevitable but a natural risk that people can be equipped to manage.

Thanks to our experience and contacts around the world, we can advocate for risk reduction and mitigate the impact of natural hazards in the developing world. We know solutions that work – and we want to export them. We make our knowledge available wherever it is needed. We are supported in these endeavours by individuals, corporations, and governmental and nongovernmental organisations who understand that risk reduction is a necessary and worthwhile cause in the developing world.



The Guru Tegh Bahadur Hospital, Delhi. Due to the necessity of providing uninterrupted health care, the hospital must continue to operate during retrofit construction.

Further information

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