CHAPTER

16

SUPPORTING LOCAL SEISMIC EXPERTS: EXPERIENCES IN NEPAL AND INDIA

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Abstract: This paper discusses the development of local expertise in Nepal and India. The obstacles to the development of local expertise in Nepal are presented, in addition to the work of the National Society of Earthquake Technology, which has used local and international knowledge and experience to advance earthquake safety in Nepal. Concerning India, which has well-developed local networks of professionals in universities and the private sector, the case study of Bhuj Hospial in Gujurat is described.

Introduction

In every country, there are a small number of individuals who are very knowledgeable about the likelihood and consequences of earthquakes and who struggle to make people listen. Identifying these people is key to developing the *modus operandi* for providing external assistance to improve seismic safety within the country. These people often work in education or in civil service; they are rarely politicians at the national or municipal level. Those who are subject to political re-election, or who have many and changing responsibilities, may appear to be interested in promoting seismic safety; the reality is, however, that these people move on to other positions with other priorities and agendas.

Local expertise in Nepal

Local and international experts need to work together to empower communities to improve earthquake safety. Following the 1988 earthquake in Nepal, the United Nations Development Programme (UNDP) launched the Nepal National Building Code Development Project. The driving force behind the project was a senior civil servant from the Ministry of Housing and Urban Planning, who had the knowledge and ability within the government to promote the code and gain the support of international donors. The project's aim was to assess the seismic hazard and seismic risk of building construction in Nepal, including the development of earthquake design strategies.

Obstacles to developing local expertise

A number of obstacles to developing local expertise in Nepal can be identified.

- *Past lessons forgotten.* Nepal was struck by devastating earthquakes in 1934 and 1988. By 1998, the lessons of the 1934 earthquake had unfortunately been long forgotten. Many practices had deteriorated as new materials were introduced (*e.g.* reinforced concrete) without appropriate design and construction practices. In Kathmandu, for example, traditional Newari houses were built with pairs of vertical pegs in the roof rafters, which fixed the rafters to the support walls. This practice, largely discontinued, had the effect of mobilising the opposite walls to resist seismic loads generated by the roof. A decade ago in Nepal, high-strength non-ductile reinforcing steel replaced lower strength ductile steel in the market because steel manufacturers promoted it as providing more value for money. In effect, the safety net provided by ductile action – even in structures with no formal design – was eliminated.

- *Disagreement between experts*. Problems can arise when experts disagree with each other, and this often provides a justification for inaction. For example, a short time after the first seismic hazard map was published in Nepal in 1994 – an outcome of the UNDP code project – two organisations announced plans to undertake seismic microzonation of the Kathmandu Valley, without consulting the original developers of the hazard map. These organisations obtained different values of hazard and risk from the original developers.

- *Lack of empowerment of local experts*. In many cases, national experts have the technical knowledge to undertake project work. During the author's time in Nepal, this fact was regrettably ignored because the presence of a foreign "expert" was considered necessary to influence higher levels of government, which otherwise would have been difficult to achieve. Affirmation by the foreign expert of the local experts' technical competence improved the latter's credibility among the political and social hierarchy, further demonstrating a lack of regard for local experts.

- *Disregard for simple solutions*. In some cases, simple, inexpensive solutions can solve common problems. As in many countries, it is common practice in Nepal to bend hoop steel for reinforced-concrete columns, without using the hooks necessary to make the hoops effective in large earthquakes (this is similar to having the belt in one's trousers constantly undone). After failing to persuade the authorities to undertake a simple campaign of distributing leaflets on best practice to local construction sites, one of the national project team members decided to produce the leaflets privately, which he distributed from his motorcycle bag.

National Society of Earthquake Technology

In Nepal, the National Society of Earthquake Technology (NSET), a non-governmental organisation established in 1993, has used local and international knowledge and experience to significantly advance earthquake safety within the country, including implementing a pilot schools retrofit project (*www.nset.org.np*). Students, teachers, head teachers, parents, local masons and the wider community have been motivated by enthusiastic lectures and demonstrations by NSET to finance pre-engineered retrofit seismic resistance improvements for school buildings. Communities have responded positively though financial contributions, and masons have been asked by some members of the community to apply their new skills to their own houses. The NSET is now supplying teams of masons experienced in seismic-resistant construction to teach other Himalayan communities.

Local expertise in India

India can be perceived as a conundrum with respect to earthquake engineering. It has produced some of the finest structural engineers in the world yet has not solved some of the fundamental problems common to other countries in the area. India has a reasonable building code but also has the generic problem of enforcing compliance from both design

professionals and builders. The country has a seismic zoning map that is not probabilistically based and has experts that could construct such a zoning map. However, it appears that there is currently a lack of consensus about the correct approach to be taken.

Seismic engineering expertise is mainly based in universities – Sudhir Jain from the Indian Institute of Technology in Kanpur and his team are making great efforts in many sectors to improve the standard of structural engineering in India – but there are a growing number of highly motivated private consultants who are producing state-of-the-art designs and working for clients who will accept only their advice regarding seismic resistance. In the disaster management area, one engineer in the northern state of Uttaranchal is almost single-handedly encouraging remote villages to produce their own village vulnerability assessments. He is networking internationally and allocating foreign resources to meet the specific requirements of the communities in the area.

The January 2001 earthquake in the Kutch region of Gujarat affected a middle-class community situated some 300 km from the epicentre. There has been a sustained reaction to this event, in that some residents are considering investing in houses with improved seismic resistance.

The effect of the base isolation of the new Bhuj Hospital in Gujarat, which replaced the hospital that collapsed during the Kutch earthquake, is an interesting case study. The Indian architect convinced the officials of the prime minister's department, who financed the construction of the hospital, to accept that the New Zealand Ministry of Foreign Affairs provide assistance and the author identify and arrange the base isolation of a replacement hospital in Bhuj. While the leading earthquake engineers provided the required endorsement of the technology, it was the non-engineer officials who understood the possible significance of an application to the wider community. Since construction commenced, there was clearly an empowerment effect amongst a number of structural engineers who realised that a non-traditional solution was possible.