

INTRODUCTION

**ACKNOWLEDGING THE IMPORTANCE OF
IMPROVING EARTHQUAKE SAFETY IN SCHOOLS**

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INTRODUCTION

Keeping schools safe in earthquakes

I think that it is our right to know about earthquakes. This is because when earthquake comes everybody including our parent, teachers will try to save their own lives. At that time they may not take care of us. So, we ourselves need to know what to do during earthquakes.

Also, it is our right to have a safe school. we don't build our school building ourselves. But, if it is very weak then earthquake will destroy it and kill us. Why should we children die from weakness which other create? That is not because of our fault. It is their fault who build houses. So we request all our parents, teachers to build safe school buildings for us.

Letter written by Sony, a student in Nepal

Introduction

Few individuals will contest the importance of protecting society's most valuable and vulnerable members, children; and few will contest the importance of providing compulsory education for all children. Even fewer people will argue with the fact that earthquakes kill people and damage property. But these three essential principles are not valid in modern society. In many earthquake-prone countries, a surprisingly high number of school buildings are not constructed to withstand even moderate-sized earthquakes. The fundamental question that we must ask ourselves is "Why is it so simple to acknowledge the importance of the education and safety of our children, yet so difficult to ensure them?" This paper explores the development of man's consciousness concerning natural disasters, particularly those involving schools, and the nature and effectiveness of his response to natural disasters, especially to earthquakes.

From the great 1755 Lisbon earthquake to the recent tragedies in Algeria, Italy, Japan and Turkey, governments, communities, scientists and decision-makers have all witnessed the collapse of school buildings and other essential structures. In the Kobe earthquake, for example, approximately 40% of the city government employees were victims of the disaster and 300 000 people lost their homes (Tierney and Goltz, 1997). The extent to which such disasters act as a catalyst for change is a reflection of the willingness of these groups to acknowledge that a problem exists and thereafter empower themselves and

others to mitigate future disasters. In an effort to comprehend this process of realisation and action, the responses of communities, governments, inter-governmental organisations and the scientific community to the problem of earthquake safety in schools must be closely examined.

The lessons of Lisbon

When they had recovered a little, they [Candide, Pangloss and the "brutal sailor"] walked towards Lisbon. They still had some money, and hoped, having escaped from the storm, also to save themselves from starvation...At this moment the earth shook, the sea rose up foaming in the harbour and dashed to pieces the ships lying at anchor. The streets and squares were filled with whirling masses of flaming and cinders. The houses collapsed, the roofs crashing down on the shattered foundations. Thirty thousand inhabitants were crushed beneath the ruins. (extract from *Candide*)

Next year marks the 250th anniversary of the great Lisbon earthquake, in which up to 70 000 people were killed. Only 3 000 of 20 000 dwellings were inhabitable after the event (Dynes, 2000). This event is significant for two principal reasons.

First, while formerly earthquakes had been perceived as catastrophic events unleashed on a deserving populace, this event served as a catalyst for great philosophical, religious and scientific debate, signifying the union of fatalistic ("Act of God"), scientific ("Act of Nature") and sociological ("Acts of Men and Women or Society") paradigms on disasters (Quarantelli, 2000). Voltaire used the earthquake as a vehicle to attack the prevailing Enlightenment views on optimism, while his antagonist in correspondence, Rousseau, suggested that urbanisation and inappropriate construction in a seismic zone contributed to the damage in Lisbon (Dynes, 2000).

Without departing from your subject of Lisbon, admit, for example, that nature did not construct 20 000 houses of six to seven stories there, and that if the inhabitants of this great city had been more equally spread out and more lightly lodged, the damage would have been much less and perhaps of no account. (Masters and Kelly, 1992 in Dynes, 2000)

The Lisbon earthquake also prompted Kant to write three essays on earthquakes. Kant's theory that earthquakes occurred as a result of explosions of combustible gases in subterranean caves in mountain ranges proved incorrect – it was not until 1855 that faults were recognised as the source of earthquakes – but his search for a proto-scientific explanation for the disaster was a considerable departure from prevailing religious interpretations (Oeser, 2001).

Second, the Lisbon earthquake can be considered as "the first modern disaster in which the state accepted the responsibility for mobilising the emergency response and for developing and implementing a collective effort for reconstruction" (Dynes, 1997). One of the most significant figures in Lisbon at the time of the earthquake was the Marques de Pombal, who organised the emergency response and reconstruction of the city of Lisbon. For emergency response, he appointed 12 district leaders and gave

them emergency powers, disposed of bodies immediately to avoid plague, ensured a continued food supply, controlled the price of food and increased security to prevent looting; even the weekly newspaper was published on time. For reconstruction, Pombal appointed engineers and surveyors to draw up plans for the new city and to ensure that sanitary and levelling operations were carried out correctly, controlled land rents, passed laws prohibiting landlords to evict tenants, and prohibited unauthorised construction that did not conform to planned reconstruction. A wooden frame or *gaiola*, which was known to provide flexibility in the case of earthquakes, was required for all construction (Dynes, 1997).

Earthquakes in the world today: Towards a culture of disaster prevention and mitigation

As societies have developed and knowledge about seismic events has improved over the centuries, the task of engaging governments, communities and others to reduce risk and vulnerability of the world's populations has made variable progress. Over the last decade or more, there has been a movement towards a "culture of risk prevention", meaning that the focus of many programmes has moved from response and recovery towards prevention and mitigation. The responses of the principle stakeholders described in this paper attest to this evolution. Yet the fact that structures continue to collapse as a result of earthquakes would indicate that insufficient priority is being given to this issue by decision-makers. Some of the most recent tragedies are described in Part I of this publication.

Building strong communities

Disasters can often provide a strong impetus for social change, and an increasing amount of anecdotal evidence illustrates the fundamental role of concerned citizens and communities in advocating not only social, but also political and economic change (Nigg and Tierney, 1993). The disturbing post-disaster reality is that the "window of opportunity" for action is only open for a short period of time following a disaster, and without concerted and continued intervention and pressure by individuals and groups, there is a real danger that systems will return to their pre-disaster states. Several case studies from Canada, the United States and elsewhere attest to the effectiveness of this "bottom-up" approach to disaster mitigation with regard to school buildings – where mitigation activities are initiated at the community level and communities leverage moral and financial support from public and private sector partners.

When Jules Quesnel [elementary school] parent Tracy Monk went looking for information about her daughter's school's ability to withstand an earthquake, she thought what she found out must be a mistake. "I discovered that the co-efficient of risk for my child's school building was a hundred times greater than that of the typical wood-frame houses of the neighbourhood...At first I thought, this can't be right..." Not only was her school – Jules Quesnel – found to be seismically at-risk according to the school district's most recent assessments, so were 46 other Vancouver schools. (Ince, 2004)

This realisation marked the starting point of one parent's quest to improve the basic safety of the structure in which her child is schooled. After geologists informed Monk that an earthquake "strong enough to cause serious damage" could occur in the next 20 to 40 years, she and a group of equally committed colleagues – who came to be known as Families for School Seismic Safety (FSSS) – lobbied seismic experts, national and local government officials, and school board members. After establishing support from experts and public officials, FSSS worked to obtain numerous endorsements for a programme of seismic upgrades for at-risk schools in Vancouver.

A similar story of community advocacy started in the 1990s in California. Following the 1989 Loma Prieta earthquake, which demonstrated the weakness of many reinforced-concrete structures, a group of parent advocates in Berkeley found that seven of its 16 district schools posed serious life threats to students. In 1991, a community group proposed that school district officials embark on a USD 158 million comprehensive safety programme to rebuild Berkeley schools. Since that time, all Berkeley schools have been rebuilt, and the community has approved over USD 362 million in taxes for safety improvements. Achieving improved seismic safety was not only a technical problem, but also a challenge to prompt community engagement, accountability and action. (see Chakos in this publication)

In a national effort to reduce the escalating social and economic costs of natural disasters, a pilot community-based national disaster mitigation programme was initiated in 1997 by the Federal Emergency Management Agency (FEMA) in the United States (Wachtendorf, 2000). The objectives of Project Impact were to build community partnerships, involving federal and local government, schools, local businesses and federal agencies; to identify hazards and community vulnerability; to prioritise and complete risk reduction actions; and to develop communication strategies to increase public awareness of the importance of reducing disaster losses. In 2000, more than 250 communities and 2 500 businesses partners were involved in Project Impact (FEMA, 2000). An independent assessment of the project (Wachtendorf, 2000) found that valuable local partnerships, particularly between schools and local government agencies, had been developed and strengthened; although Project Impact communities need to work to include all members of the community, particularly its most vulnerable members, and to better capitalise on regional partnerships and those involving other Project Impact communities. Other countries such as Canada, New Zealand and Turkey are considering implementing similar studies (Wachtendorf, 2000).

Scientific expertise

The knowledge presently exists to significantly lower the seismic risk of schools and to help prevent further injury and death of school occupants during earthquakes...at reasonable cost and in a reasonable time frame. (extract from "ad hoc Experts' Group Report on Earthquake Safety in Schools", in this publication)

Scientists and communities have often worked together to gain the attention and support of the wider community and government. In the case study of Vancouver

schools, engineers from the Association of Professional Engineers and the Director of the Earthquake Engineering Research Facility at the University of British Columbia worked with the parent advocacy group to identify and explain the seismic risk in Vancouver's schools. A number of university research centres such as the European Association for Earthquake Engineering (EAEE), the Earthquake Engineering Research Institute (EERI), the Disaster Management Research Centre in the Middle East Technical University in Turkey, the Italian National Association for Earthquake Engineering at the University of Basilicata and the Disaster Research Centre at the University of Delaware are heavily involved in national research projects on earthquake safety in schools. A number of non-governmental organisations such as GeoHazards International (GHI) and Volunteers for India Development and Empowerment (VIDE) are also working with communities to reduce seismic risk, particularly in developing countries, where there is an even greater need for expert knowledge and experience and for collaboration on the part of all stakeholders.

But while experts possess the knowledge and experience required to advance the cause of important issues such as seismic safety, they may encounter any number of obstacles applying this expertise. Sharpe (in this publication) recounts the reluctance of authorities to implement a simple and cost-effective measure to improve the seismic resistance of school buildings. In other cases, public bodies may be unwilling to allocate resources to improve existing seismically hazardous structures. Spence (in this publication) states that the annual cost of a 20-year school strengthening programme in the six European Union countries with the highest seismic risk is between 0.2% and 2.4% of total capital expenditure on education.

The response of governments

The Commission deeply regrets the loss of human lives and the damages caused to the population of San Giuliano di Puglia. At this stage, the Commission does not envisage any specific proposal for legislation in the field of earthquake mitigation. (EU Environment Commissioner Margot Wallström, cited by Spence in this publication)

This is the disappointing response by the European Commission to the request by a member of the European Parliament to establish a directive requiring member states to set up programmes for assessing all buildings in high seismic zones. The statement was made in the wake of an earthquake in Molise, Italy, in which a school building collapsed, killing 25 children. The reluctance of this body to establish a regulatory framework at a European level, as Spence notes, is related to preference for other methods of "achieving desirable social and environmental goals", which probably cost less and do not require the enforcement of regulations. The effectiveness of the non-regulatory approach was tested less than three months later, when more than 100 schoolchildren were killed as a result of a school collapsing in an earthquake in Turkey.

In some cases, individual governments have been more willing to take regulatory action, particularly following devastating earthquakes. Within months of the Molise earthquake, the Italian government drafted an earthquake code, which introduced new seismic zonation for the whole of the Italian territory and set out a detailed process for evaluating and

strengthening existing structures (see Dolce in this publication). Further legal instruments and supporting funding mechanisms are also being established. In Portugal, a National Plan for Reducing the Seismic Vulnerability of Constructions, which is modelled on the National Earthquake Hazards Reduction Programme in the United States, envisages the creation of legislation that will require certification of designers, improvement of building control and creation of tax incentives (see Spence in this publication).

In other countries, a number of different mechanisms have been established by governments to oversee the general safety of school buildings, including updating building acts to include seismic provisions. In Mexico, federal, state and municipal governments are providing updated and regional building codes and supporting public infrastructure in case of disaster through the Natural Disaster Fund, the Natural Preventive Disaster Fund and a seismic alarm system (see de la Garza Reyna, in this publication). In 1995, the French Government set up a National Observatory for Safety in Schools and Higher Education Institutions, comprising representatives of public authorities holding title to school buildings, school staff, parents of students in public and private schools, and public officials to deal with all issues affecting the safety of persons, buildings and equipment (Schl ret, 2004). In New Zealand, new seismic safety standards were incorporated into the 1991 Building Act, and a structural survey of 2 361 schools was conducted between 1998 and 2001 to (see Mitchell in this publication).

Undoubtedly, the fact that public bodies are supporting a wide range of safety-related initiatives is encouraging, but experiences from previous earthquakes have shown that the existence of a building code does not mean that the code is rigorously enforced. This is the task of a formal regulatory body, which rarely exists at a national level and at present does not exist at an international or European level. Future events will continue to test the effectiveness of non-regulatory approaches to improving earthquake safety in schools.

The response of inter-governmental agencies

A number of international organisations have embarked on ambitious programmes to address issues of disaster reduction. These global initiatives have proven successful in that they have increased the general level of awareness of the importance of disaster mitigation in many areas of society.

In 1990, the United Nations proclaimed an International Decade for Natural Disaster Reduction (IDNDR). The Decade brought issues of disaster-risk reduction to the attention of the world and led to some improvement in disaster planning, particularly in developing countries. It also represented a major conceptual shift from disaster response to disaster reduction and to the promotion of a general "culture of prevention", the principles of which are outlined in the "Yokohama Strategy and Plan of Action for a Safer World" adopted at the first World Conference on Natural Disaster Reduction in 1994. In January 2005, a second World Conference on Disaster Reduction will take place in Kobe. One of the goals of this meeting is to further motivate and guide governments and policy-makers to incorporate disaster risk reduction to poverty reduction. There is also a focus on the needs of the most vulnerable members of the community and on assessing the achievements and identifying good practices since the

Yokohama Strategy in 1994. The conference will be organised around three main processes: intergovernmental process, public participation and knowledge exchange within the thematic area of "Building a culture of resilient communities". The latter will include a topic related to disaster risk reduction in schools (United Nations, 2004).

Other international organisations such as the Council of Europe have also established significant mechanisms by which to address issues of disaster reduction within the framework of advocating a "culture of risk prevention". The Council of Europe's EUR-OPA Major Hazards Agreement was adopted by the Council's Committee of Ministers in March 1987. The agreement – which was signed by 25 member states – was designed "to ensure better prevention, protection and organisation of relief in the event of major natural or technological disasters" and to ensure effective contact, exchange and co-operation between the "States of Eastern Europe, the Southern Mediterranean and Western Europe". One section of the Agreement is dedicated to risk prevention in schools and in universities. Pilot programmes to raise student awareness of risk prevention have been established in Algeria, France, Morocco and other countries; a "Street Net" programme has been implemented to target socially excluded children; and a number of post-graduate degrees in risk management-related areas have been initiated in several universities in Europe (Council of Europe, 2004).

The success of these global initiatives and intergovernmental conferences is difficult to quantify; in fact a review of the achievements and challenges of the Yokohama Strategy is currently underway. Importantly, none of these global initiatives have addressed the specific problem of school building collapse. So although the importance of awareness-raising for global issues such as disaster reduction cannot be underestimated, in order to accurately assess the specific problem of *why* school buildings are collapsing, a more systematic problem-solving approach may be required.

The way forward

Several million earthquakes occur every year, and about 20 000 of them are recorded. According to the National Earthquake Information Centre, based on observations made since 1990, an average of 18 major earthquakes (>M7), 134 strong earthquakes (M6) and over 1 300 moderate (M5) earthquakes occur every year (NEIC, 2004). In the 1990s, natural disasters affected some 2 billion people world-wide, killed 400 000 to 500 000 people and cost more than USD 600 million, more than in the previous four decades combined. Floods and earthquakes were the two largest causes of death (Rischar, 2002). In the last two years alone, economic losses from disasters rose from USD 55 billion in 2002 to USD 60 billion in 2003, and the number of victims killed in 2003 has increased fivefold compared to the previous year. Indeed, the gap between the more and less affluent countries is widening in terms of their capacity to cope with disasters. The integration of disaster-reduction strategies into effective national policies is also difficult (United Nations, 2004). Does this mean that the current concerted efforts of communities, intergovernmental agencies, governments, experts and others to address

issues such as disaster mitigation and school building collapse during earthquakes are *insufficient*, or rather that in the face of advancing technologies, growing urbanisation and increasing populations, a new approach is required?

...what's needed is imagination, and a different type of thinking. New thinking about how government, business and civil society ought to work together and about how to coax nation states into passing legislation in the interest of the planet, not just their own local constituencies. New thinking about network-like setups that create, global issue by global issue, a sort of horizontal cross-border source of legitimacy that complements the traditional vertical representation processes and legitimacy of nation states. (Rischard, 2002)

In *High Noon: 20 Global Issues, 20 Years to Solve Them*, Jean-François Rischard identifies natural disaster prevention and mitigation as one global issue that is "so urgent and pervasive that nothing less than a global commitment or coalition will solve [it]". He envisages a "global issues network" that can address this issue. This network would embark on a three-phase approach involving a *constitutional phase*, in which a network of committed problem-solvers is convened by a global multilateral, for example, who could act as a facilitator; a *norm-producing phase*, involving the production of norms, standards and policy recommendations; and an *implementation phase*, during which the network takes on a rating role. This final phase may involve enacting conforming legislation or "naming and shaming" those who violate or ignore norms.

Certainly, implementation and enforcement mechanisms do exist at an international level. The OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions is a recent example of the effectiveness of an international monitoring programme. Countries that accede to the convention agree to make bribing foreign public officials in international business transactions a criminal offence. They also accept the OECD Revised Recommendation on Combating Bribery in International Business Transactions, which contains broader measures to prevent and combat transnational bribery. If the convention is to have any real effect, companies must become fully implicated in ensuring compliance with the convention and with national anti-bribery laws. To date, more than 34 countries have ratified and transposed the convention into domestic legislation (OECD, 2003). In the field of education, "league tables" in such publications as *Knowledge and Skills for Life: First Results from PISA 2000* (OECD, 2001) and *Education at a Glance* (OECD, 2003) rank countries according to certain criteria such as student performance, graduation rates and expenditure on education. Such international country comparisons, which could be interpreted as a type of "naming and shaming" can often have a significant impact on education policy. The most striking example is the performance of Germany in the Programme for International Student Assessment (PISA) (Bulmahn, 2002), which has resulted in significant public debate and re-evaluation of the German education system.

Similarly, the recommendations of this *ad hoc* Experts' Group on Earthquake Safety in Schools could be adopted, implemented and enforced by national governments and international agencies. The only requirements are a shared commitment on the part of governments to address this problem and a consensus-based monitoring mechanism to support them.

References

- Bulmahn, E. (2002), "PISA: The Consequences for Germany", *OECD Observer*, OECD, Paris.
- Council of Europe (2004), "International Organisations and Major Hazard Management. Open Partial Agreement on the Prevention of, Protection against and Organisation of Relief in Major Natural and Technological Disasters", http://www.coe.int/T/E/Cultural_Cooperation/Disasters/Resources/APCAT_2003_12e.pdf.
- Dynes, R.R. (2000), "The Dialogue Between Voltaire and Rousseau on the Lisbon Earthquake: The Emergence of a Social Science View", *International Journal of Mass Emergencies and Disasters*, Vol. 18, No. 1, pp. 97-115, <http://www.udel.edu/DRC/preliminary/pp294.pdf>.
- Dynes, R.R. (1997), "The Lisbon Earthquake in 1755: Contested Meanings in the First Modern Disaster", *Disaster Research Centre Preliminary Papers*, Vol. 255, <http://www.udel.edu/DRC/preliminary/255.pdf>.
- Federal Emergency Management Agency (FEMA) (2000), "Project Impact: Building Disaster Resistant Communities", <http://www.app1.fema.gov/impact/impact00.htm>.
- Ince, J. (2004), "Students' Earthquake Play Shakes Politicians", *The TYEE*, 26 May 2004, <http://www.thetyee.ca/News/current/Student+Earthquake.htm>.
- National Earthquake Information Center (NEIC) (2004), Earthquake Hazards Program Web site, <http://neic.usgs.gov>.
- Nigg, J.M. and K.J. Tierney, (1993), "Disasters and Social Change: Consequences for Community Construct and Affect". *Annual Meeting of the American Sociological Association*, Miami, Florida, 13-17 August 1993.
- OECD (2003), *Education at a Glance: OECD Indicators*, OECD, Paris.
- OECD (2003), "OECD Policy Brief. Fighting Bribery in International Business Deals", OECD, Paris, <http://www.oecd.org/dataoecd/2/58/20610942.pdf>.
- OECD (2001), *Knowledge and Skills for Life: First Results from PISA 2000*, OECD, Paris.
- Oeser, E. (2001), HEAT. Historical Earthquake Theories, <http://www.univie.ac.at/Wissenschaftstheorie/heat/heat.htm>.
- Quarantelli, E.L. (2000), "Disaster Planning, Emergency Management and Civil Protection: The Historical Development of Organised Efforts to Plan for and to Respond to Disasters", *Disaster Research Centre Preliminary Papers* Vol. 301, <http://www.udel.edu/DRC/preliminary/301.pdf>.
- Rischar, J.-F. (2002), *High Noon: Twenty Global Issues, Twenty Years to Solve Them*, Perseus Press, Oxford.
- Schl ret, J.-M. (forthcoming), "Risk Assessment in Schools in France", *Keeping Schools Safe and Secure, Proceedings of an International Conference on School Safety and Security*, 12-14 November 2003, OECD, Paris, France.

Tierney, K.J. and J.D. Goltz (1997), "Emergency Response: Lessons Learned from the Kobe Earthquake", *Disaster Research Centre Preliminary Papers*, Vol. 260, <http://www.udel.edu/DRC/preliminary/260.pdf>.

United Nations (2004), "First Announcement: World Conference on Disaster Reduction, 18-22 January 2005, Kobe, Hyogo, Japan: A Safer World for All", <http://www.unisdr.org/eng/wcdr/First-Announcement-WCDR-eng.pdf>.

Voltaire (1993), *Candide*. Wordsworth Editions, Ware.

Wachtendorf, T. (2000), "Building Community Partnerships Toward a National Mitigation Effort: Inter-Organisational Collaboration in the Project Impact Initiative", *Disaster Research Centre Preliminary Papers*, Vol. 306, <http://www.udel.edu/DRC/preliminary/pp306.pdf>.