CONFRONTING NATURAL DISASTERS

AN INTERNATIONAL DECADE FOR NATURAL HAZARD REDUCTION

In 1984, Frank Press, the President of the U.S. National Academy of Science suggested an International Decade for Natural Hazard Reduction (IDNHR) in his keynote address at the 8th World Conference on Earthquake Engineering. Since then, the National Research Council (NRC) in the United States has explored ways to organise the proposed Decade, with the goal of reducing worldwide the death, injury, and social and economic disruption caused each year by natural disasters. To this end, the NRC has published a report in which it describes a framework for such an effort that would begin in 1990, hopefully under the umbrella of the United Nations. The NRC now solicit our support and our suggestions on how to proceed with this undertaking.

The following are a few extracts from the NRC report.

THE NEED FOR AN IDNHR

Throughout history, natural disasters have exacted a heavy toll of death and human suffering. Natural hazards such as earthquakes, landslides, tsunamis (tidal waves), hurricanes, tornadoes, floods, volcanic eruptions, and wildfires have claimed more than 2.8 million lives worldwide in the past 20 years, adversely affecting 820 million people. Since 1949, at least 17 individual disasters have killed more than 10,000 people each; on two occasions - in Bangladesh and China - single disasters took more than a quarter-million lives.

Nearly all countries risk devastation by natural hazards. Truly, such hazards recognise no geopolitical boundaries. Yet losses from these events rise each year, despite progress in understanding natural hazards and how to mitigate their effects. Though economic losses are highest - in monetary value - in industrialised nations, the greatest burden from natural catastrophes falls on developing nations, where high death tolls and greater relative economic loss deal a double blow.

The magnitude of the problem worldwide might seem to defy solution. Yet hazard reduction successes clearly show that heavy losses at the hands of nature are not inevitable. It may not be possible to prevent the occurrence of natural hazards, but the disasters they generate can often be avoided. In general, hazard reduction refers to the process of lessening the impacts of a potential event on the social and built environments. In essence, this means reducing deaths, injuries, and property damage, and minimising the destruction of a community's social and economic fabric.

Experience demonstrates that we have enough knowledge already, if properly applied, to reduce both human and property losses substantially. In fact, progress in scientific and technical understanding of natural hazards, as well as in techniques to mitigate their effects, has lead to the proposal for an International Decade for Natural Hazard Reduction (IDNHR). Such a concerted effort to develop, disseminate, and apply this knowledge could yield both immediate and long-term benefits worldwide.

RECOMMENDATIONS OF THE (US) ADVISORY COMMITTEE

The Decade, encompassing both the IDNHR and individual National Decades for Natural Hazard Reduction, would be one of intense activity, beginning with the effort to pool and implement existing capabilities for immediate use. The interrelated strategies presented in the recommendations that follow are intended to achieve life-saving and economic advantages during the Decade and beyond. In so doing, they would lay the foundation for continuing achievements in the next century that will yield a world less at risk from the violent forces of nature.

The (US) Advisory Committee on the International Decade for Natural Hazard Reduction recommends the following:

1. An International Decade for Natural Hazard Reduction (IDNHR) should be established for the period 1990-2000.
The IDNHR's objective is to reduce catastrophic life loss, property damage, and social and economic disruption from natural hazards. The IDNHR should initially focus on earthquakes, windstorms (cyclones,hurricanes, tornadoes), floods,tsunamis, landslides, volcanic eruptions, and wildfires. Its objective should be pursued by:
  * collecting existing hazard mitigation experience and practices and identifying gaps in current knowledge,
  * accelerating application of known mitigation and preparedness approaches,

* developing scientific and engineering knowledge that offers substantial potential for improving hazard mitigation practices.

This objective would be accomplished through:

* cooperative research,
* demonstration projects,
* information dissemination,
* technical assistance,
* technology transfer, and
* education and training.

These objectives should be tailored to specific hazards and locations, allowing for cultural and economic diversity.

2. The United States should establish a U.S. National Decade for Natural Hazard Reduction (USDNHR) to provide a focus for U.S. activities.

3. All nations should be encouraged to participate in the IDNHR, including those that suffer from natural disasters as well as those that can contribute to reducing the effects of natural hazards.

4. The United Nations should promote and facilitate the IDNHR, with full participation of the concerned nations and of the relevant international engineering, scientific, and social science communities. The United Nation should convene an international planning meeting as early as possible in 1988 to define objectives for the International Decade and to formulate an institutional framework for the technical conduct of the program.

EARTHQUAKES

Achieving these goals requires that the extent of the earthquake risks and the exposure of citizens first be identified. This task can take the form of preparing earthquake risk maps, which plot the probability of experiencing a specific level of ground motion within a specific time. Determining the exposure of citizens relies on evaluating the safety of existing structures, water and sewer systems, gas and oil pipelines, and other lifelines. However, determining structure safety is often handicapped by an inability to assess materials and designs used in older construction.

Even with the best determination of building properties and conditions, the level of damage a specific ground motion may cause still cannot be predicted accurately. Nonetheless, a number of techniques can be used to strengthen existing structures, and many buildings have been retrofitted for increased seismic resistance. As research further develops these techniques and their cost falls, more buildings can be upgraded.

What needs to be done during the Decade? First, programs must be initiated that include avoidance, through zoning, of construction on vulnerable sites as well as evaluation and reconstruction after a hazard occurs. In addition, emergency response for buildings and lifelines must be planned and care taken to ensure that these plans are properly implemented.

Second, instrumentation networks must be established to determine ground motion influences caused by local site conditions. Such networks will also provide the means to determine the relationship between specific ground motions and the degree of damage to man-made structures - from initial damage to ultimate collapse.

Third, a testing program must be undertaken to explore this relationship between ground motions and the behaviour of man-made structures up to the point of collapse, and to develop economical methods to improve the safety of existing structures.

Further, efforts must be made to sustain a reasonable level of earthquake preparedness in the minds of citizens. This need includes a continued readiness to respond to earthquake warnings despite the long periods between destructive quakes and the uncertainties of most warnings.

Potential projects during the IDNHR include:

* establishment of a cooperative international program in strong motion measurement and data analysis,
* organisation of a coordinated international earthquake information service,
* development of new earthquake prediction models,
* study of the timing and methods for effective delivery of earthquake warnings,
* assessment of technical considerations in strengthening brittle reinforced concrete buildings and other hazardous structures,
* study of the international financial and insurance implications of catastrophic earthquakes,
* improvement of techniques to control nonstructural damage (for example, ceilings, partitions, windows, and other interior fixtures),
* analysis of various strategies for preparedness and response to earthquakes,
* study of failure modes of structures,
* study of the special concerns in designing constructing and rehabilitating critical facilities,
* improvement of guidelines for earthquake-resistant design,
* preparation of unified risk maps that include hazard potential, frequency of occurrence, expected ground motions, and site variations,
* study of microzonation in worldwide seismotectonic analogs,
* development of seismic-safety analyses for existing dams and nuclear power facilities, and
* continued studies of seismic gaps (faults with no recent activities) and their implications.

Editor's Note. If you have any suggestions about activities, etc, that we in New Zealand should follow, then please write to the Secretary so that they can be considered by the Management Committee.