Making Buildings Safer

The problem of poor buildings is preventable. And making buildngs safer is the only way man can make a future safe from earthquakes. What must be done if we are to achieve this?

1. Determine the earthquake risk in different parts of the world.
2. Correct unsafe conditions in existing structures.
3. Make sure that all new construction is earthquake-safe.
4. Prepare and plan for response to and recovery from earthquakes.

The problem is that few nations have the financial and technical resources to do all that could be done to satisfy these needs. The challenge to each nation and each community is to find the right mix of actions that will manage the earthquake risk as an integrated strategy, consistent with their resources and aspirations. Balancing present actions against future vulnerability is at the heart of controlling the consequences of earthquakes. Having the knowledge and capability necessary to select the best mix of actions is fundamental to making these choices.

Luzon Earthquake, Philippines, July 1990

World Seismic Risk

Building damage causes almost all deaths and injuries in earthquakes. Worldwide, earthquakes cause almost 60% of deaths due to natural disasters, over half a million deaths in the last two decades. Millions more were injured or rendered homeless. Property damage was well over $100 billion. All of these factors can be *significantly* mitigated by making buildings safer.

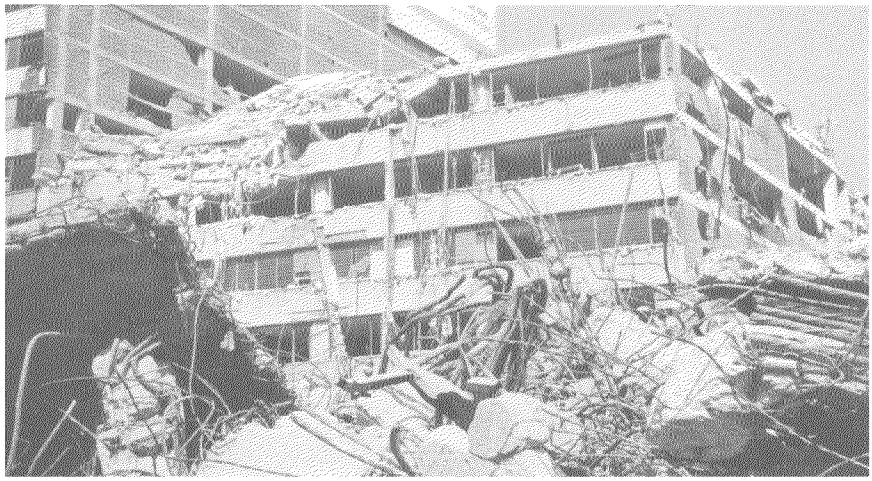
While large earthquakes are widely publicized, moderate earthquakes occur far more often and cause more cumulative life loss and property damage than do the very large ones. Scientists expect about a thousand earthquakes of low to moderate magnitude for every major earthquake that occurs.

For every magnitude 8 or greater earthquake, about 1 000 earthquakes in the magnitude range 5-6 are expected

Magnitude	Number
8 or greater	1
7-8	16
6-7	150
5-6	1,000

Population increases, combined with poorly built structures and a general lack of pre-earthquake hazard reduction planning, put a staggering number of people at risk worldwide. In fact, the adoption of modern construction has, in some areas, decreased structural safety compared to that of traditional building styles. Population projections for year 2000 for a number of cities in seismically active areas clearly show that the world's earthquake risk is growing, not decreasing.

City	Population in million	
	1975	2000
Mexico City	11.6	26.0
Tokyo	16.4	20.0
Jakarta	5.5	13.0
Los Angeles	9.0	11.0
Beijing	8.9	11 0
Lima	3.7	9.1
Algiers	1.6	5 1
Baghdad	2.7	7 5
Naples	3 8	4 3
San Francisco	3.0	5.0



Michoacan Earthquake, Mexico, September 1985.

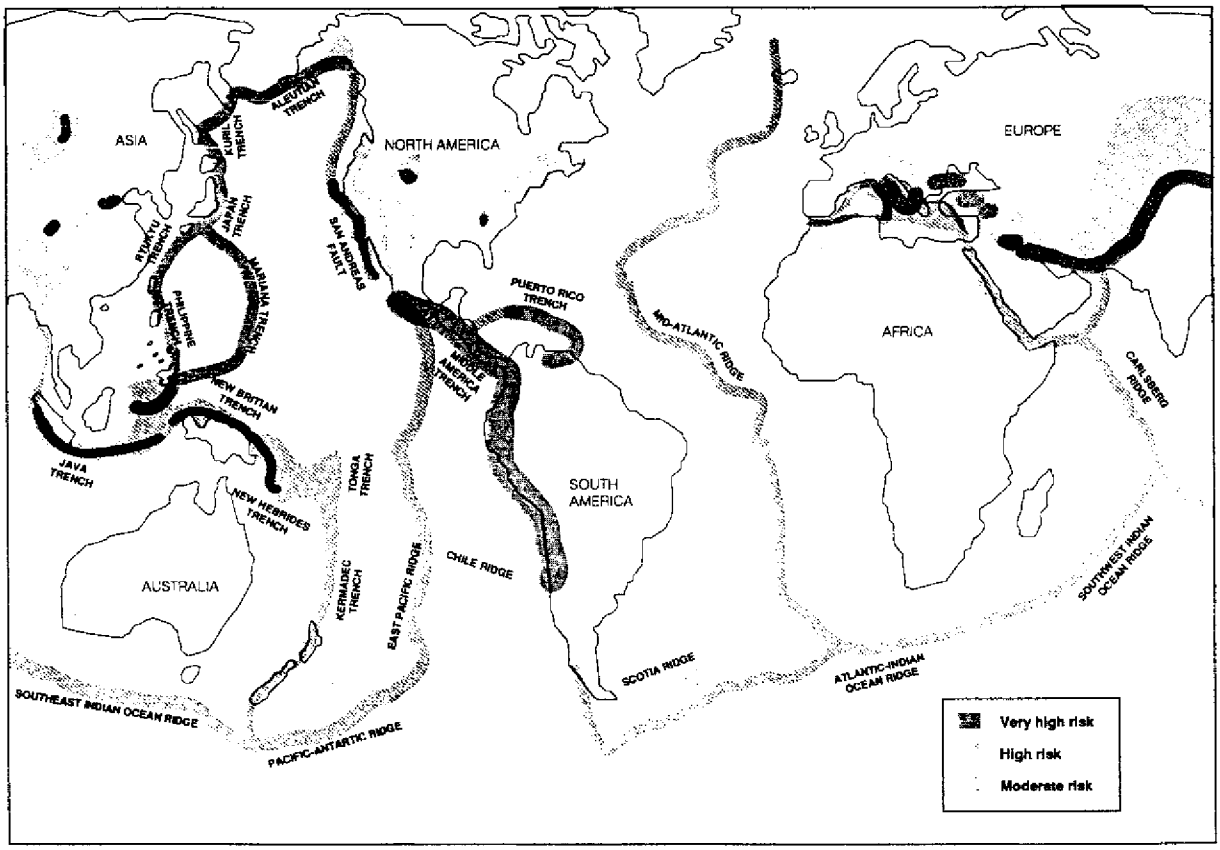
A well-engineered and properly constructed building can survive a severe earthquake quite well, but a poorly engineered or badly constructed building cannot survive even a moderate earthquake. And those that are not designed at all, or constructed by its occupants are vulnerable even to small earthquakes. The number of deaths resulted from numerous small to medium earthquakes could have been minimized through better-engineered buildings.

Several representative small to moderate earthquakes that have caused major damage.

Location	Magnitude	Year	People killed
Agadir, Morocco	5.7	1960	10,000-13,000
Managua, Nicaragua	6.2	1972	5,000
Northern Pakistan	6.0	1974	5,000
Northern Yemen	5.8	1982	2,000-5,000

Millions of people live in earthquake-prone countries throughout the world. It is clear that the only way they can be safer from earthquakes is for buildings to be safer. The only question is *when* earthquakes will occur, not *if* they will occur. If we do not act now, we are trusting only to chance and this will not save lives or property.

It is time to act. Earthquakes respect our actions, not our words.



World seismic risk map roughly indicating the principal regions of the world. Because of its scale the map does not show many small regions with substantial seismic risk.

The World Seismic Safety Initiative

The goals of theWorld Seismic Safety Initiative are:

- Enhance the distribution of earthquake engineering information and knowledge so that engineers can design and construct earthquake-safe buildings.
- Improve earthquake engineering practices for all types of construction by incorporating experience and research findings into codes and recommended practices in earthquake-prone countries.
- Advance engineering knowledge through problem-focused earthquake engineering research.

The WSSI will sponsor projects that will:

- Transfer technology
- Develop professional engineering practice
- Address crucial research questions that constitute gaps in our knowledge of how structures respond to earthquakes and how they can be built to withstand them.

The WSSI will provide an organizational framework capable of raising financial resources, undertaking projects that require multi-national effort, and providing encouragement to apply better engineering practices.

The WSSI will take advantage of the fact that much of the *engineering* knowledge and research capability necessary to improve building practices exists today, although in scattered places around the world. The WSSI will use these resources, match them to needs, and, hopefully, create a forum in which a quantum leap in engineering knowledge and its application will be made.

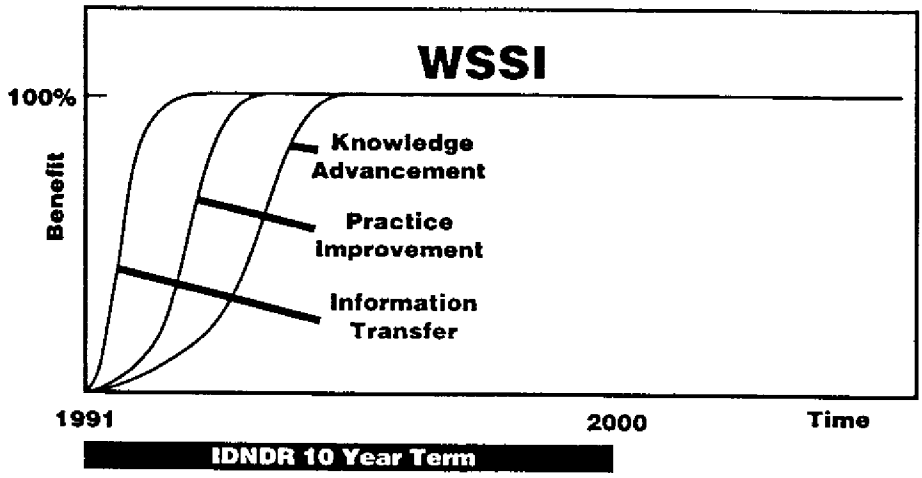
The term "engineering" is used to include not only engineering but all other scientific and professional disciplines engaged in identifying, mitigating, responding to, and recovering from earthquake damage/ disaster.

Projects to achieve these three goals are long-term in nature. They will require different time frames and levels of effort, depending on their complexity. Though the WSSI has been started as part of the International Decade for Natural Disaster Reduction (IDNDR), its term will extend far beyond the term of the IDNDR.

Start-up Phase: Focus will be on the first goal—spreading state-of-the-art engineering knowledge around the world. Practice improvement and research projects will be planned. In earthquake-prone countries, practices and codes that do not ensure building safety will be targeted for change. The grass roots outreach that will be necessary to involve local engineers in practice improvement activities and in incorporating these practices into local, regional, and national practices and codes will begin.

Middle Phase: Research and practical projects will be initiated. The committee work necessary for improving recommended practices and incorporating them into codes will begin. The networks set up (newsletters, seminars, data banks, etc.) to distribute information will be in operation.

Final Phase: The WSSI will see, in its final phase, the results of the research and practical activities. These results will be made available around the world through the information networks established in earlier phases.



This figure illustrates how soon various types of projects can be expected to show benefits. The WSSI activities will yield benefits for an extended period of time, well beyond the term of the IDNDR

The information transfer that will begin in the start-up phase will result in an immediate improvement in engineering practice around the world. Enacting adequate standards and codes will permanently increase the standards of safety to which buildings are designed and constructed. Research results will answer important questions that will enable engineers to build structures that can withstand earthquake forces. This cooperative effort will become a body of knowledge that can be distributed and used worldwide. The practical effect will be safer buildings.