TECHNOLOGY TRANSFER DURING THE "MIDDLE GAME" OF THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

Badaoui M. Rouhban
Division of Earth Sciences
UNESCO
7, Place de Fontenoy
75700 Paris
France
Voice: 33 1 45 68 41 20
Fax: 33 1 43 06 17 76

Walter W. Hays
U.S. Geological Survey
Reston, Virginia 22092
United States of America
Voice: 703-648-6711
FAX: 703-648-6717

KEYWORDS: Technology transfer, IDNDR, STAPLE

ABSTRACT

This paper describes the urgency for and the importance of technology transfer during the remainder of the International Decade for Natural Disaster Reduction (IDNDR). Eleven case histories are cited to illustrate the types of activities involving technology transfer that every nation can undertake.

INTRODUCTION

The concept of the IDNDR was proposed in July 1984 by Dr. Frank Press at the Eighth World Conference on Earthquake Engineering. After several years of planning, on December 22, 1989, 155 nations cosponsored United Nations Resolution 44/236 which called for concerted national and international actions during the 1990;s to reduce the loss of life and economic losses from earthquakes, volcanic eruptions. landslides, floods, severe storms, wildfires, tsunamis, and droughts.

The IDNDR is now in the "middle game." Unlike the "opening" game in 1990 and the "end game," the middle game of the IDNDR is more complex because of the following factors:

1. Considerable resources from natural disaster reduction have been used up during the first 5 years of the decade and cannot be recovered or reallocated.
2. Many initial courses of action (strategies) are no longer viable because of limitations in time and space on human fiscal resources.
3. The focus has shifted from "what one would like to accomplish" (i.e., the vision in 1990) to "what one can actually accomplish during the remaining 5 years" (i.e., reality in 1995).
4. The complexities of regional/national needs are greater than ever because of the large number of recent, devastating natural disasters and the threat of others. Recent disasters include:

   -- Earthquakes in Iran, Turkey, Egypt, the Philippines, Japan, Colombia, India, and the United States;
   -- Volcanic eruptions and/or threatening eruptions in Hawaii, Alaska, the Philippines, and Zaire;
   -- Floods in China, United States, and Italy;
   -- Droughts in Africa;
   -- Tsunamis in Japan, Indonesia, and Nicaragua; and

-- Severe storms in the Philippines, United States, and Mexico.

5. The "end game" of the IDNDR has not yet been defined.

TECHNOLOGY TRANSFER

The May 1994 World Conference In Yokohama, Japan provided a basis for strategic planning during the middle game of the IDNDR. The 3,000 delegates to the conference called for a renewed emphasis on regional technology transfer to solve local problems. Countries having data, information, experience, and know how were urged to assist neighboring and developing countries needing a greater technical capacity.

The goal is to reduce community vulnerability to natural hazards (i.e., eliminate flaws in planning and development). These flaws make communities throughout the world susceptible to socioeconomic impacts from: floods, landslides, wildfires, severe storms, earthquakes, tsunamis, droughts, and volcanic eruptions.

The potential for disaster is greatest when communities are located:

--in or adjacent to seismogenic zones capable of generating damaging earthquakes,
--along coasts where hurricanes, cyclones, typhoons, storm surges, or tsunami flood waves strike,
--in flood plains subject to inundation from riverine floods or flash floods,
--in regions prone to tornadoes,
--near active volcanoes,
--on unstable slopes susceptible to landslides triggered either by meteorological or seismological sources,
--along wilderness/urban interfaces susceptible to wildfires, and
--in regions prone to drought episodes.

Reduction of community vulnerability to natural hazards requires a long-term process to change the hazard-, the built-, and the policy-environments of the community (fig. 1). These changes take time because the process depends on actual experiences with natural disasters and on current and ongoing research to deepen understanding of the six forces (called STAPLE forces in this paper): social, technical, administrative, political, legal, and economic. The STAPLE forces shape the policy environment and are the key to reduction of community vulnerability. They vary with time, place, and circumstances (fig. 2). The hazard environment produces or generates the physical effects (hazards) which can adversely impact the community and its built environment. The built environment (i.e., buildings and lifeline systems) is at risk (i.e., faces potential loss from these hazards), depending on location, value, exposure, and vulnerability. The community decisionmakers determine the mix of risk management policies and practices that are needed to protect the people and the built environment.

THE PROBLEM

Many experts believe that the world's current technology base (i.e., information, knowledge, experience, and know how) is adequate to reduce any community's vulnerability to natural hazards (ref. 2). However, even though adequate technologies are available, they are not being transferred to end users and implemented at a rapid enough rate in both developed and developing countries to change the policy environment and reduce the risk. Too few communities have adopted policies that: 1) stop increasing the risk for new development, 2) start decreasing the risk for existing development, and 3) continue improving preparedness plans for the inevitable damaging event.

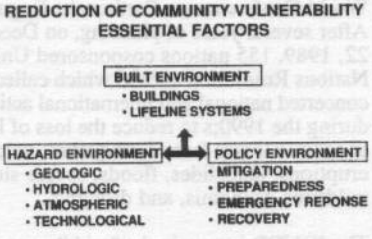

Figure 1.--Schematic illustration of the hazard-, built-, and policy environments which control community vulnerability to natural hazards.

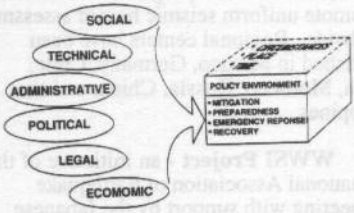

Figure 2.--The forces shaping the community policy environment that must be changed by technology transfer.

Three problems continue to hinder transfer of technology for natural hazard reduction throughout the world (ref. 3). They are: 1) resistance to change; 2) coordination and communication, especially at disciplinary interfaces, between researchers, practitioners, and decisionmakers; and 3) failure of end users to take "ownership" of new technologies (fig. 3).

Past experience (refs. 3-5) has shown that:

1. The status quo for natural disaster reduction will be maintained until external forces (e.g., those associated with political decisions or a natural disaster) compel changes in the hazard-, built-, and policy environments that will make the community's people, buildings, and lifelines less vulnerable to natural hazards.

2. Coordination and communication, especially at disciplinary interfaces between researchers, practitioners, and decisionmakers are not likely to change much until external forces compel them to work together at the margins of their disciplines to change the STAPLE forces.

3. Inability or reluctance of practitioners to take ownership of new technologies is often a result of lack of understanding of the technology, the inability to change the STAPLE forces, or not being part of the process(ref. 2).

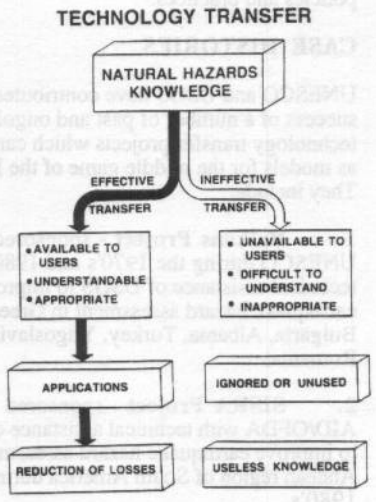

Figure 3.--Schematic illustration of the process required to transfer "ownership" of technology from researchers to practitioners.

THE SOLUTION

To be successful, the technology transfer program should seek incremental changes in the STAPLE forces. An accelerated worldwide technology transfer program should institutionalize a long-term process that will enable researchers, practitioners, and decisionmakers in a community solve work through the problems of apathy, communication, and understanding, thereby transferring the "ownership" of available technologies (i.e., information, knowledge, experience, and know how developed within and outside their country). The researcher is seeking answers to the questions: where, how big, or how bad and why; the practitioner to the questions: when, how big, how bad, and where; the decisionmaker to the questions: what should I do to save lives, reduce damage and economic loss that is feasible technically, socially, and economically. Once answered to everyone's satisfaction and the new technologies are owned; they can then be

adapted for use in local risk management policies and practices.

CASE HISTORIES

UNESCO and USGS have contributed to the success of a number of past and ongoing technology transfer projects which can be used as models for the middle game of the IDNDR. They include:

1. **Balkans Project** - sponsored by UNESCO during the 1970's and 1980's with technical assistance of USGS to improve earthquake hazard assessment in Greece, Bulgaria, Albania, Turkey, Yugoslavia, and Romania.

2. **SISRA Project** - sponsored by AID/OFDA with technical assistance of USGS to improve earthquake hazard assessment in the Andean region of South America during the late 1980's.

3. **SEISMED Project** - sponsored by Italian government, UNDP, and UNDRO (now DHA) with technical assistance of USGS and others to foster earthquake risk reduction in the countries adjacent to the Mediterranean Sea during the late 1980's and early 1990's. Participating countries included: Spain, France, Monaco, Malta, Albania, Italy, Macedonia (former Yugoslavia), Turkey, Israel, Egypt, Syria, Greece, Cyprus, Libya, Morocco, Tunisia, and Algeria.

4. **WWERM Program** - sponsored by AID/OFDA with technical assistance of USGS to develop seismic zonation maps and risk assessments in major cities of Peru, Chile, Morocco, Indonesia, and the Philippines with eventual expansion worldwide during the late 1980's and 1990's.

5. **RELEMR Project** - sponsored by US Department of State with technical assistance of USGS and support of UNESCO to reduce earthquake losses in the Eastern Mediterranean Region (i.e., Turkey, Lebanon, Cyprus, Syria, Jordan, West Bank, Israel, Egypt, Saudi Arabia, and Yemen) during the period 1993-2000.

6. **GSHAP Project** - proposed by the International Lithosphere Program with sponsorship by the International Council of Scientific Unions as a program of the IDNDR to promote uniform seismic hazard assessment worldwide. Regional centers have been established in Mexico, Germany, Chile, Kenya, Morocco, Russia, China, and the Philippines.

7. **WWSI Project** - an initiative of the International Association of Earthquake Engineering with support by the Japanese government and technical assistance by the United States to facilitate the development and implementation of cooperative seismic risk reduction projects worldwide during the 1990's.

8. **PAMERAR Program** - the "Programme for Assessment and Mitigation of Earthquake Risk in the Arab Region" is an initiative sponsored by the Arab fund for Economic and Social Development and the Islamic Development Bank, with technical assistance from UNESCO, during the 1980's and 1990's.

9. **CERESIS** - headquartered in Lima, the Centro Regional de Sismologia para America del Sur, was created in 1966 by agreement between the Government of Peru and UNESCO to provide international and intergovernmental coordination. Eleven nations (Argentina, Bolivia, Brazil, Ecuador, Spain, Chile, Colombia, Peru, Trinidad-Tobago, Uruguay, and Venezuela.

10. **CENAPRED** - a national disaster prevention center established in 1990 in Mexico City through a cooperative program of the governments of Japan and Mexico. Technical assistance has been provided to: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama.

11. **IFSZ** (International Forum on Seismic Zonation) - a project of UNESCO and USGS initiated in 1990 to identify the safest part of a geographic area for earthquake resistant development.

SUMMARY

The middle game of the IDNDR provides an unprecedented opportunity to improve and accelerate technology transfer for natural disaster reduction during the 1990's. An opportunity like the IDNDR is to accelerate and improve worldwide technology transfer for natural disaster reduction may never occur again.

REFERENCES

1. Merani, Neelan S., 1991, The Reduction of Natural Disasters, in Aaron, John M and Hays, Walter W. (eds.), The Challenge of IDNDR, Episodes, v. 14, no. 1, pp 1-6.

2. United Nations, 1989, International Decade for Natural Disaster Reduction, 44th Session of the General Assembly, Resolution 44/256, 6p.

3. Hays, Walter W. and Rouhban, Badaoui M., 1991, Technology Transfer, Episodes, v. 14, no. 1, pp. 66-72.

4. Hays, Walter W., van Essche, Ludovic, and Maranzana, Franco, 1991, SEISMED and IDNDR: Opportunities to Reduce the Risk From Earthquakes and Other Natural Hazards, Episodes, v. 14, no. 1, pp. 13-18.

5. United Nations Centre for Regional Development, 1987, Challenges of the IDNDR, Nagoya, Japan, 129 p.

6. STOP Disasters, 1991, First Session of the Scientific and Technical Committee, no. 1,/May-June, pp. 4-7.

7. Kreimer, Alcira and Munasinghe, Mohan, (eds.), 1992, Environmental Management and Urban Vulnerability, Report 168, The World Bank, Washington, DC.