The challenge of the IDNDR in Latin America and the Caribbean is to apply the knowledge that has been accumulated and developed in the Region.

has been important, but such studies now must be increasingly directed toward bringing benefits to communities

Some institutions of higher learning are motivated by an ever-increasing awareness of their role in community health and safety. There are many examples, but mention should be made of the postgraduate-level curricula at the University of the Andes in Venezuela and the University of the Andes in Colombia in the areas of structural and seismic engineering; the Center for Disaster Prevention Studies of the Faculty of Physical Sciences and Engineering of the University of Chile; the applied studies and research being carried out by the National University of Engineering, Peru; the Geophysical Institute of the Polytechnic School of Ecuador; the ongoing support for updating the Seismic Code that is provided by the Seismic Engineering Laboratory of the Faculty of Civil Engineering of the University of Costa Rica; and the applied studies of the Seismic Research Unit of the University of the West Indies in Trinidad Mention must also be made of the interest of the National University of Nicaragua in developing a postgraduate program in disaster prevention and management in Central America; the fundamental role that the National University of Mexico plays in connection with CENAPRED; and the willingness of the Schools of Architecture of Federico de Villarreal University in Peru and of the Piloto University in Colombia to formally incorporate the study of disasters in their curricula. Box 6 10 describes some of the prominent centers carrying out applied research in disaster mitigation in the Region.

The ICAROS project (the IDNDR "Roving Seminar in the Caribbean") was initiated by the International Union of Technical Associations and Organizations and the World Federation of Engineering Organizations (UATI/WFEO), and other regional and multilateral organizations to disseminate and share high-quality information on natural disasters in the countries and territories of the Caribbean. The principal subjects of discussion are risk maps, training at the local level, workshops and demonstrations of proper construction methods, improvement of warning systems, case studies on the role of insurance companies and the socioeconomic impact of disasters, and analyses of cost-benefit ratios.

In the area of the social sciences, La RED the Latin American Network of Social Studies in Disaster Prevention, analyzes the influence of governmental organization on disaster prevention, response and recovery measures and policies in a society faced with disasters, and evaluates the experiences of the countries in implementing these measures The Institute for Training in Public Administration (ICAP), located in Costa Rica and serving all of Central America, is making an important contribution in this field; it offers a well-structured master's degree program that includes natural hazards in the management of investment projects In addition, the Department of Social Work of the University of Antioquia, Colombia, has established a graduate-level program that emphasizes aspects of social development as related to emergency and disaster situations.

As a consequence of the commitment by institutions of higher learning to disaster studies, many professional engineering and architectural associations, which influence political decision-making and enjoy credibility among the public in countries of the Region, are giving more

Box 6.10

CENTERS OF APPLIED RESEARCH IN DISASTER MITIGATION

The **Centro Nacional para la Prevención de Desastres** (National Center for Disaster Prevention—CENAPRED) was inaugurated in 1990 in Mexico City with three aims:

- To study, develop, and apply technologies for disaster prevention and mitigation
- To promote technical training
- To disseminate information on preparedness and self-protection for the Mexican people

The Center's research encompasses the following areas: geological risks, seismology equipment, seismic experiments, hydrometeorological risks, and chemical hazards. CENAPRED supports the implementation and operation of detection, surveillance, and forecasting activities and risk evaluation networks in cooperation with other government agencies.

The **Centro Peruano-Japonés de Ingeniería Sísmica y Mitigación de Desastres** (Peruvian-Japanese Center for Seismic Research and Disaster Mitigation—CISMID) is an academic research center for the study and improvement of techniques to reduce human and material losses caused by natural disasters. CISMID, established by the Faculty of Civil Engineering of Peru's National University of Engineering, receives support from the National Council for Science and Technology of Peru.

The Center's facilities in Lima include a geotechnical laboratory and a building materials laboratory, and offer specialized courses in structural engineering and building materials sciences. CISMID's efforts have led to the creation of a standard for building codes and land use statutes in Peru. Both CENAPRED and CISMID receive technical and financial support from JICA.

The **Centro Regional de Sismología para América del Sur** (South American Regional Center for Seismology—CERESIS) was established in Lima (Peru) as an autonomous intergovernmental agency by the governments of the South American countries in 1971, with initial backing from UNESCO and other agencies. It has had a major scientific and technical impact on the region in the evaluation of seismic risk, digital seismic networks, production of maps and geophysical catalogues, and in developing South America's own professional capacity.

Since 1989 CERESIS has been carrying out a regional standarized methods project to evaluate seismic risk in South America, based on national maps and catalogues produced by each country. The project is associated with the Latin American Map Program on Seismic Hazards and will contribute to the Global Seismic Hazard Assessment Program.

The Seismic Research Unit (SRU) of the University of the West Indies in Trinidad was established 40 years ago to monitor seismic events throughout the Commonwealth and Eastern Caribbean islands. It coordinates earthquake-related activities by centralizing data on events in the area. In addition, it maintains ties with earthquake centers in the French departments of Martinique and Guadeloupe and in Puerto Rico, the Dominican Republic, and Cuba.

importance to the consideration of natural hazards in all phases of a project, from its planning to its construction and maintenance. To illustrate the multiple possibilities of cooperation and the influence of this type of professional group, the Civil Engineering Association of Ecuador and the Colombian Association of Engineers signed a Letter of Intent for cooperation. One of the points of this agreement calls for mutual support in emergency situations and joint activities to train and update their professionals in disaster-related subjects.

Society on the whole, because it comprises a range of different actors from government-level planners to the beneficiaries of an individual project, is familiarizing itself with the terms associated with disaster management. This process ideally leads to a greater awareness of the problem, and helps to promote the idea that mitigation of natural disasters profits everyone.

DISASTER: A WINDOW OF OPPORTUNITY

A disaster can provide opportunities for a sector to reorganize, as was the case with the decentralization of the health care system in El Salvador's capital in 1986 (see Box 6.11), or for the reorganization of disaster management systems themselves. To cite only a few examples, the 1985 earthquake in Mexico prompted the creation of the Sistema Nacional de Protección Civil (National Civil Protection System—SINAPROC), in Colombia, the violent eruption of the Nevado del Ruiz Volcano in 1985 led to the establishment of the Sistema Nacional de Prevención y Atención a los Desastres (National Disaster Prevention and Response System) and at the same time promoted guidelines for mitigating future disasters during reconstruction. The example of municipal development of La Paz, Bolivia (see box 6.12), illustrates perfectly how disasters provide the opportunity to promote long-term development programs.

CONCLUSIONS: DISASTER MITIGATION IS IRREVERSIBLE

Practical and concrete experiences prove that investing in mitigation, either directly or indirectly, profits everyone. Planners in Latin America and the Caribbean, who can demonstrate the cost effectiveness of disaster mitigation in plans must be more aggressive, especially in promoting the following measures

- Gathering data on hazards and vulnerability through GIS and preparing risk maps for incorporation into development plans and assessments;
- Legalizing and applying efficient regulations on land use;
- Studying sectoral vulnerability;
- Using political decisions to formalize restrictions and economic incentives to achieve mitigation

An analysis of the various activities being developed or implemented in the countries of the Region to mitigate the effects of natural disasters shows a common denominator that has acted to trigger this process countries cannot afford

Box 6.11

THE RECONSTRUCTION OF THE HEALTH SECTOR IN EL SALVADOR: AN EXPERIENCE IN MITIGATION

In terms of damage caused to the health care infrastructure, the 1986 earthquake in the city of San Salvador was not much different from the one that hit Mexico City barely a year before The most striking example of this destruction was the Benjamín Bloom Children's Hospital This public institution became inoperative just when it was most needed—during the phase of emergency relief—because of structural damage and shifting and falling nonstructural components. Thanks to the preparedness of its personnel, the existence of emergency plans, and the evacuation, there were no casualties, and medical care was organized promptly in temporary facilities The hospital was subsequently renovated and underwent structural reinforcement

This experience prompted a reorganization of the health sector so that it would not be dependent on the services of one "mega-hospital" of 400 beds or more. In an effort to decentralize hospital care, four new health centers with 100 beds each were constructed on the outskirts of the city.

Source PAHO/WHO EC.AC