
HOSPITAL DE NIÑOS
BENJAMIN BLOOM

4

Investment in Risk Reduction Measures

As a consequence of recent disasters, which have underscored the extreme vulnerability of the region, several governments have placed disaster prevention near the top of their political agendas. In the health sector, national authorities and subregional and international organizations are more aware of the importance of implementing firm mitigation policies, given the strategic role that health facilities play in the event of a disaster. However, this increased awareness has yet to materialize in a sufficient number of concrete measures, due to budgetary, bureaucratic, and political constraints.

The main challenge consists in awakening the interest of countries in incorporating prevention and mitigation measures when allocating resources for investments in infrastructure. A key problem with mitigation projects is the belief that they will significantly increase the initial investment, affecting eventual profits or health care budgets. This reticence by governments and the private sector alike is aggravated when financial resources are scarce or expensive, forcing mitigation projects down the list of priorities when it should be just the opposite: protecting significant investments requires high safety and performance standards.

A mitigation investment that increases the structural integrity of a hospital will increase total construction costs by no more than 1 or 2 percent.[9] If to this we add the cost of the nonstructural elements (which account for about 80 percent of the total cost of the facility), it is estimated that incorporating mitigation elements to the construction of a new hospital accounts for less than 4 percent of the total initial investment. Clearly, a vulnerability assessment will indicate the advisability of such a small marginal investment, if only as an alternative to expensive insurance premiums or replacement costs—all this without taking into account the human and social losses that are likely to occur if mitigation measures are not taken into account.[10]

On the other hand, a good architectural-structural design can actually reduce the costs entailed in protecting nonstructural elements. The quality of such a design will depend on the collective experience of the work group, how well coordinated it is, what the conditions of the site are like, and how amenable the client institution is to such a way of working and thinking.

Another important consideration regarding costs has to do with the infrastructure's nonstructural components. It should be noted that if protection measures are taken into account as early as the design stage, their cost will be much lower than if such measures are implemented during the construction stage or after the building has been completed. For instance, a power-cut in a hospital as a result of severe damage to a generator costing, say, US$50,000, could be prevented if seismic isolation devices for protecting the generator and fastenings to prevent it from tipping over are installed, at a cost of approximately US$250.[11]

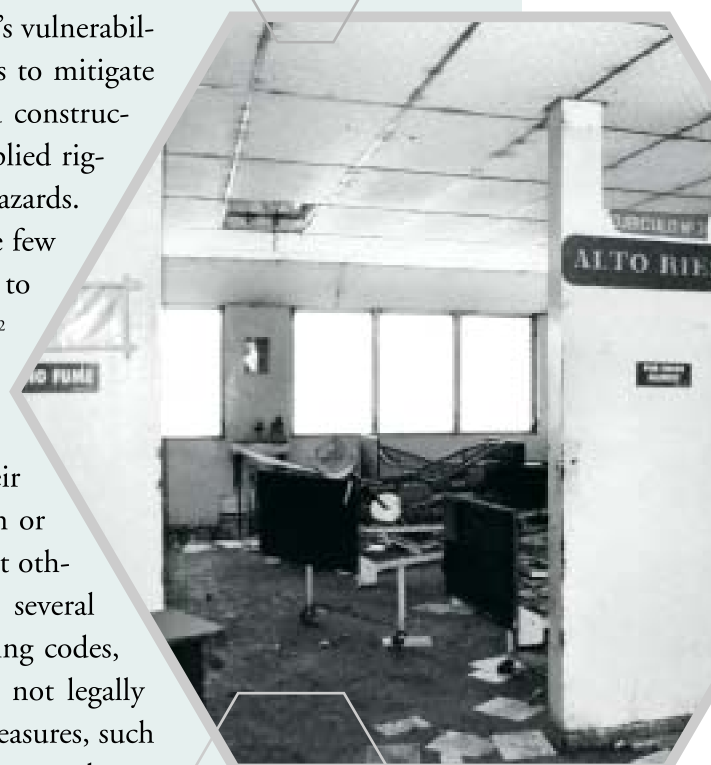
9 Pan American Health Organization (PAHO/WHO), *Principles of Disaster Mitigation in Health Facilities, .Mitigation Series*, Washington D.C., 2000.

10 Pan American Health Organization (PAHO/WHO), *Proceedings, International Conference on Disaster Mitigation in Health Facilities*, Mexico, 1996.

11 Pan American Health Organization (PAHO/WHO), *Guías para la mitigación de riesgos naturales en las instalaciones de la salud en los países de América Latina*. Washington, D.C., 1992.

5

Policies and Regulations



With rare exceptions, policies do not reflect the region's vulnerability to natural disasters, nor do they embody measures to mitigate this vulnerability. Land-use management policies and construction codes remain generally inadequate or are not applied rigorously enough in most places exposed to natural hazards. Policies concerning infrastructure, meanwhile, allocate few resources to basic maintenance—affecting resiliency to natural hazards and increasing the overall level of risk.[12]

The main obstacle to building codes' effectiveness as a tool for disaster mitigation is their actual application. Some countries in the region have not developed their own regulations, but have, instead, adopted European or U.S. standards that do not match local conditions. But others, such as Colombia, Costa Rica, Mexico, and several Caribbean countries, which have developed outstanding codes, do not always enforce them, either because they are not legally required or because oversight is lax. Similarly, other measures, such as land-use restrictions in hazardous areas, depend not only on whether the laws have "teeth" but on the institutional capacity to monitor their application.

When it comes to hospitals and other essential facilities, experience shows that the most likely impact of a disaster is not structural, but functional collapse. Effective preventive maintenance programs can

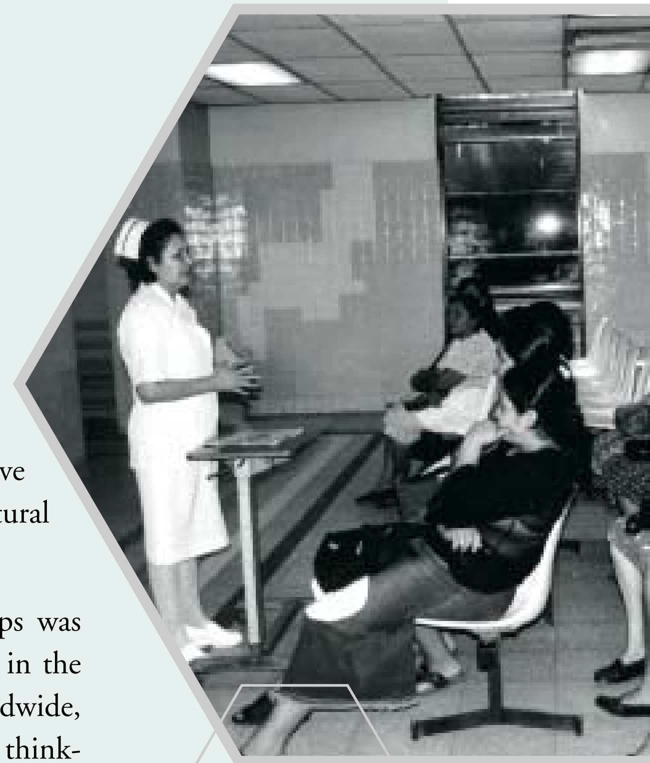
12 Inter-American Development Bank (IDB), Facing the Challenge of Natural disasters in Latin America and the Caribbean: An IDB Action Plan, Washington, D.C., 2002.

alleviate this problem. Maintenance, as a planned activity, not only reduces the degradation of the facilities but can also ensure that public services such as water, gas, and electricity, and nonstructural components such as detailing, roofs, doorways, etc., continue to function properly during an emergency. The cost for preventive maintenance is not high if seen as part of the normal operating budget of a facility.[13] The importance of preventive maintenance as a vulnerability reduction measure cannot be over-stated; the incorporation of such preventive measures can ensure the fulfillment of the performance objective chosen during the preliminary design stage.

13 Pan American Health Organization. *A World Safe from Natural Disasters: The Journey of Latin America and the Caribbean.* Washington, D.C. PAHO/WHO, 1994. www.paho.org/English/Ped/ws-chapter6.pdf.

6

Training and Education



The design of a hospital is a joint responsibility of the architects and engineers involved. More specifically, it is imperative to underscore the physical relationships between architectural forms and seismic-resistant structural systems.

It would be ideal if an understanding of these relationships was among the intellectual features of all professionals involved in the design of health facilities in high-risk areas. Regrettably, worldwide, educational methods and practices do not foster this way of thinking, since future architects and engineers are educated separately and often practice their skills in relative isolation from one another.

It is likewise vital to promote the inclusion of disaster mitigation in all training programs related to the construction, maintenance, administration, financial management, and planning of health facilities, as well as of water and sanitation systems, power utilities, and communication systems, among others.

When it comes to strategies for dealing with the potential shortage of specialists with experience in hospital design at the local level, several options may be considered: for instance, establishing strategic alliances between national and international business groups or between the public and private sectors, or including concrete requirements to this effect in “turn-key” tender specifications. Such approaches would have the added advantage of contributing to building national technical capacity.

7

The Role of International Organizations in the Promotion and Funding of Mitigation Strategies

In the field of risk reduction in hospitals and other health facilities, the Pan American Health Organization (PAHO) has worked actively with the countries of the region to assess and reduce the vulnerability of such facilities to disasters and to summon the political will of their health authorities. It has also promoted the dissemination of key information and the technical training of relevant professionals. In the early 1990s, PAHO/WHO (www.paho.org) launched a project aimed at engineers, architects and maintenance supervisors in hospitals, as well as policymakers and decision-makers at various administrative levels. Its chief objective was to raise their awareness concerning the need of investing in the protection, maintenance and retrofitting of existing health facilities, as well as of designing and building new infrastructure based on specific criteria for reducing and mitigating the impact of natural hazards. As part of this initiative, PAHO has produced a series of training materials and launched several pilot projects; it has also supported vulnerability assessments of hospitals in many countries in the region.

In 1999, within the framework of the International Decade for Natural Disaster Reduction (IDNDR, www.unisdr.org), the countries in the Region set up the Inter-American Committee on Natural Disaster Reduction, under the oversight of the Organization of American States (OAS, www.oas.org). The Committee is entrusted with developing strategic initiatives, and pays special attention to reducing the vulnerability of Member States.

At the regional level, institutions such as the Caribbean Disaster Emergency Response Agency (CDERA, www.cdera.org) or the Central American Coordination Center for Natural Disaster Prevention (CEPREDENAC, www.cepredenac.org) strive to promote international cooperation, technical assistance and the exchange of information for disaster prevention. The United Nations Economic Commission for Latin America and the Caribbean (ECLAC, www.eclac.cl) also plays a significant role in the field, particularly thanks to its experience in assessing the economic impact of natural disasters.

The World Bank and the Inter-American Development Bank (IDB, www.iadb.org) both exemplify how prevention and mitigation are becoming increasingly important in the funding of disaster-related reconstruction projects. The World Bank is the largest global provider of financial aid for disaster reconstruction, and it is taking steps to incorporate vulnerability reduction as one of the key components of its poverty reduction efforts.[14] From 1980 until 2000, it disbursed a total of US$2.5 billion for mitigation projects in Latin America alone.

At the institutional level, the World Bank's Disaster Management Facility (DMF, www.worldbank.org/dmf), established in 1998, strives to play a proactive leadership role in disaster prevention and mitigation through training, consultancies, and forging links with the international and scientific community in order to promote disaster reduction efforts.[15] To achieve these goals, the World Bank has decided to focus its efforts on the following tasks:

- Promote the establishment of sustainable development policies aimed at reducing the losses caused by natural disasters;
- Encourage among member countries the assessment of risks and potential losses, a cost-benefit analysis of risk management, and their use as inputs for planning and budget allocation;

14 Inter-American Development Bank, "Preparatory Group Meeting on Natural Disasters: Disaster Prevention and Risk Reduction" (Working Paper), Inter-American Committee on Natural Disaster Reduction (IANDR), Washington, D.C., 2001.

15 http://www.worldbank.org/dmf/.

- Encourage research on how natural disasters and disaster mitigation impact on long-term socioeconomic development, as well as research on how cost sharing and cost recovery affect mitigation;
- Incorporate risk management into member countries' economic strategy programs as an integral component of national development planning;
- Raise awareness of the importance of disaster mitigation, emphasizing its economic and social benefits, and search for solutions for existing constraints;
- Incorporate mitigation in the design of development projects, with the ultimate goal of making it an intrinsic part of every project. In short, the goal is for mitigation to be a standard part of the quality-auditing process within the project cycle. As part of this effort, the Prevention Unit has produced an information toolkit for World Bank personnel. The kit includes guidelines and examples of disaster mitigation and prevention projects, with a view to disseminating their adoption at the institutional level. It also provides training and technical assistance to various departments of the World Bank itself.

One of the coalitions that emerged from such mitigation promotion efforts by the World Bank was the ProVention Consortium (www.proventionconsortium.org). Made up of governments, international organizations, academic institutions and representatives of the private sector and civil society, its mission is to support developing countries in reducing the risk and the social, economic and environmental impact of natural and technical disasters, particularly among the poorest sectors of the population.

The IDB has also been proactive in this area. In 1999, it adopted a new policy aimed at placing disaster prevention near the top of the development agenda and applying a more integral and preventive approach to risk reduction and recovery. The IDB's policy, currently under review to expand and strengthen its objectives and fields of action, contemplates assigning top priority to vulnerability reduction measures and providing financial resources to the region for disaster prevention and mitigation and capacity-building for improved risk management.

The IDB has committed itself to supporting Member States in the adoption of integral risk management plans by means of the following actions:[16]

- Establish new **financial mechanisms** (loans, or refundable and non-refundable technical cooperation services) to help countries undertake and strengthen disaster prevention and risk management actions;

- Engage in a **dialogue with member countries** on issues such as risk assessment, risk management strategies, and the use of available IDB in-struments for financing investments related to natural disasters;

- Incorporate **risk reduction in the project cycle**, including risk analysis and reduction in programming and in project identification, design, implementation and evaluation. As part of this process, a series of sectoral checklists for disaster risk management are being developed to support the drafting of projects in the various sectors;

- Identify **focal points for disaster management** at the institutional level in order to support countries in preparing risk reduction programs and coordinating prevention and response activities;

- Build **partnerships** for the establishment of an integrated information and response network that can assist in coordinating the preparation of pre-investment studies, as well as investing in prevention and reconstruction and establishing interagency response protocols.

16 Inter-American Development Bank (IDB), *Facing the Challenge of Natural Disasters in Latin America and the Caribbean: An IDB Action Plan*. Washington, D.C., 2002.

Annex I

Effects of natural disasters

Type of disaster	General effects	Effects on infrastructure
Earthquakes	Tremors and cracks Landslides Liquefaction Underground settling and rock falls Avalanches and landslides Changes in underground water courses Fires	Damage to constructions Diverse damage in roads, bridges, dikes and channels Broken ducts: pipes, posts and wires damage to dams, overflow of rivers causing local floods Sinking of structures and buildings Deterioration of underground constructions Destruction and damage to urban infrastructure (networks, streets, equipment and furniture) Fires
Hurricanes, typhoons and cyclones	Strong winds, both steady and gusts Floods (due to rain and swollen and overflowing rivers)	Damage to buildings Impact-damaged, broken and fallen power distribution lines, especially overhead Damage to bridges and roads due to landslides, avalanches and mudslides
Drought	Drying and cracking of the earth and loss of vegetation Exposure to wind erosion Desertification	Does not cause major losses to infrastructure
Floods	Erosion Water saturation and destabilization of soils, landslides Sedimentation	Loosening of building foundations and piles Burial and slippage of constructions and infrastructure works Blockage and silting of channels and drains

Continue

Effects of natural disasters

Type of disaster	General Effects	Effects on infrastructure
Tsunamis	Floods Salinization and sedimentation in coastal areas Contaminated water and water table	Destroyed or damaged buildings, bridges, roads, irrigation and drainage systems
Volcanic eruptions	Fires, loss of plant cover Deposit of incandescent material and lava Deposit of ash Deterioration of soils due to settling of air-borne chemicals Landslides, avalanches and mudslides Liquefaction Melting ice and snow, avalanches	Destroyed buildings and all types of infrastructure Collapsed roofs due to ash deposits Burial of buildings Fires Affect on channels, bridges and overhead and underground conduction and transmission lines

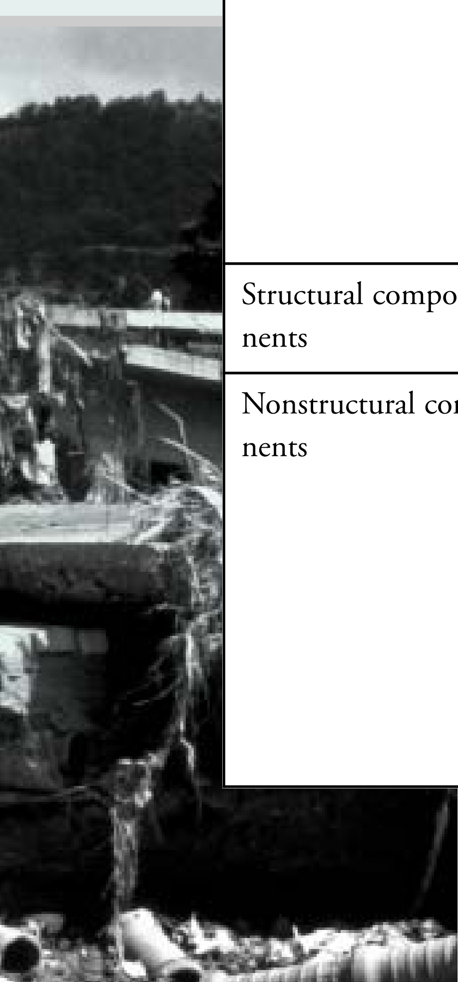
Source: Adapted from Frederick C. Cuny (1983), *Disasters and prevention*, Oxford University Press, New York.

Annex II

Glossary of key terms

Concepts of a general nature are defined below. Definitions of more specific concepts are included in the relevant chapters of the Guidelines for Vulnerability Reduction in the Design of New Health Facilities.

Natural hazard	An event of natural origin and sufficient intensity to cause damage in a particular place at a particular time.
As-built report	Set of documents prepared for project managers and the professionals involved in regional and local risk assessment. The documents include contractual documents, the design of the project, construction and inspection procedures, applicable codes and standards, certificates of component safety, final plans for the structure, its components and protection systems, and certificates of compliance with project specifications.
Structural components	Elements that are part of the resistant system of the structure, such as columns, beams, walls, foundations, and slabs.
Nonstructural components	Elements that are not part of the resistant system of the structure. They include architectural elements and the equipment and systems needed for operating the facility. Some of the most important nonstructural components are: architectural elements such as façades, interior partitions, roofing structures, and appendages. Nonstructural sys-tems and components include lifelines; industrial, medical and laboratory equipment; furnishings; electrical distribution systems; heating, ventilation and air conditioning systems; and elevators.



Structural detailing	A set of measures, based on the theoretical and empirical experience of the various participating disciplines, for protecting and improving the performance of structural components.
Nonstructural detailing	A set of measures, based on the theoretical and empirical experience of the various disciplines, aimed at protecting and improving the performance of nonstructural components.
Tender documents	Legal documents that stipulate the characteristics of the design or building contract or contracts (parties involved, financial amounts, deadlines, forms of payment, etc.) and the technical characteristics of the construction (general and detailed plans, structural and non-structural components, standards and codes that must be followed, specialized inspection requirements, recommended and unacceptable construction methods, etc.).
Specialized inspection	Activities aimed at ensuring that the requirements of the project are met in matters such as: quality of the labor force, the use of construction processes and materials of a quality commensurate with the goals of the project, the fulfillment of the provisions established in the standards and codes referenced in the contracts, and the procurement of component safety certificates and others.
Life protection	Minimal level of protection required in a structure to ensure that it does not collapse or otherwise endanger the lives of those who occupy a building during a natural disaster. It is the protection level most commonly used in the construction of health facilities.
Investment protection	The level that protects all or part of the infrastructure and equipment, although the facility itself ceases to function. This level of protection would ensure that the facility would resume operations in a timeframe and at a cost that is in keeping with the institution's capacity.

Operations protection	This protection objective for a facility aims not only to prevent injury to occupants and damage to infrastructure, but to maintain operations and function of the facility after a disaster. It is the highest protection objective: it includes life protection and investment protection.
Risk	Extent of the likely losses in the event of a natural disaster. The level of risk is intimately associated with the level of protection incorporated into the structure.
Critical services	Services that are life saving, involve hazardous or potentially dangerous equipment or materials, or whose failure may generate chaos and confusion among patients or the staff.
Resistant system	A structural system especially designed to withstand the impact of external forces. The structural system must be designed in such a way that its detailing is proportional to the protection objective chosen for the structure.
Protection systems	Devices and procedures aimed at providing safety to the structural and nonstructural components of the building and meeting the protection objectives.
Vulnerability	The likelihood of a facility suffering material damage or being affected in its operations when exposed to a natural hazard.


HOSPITAL
SAN JUAN DE DIOS

References

Bitrán, D. *Análisis de costo-efectividad en la mitigación de daños de desastres naturales sobre la infraestructura social*. CEPAL. Mexico City, 1988.

De Ville de Goyet, C. "Protección de sistemas de subsistencia vitales en la sociedad: mitigación de los desastres en los hospitales" International Decade for Natural Disaster Reduction (IDNDR), *Stop Disasters*, No. 14, July-August 1993.

Freeman , P. and L. Martin et al. *Catastrophes and Development: Integrating Natural Catastrophes into Development Planning.* Disaster Risk Management, Working paper Series 4. The World Bank. Washington, D.C., 2002.

Inter-American Development Bank (IDB), *Facing the Challenge of Natural disasters in Latin America and the Caribbean: An IDB Action Plan*, Washington, D.C., 2002.

Inter-American Development Bank, *Preparatory Group Meeting on Natural Disasters: Disaster Prevention and Risk Reduction* (Working Paper), Inter-American Committee on Natural Disaster Reduction (IANDR), Washington, D.C., 2001.

Keipi, K. and J. Tyson, *Planning and Financial Protection to Survive Disasters*, Inter-American Development Bank (IDB), Washington, D.C., 2002.

Kreimer A. and R. Gilbert. *Lessons from the World Bank's Experience of Natural Disaster Related Assistance.* Disaster Risk Management, Working Paper Series 2. The World Bank. Washington, D.C., 1999.

Kreimer A., M. Arnold, et al. *Managing Disaster Risk in Mexico: Market Incentives for Mitigation Investment*. The World Bank. Washington, D.C., 1999.

Pan American Health Organization (PAHO/WHO) / U.N. Department of Humanitarian Affairs, *Lessons Learned in Latin America on Disaster Mitigation in Health Facilities: Aspects of Cost-Effectiveness*, Washington, D.C., 1997.

Pan American Health Organization, PAHO/WHO. *A World Safe from Natural Disasters: The Journey of Latin America and the Caribbean.* Washington, D.C. PAHO/WHO, 1994. www.paho.org/English/Ped/ws-chapter6.pdf.

Pan American Health Organization, PAHO/WHO. *Guías para la mitigación de riesgos naturales en las instalaciones de la salud en los países de América Latina*, Washington, D.C., 1992.

Pan American Health Organization, PAHO/WHO. *Principles of Disaster Mitigation in Health Facilities*, Mitigation Series, Washington, D.C., 2000.

Pan American Health Organization, PAHO/WHO. *Principles of Disaster Mitigation in Health Facilities – Volume I: General Issues*, Washington, D.C., 1993.

Pan American Health Organization, PAHO/WHO. *Principles of Disaster Mitigation in Health Facilities – Volume II: Administrative Issues*, Washington, D.C., 1993.

Pan American Health Organization, PAHO/WHO. *Proceedings, International Conference on Disaster Mitigation in Health Facilities*, Mexico, 1996.

Sundnes K.O. and M. Birnbaum. "Health Disaster Management: Guidelines for Evaluation and Research in the Utstein Style." *Prehospital and Disaster Medicine*. Vol. 17 (Supp 3), 2003.

Other PAHO/WHO publications on disaster mitigation in health facilities

Guidelines for Vulnerability Reduction in the Design of New Health Facilities. 2004
New guide published in collaboration with the World Bank. Presents guidelines to protect the investment and operations in the design and construction of new health facilities.

Principles of Dissater Mitigation in Health Facilities. 2000
Provides the basis to prepare vulnerability studies and to apply practical mitigation measures in hospitals.
www.paho.org/english/dd/ped/fundaeng.htm

CD-ROM *Planeamiento Hospitalario para Desastres*
(in Spanish only). 2003
Self-teaching material for the organization and development of the course "Hospital Planning for Disasters."
www.disaster-info.net/planeamiento

CD-ROM *Disaster Mitigation in Health Facilities*. 2001
This disc contains the main training materials—books and PowerPoint presentations—that PAHO/WHO has on this subject.

These publications can also be consulted:

Lecciones aprendidas en América Latina de mitigación de desastres en instalaciones de salud ("Lessons Learned in Latin America in Disaster Mitigation in Health Facilities"—in Spanish only) www.paho.org/spanish/dd/ped/leccispa.htm.

International Conference on Disaster Mitigation in Health Facilities: Recommendations www.paho.org/english/dd/ped/mitrecs.htm.

Video: *Mitigation of Disasters in Health Facilities*. 1991

For more information, go to www.paho.org/disasters/