

- The design, construction, operation, and maintenance standards of water and sanitation systems, in general, do not include disaster prevention and mitigation criteria, or the implementation and control of the regulations are not enforced.
- In many service contracts, providers are exempted from their responsibilities in case of "acts of God or force majeure", including foreseeable natural events with a high probability of occurrence during the useful lifetime of the infrastructure or during the service delivery period.
- There is little awareness among authorities and no training is provided to the technical personnel and professionals of the sector.
- Vulnerability studies are often carried out, but their recommendations are not implemented.
- The high turnover of technical staff is a hindrance to develop the necessary expertise and impedes the continuation of vulnerability reduction projects.

In the case of rural systems, the problem is aggravated by the lack of integration with the rest of the sector, which is partly due to the dispersion of the systems. The limited training of the technical personnel and the lack of economic resources for adequate maintenance have caused, after a disaster, the abandonment or excessive time-consuming recovery of rural systems.

It should be highlighted, however, that in Latin America there are some successful experiences that, in spite of being isolated, they have proven that it is technical and economical feasible to reduce vulnerability of water and sanitation systems. Some of these experiences are:

- The incorporation of criteria for disaster prevention and mitigation into the design and construction standards of water and sanitation systems.
- Training and awareness raising of the personnel.
- Implementation of vulnerability analysis and strengthening of existing systems.



### **STRENGTHENING THE OROSI AQUEDUCT, COSTA RICA**

Since 1994, the Costa Rican Institute of Aqueducts and Sewerage (Instituto Costarricense de Acueductos y Alcantarillados, AyA) has been steadily implementing vulnerability reduction measures in the Orosi aqueduct, that supplies nearly 40% of the San José population, the capital of the country.

The investment to implement protective actions in this aqueduct during the last 10 years amounted to nearly 1.5 million dollars. The benefits of this work, however, are:

- The cost of the prevention and mitigation program accounted for less than 3% of the total system cost.
- Direct expenses of an eventual failure of the system would be about five times the program cost, without considering indirect costs as:
  - loss of human lives and properties in Orosi;
  - substantial reduction in the national production;
  - weakening of the institutional image, and
  - possible fines or lawsuits against the institution and its authorities.

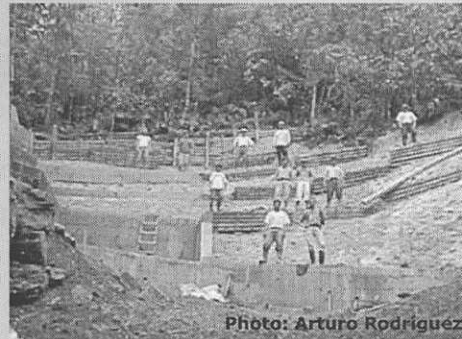


Photo: Arturo Rodríguez

### **SESSIONS II AND III: ESSENTIAL VULNERABILITY REDUCTION MEASURES IN DRINKING WATER SYSTEMS**

The common problems and existing initiatives for vulnerability reduction in drinking water systems led to the identification of essential measures to be implemented by different water and sanitation institutions, using the tools and experiences available in the Region.

To facilitate its implementation and follow-up, necessary actions were analyzed to be implemented in the following areas:

- national policies
- technical tools
- operation and maintenance
- human resources
- investment and financing
- new infrastructure
- multisectoral partnerships.



## **1. NATIONAL POLICIES**

- To include water and sanitation institutions in national, regional, and local initiatives for risk management (Civil Defense, National Emergency Commission, etc.).
- To establish sectoral strategies including integrated risk management with clear definition of the roles, functions, attributes, and responsibilities of the sector actors and institutions.
- To prepare a regulatory risk management framework that takes into account:
  - a conceptual framework defining the terms related to acceptable risk, force majeure, and act of God for each system, considering local conditions;
  - water quality standards and the minimum levels of service that should be provided to the population in emergency conditions;
  - integrated risk management in all the project stages (planning, design, construction, operation, and maintenance);
  - the strengthening of the technical and legal capability of regulatory entities to enable them to control and enforce the responsibilities assigned to the operating companies, and
  - the updating of standards based on lessons learned after the occurrence of disasters.
- To create a risk management unit within the structure of water and sanitation utilities.
- To favor the development of new systems based on land management plans that consider risk analysis.
- To include risk transfer Instruments, as insurance, in systems or components where vulnerability reduction is not possible.



### **RISK MANAGEMENT IN THE MEDELLÍN PUBLIC COMPANIES, COLOMBIA**

Since 1999, the Medellín Public Companies (Empresas Públicas de Medellín, EPPMM) have established the Risk Coordination of the Strategic Unit of Water Businesses (Coordinación de Riesgos de la Unidad Estratégica de Negocios de Aguas, UEN) within their organizational structure for aqueduct and sewerage services that depend directly on the management and sub-management offices.

The functions established for the Risk Coordination of the UEN include the following activities:

- ▷ risk identification and analysis;
- ▷ application and dissemination of risk management methodologies;
- ▷ design, documentation, and implementation of risk reduction projects, and
- ▷ development and implementation of emergency and contingency plans.



## **2. TECHNICAL TOOLS**

- To include risk management in design, construction, operation, and maintenance standards and criteria.
- To analyze the vulnerability and prepare emergency plans in the existing services, starting with those that are more exposed to threats.
- To carry out sectoral water and sanitation analyses including disaster prevention and mitigation.
- To develop indicators that show evidence of the suitability (cost-benefit ratio) of risk management programs.
- To use geographic information systems (GIS) currently used by water and sanitation utilities to include information on risk areas and the different threats they have to face.
- To disseminate, socialize, and update the emergency plans.

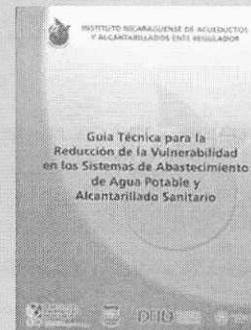


## THE NICARAGUAN AQUEDUCTS AND SEWERAGE INSTITUTE PREPARES RISK REDUCTION TOOLS

After the impact of the Hurricane Mitch and the evidence of the fragility of water and sanitation services and after implementing 28 vulnerability diagnoses in water systems, the Nicaraguan Aqueducts and Sewerage Institute (Instituto Nicaragüense de Acueductos y Alcantarillado, INAA), the regulatory entity of water and sanitation services, started the preparation of tools that will allow the operators of the services to reduce infrastructure vulnerability and attend emergencies.

The tools that INAA have prepared in recent years have contributed to the incorporation of risk management and specifically vulnerability reduction into the development of water and sanitation services in Nicaragua. The following tools should be highlighted:

- Guidelines for the preparation of environmental impact studies of drinking water supply and sewerage projects.
- General guidelines for the preparation of vulnerability analysis and emergency plans in drinking water and sewerage systems (G-05-03-INAA).
- Technical guidelines for vulnerability reduction in drinking water supply and sewerage systems.



## SECTORAL WATER AND SANITATION ANALYSIS IN LATIN AMERICAN AND CARIBBEAN COUNTRIES<sup>3</sup>

At the request of the countries, PAHO/WHO, jointly with national entities of the water and sanitation sector and international financial institutions, have carried out sectoral water and sanitation analyses in several countries of the Region.

These studies analyze relevant aspects of the sector, taking into account the historical, political, institutional, legal, technical, socio-economical, and administrative contexts, including environmental health. They are, therefore, a practical tool for planning and decision-making targeted at authorities and institutions.

The sectoral analyses identify problems, propose adequate solutions, set goals, and establish processes to strengthen national and local capabilities of the sector.

In this context, the most frequent natural hazards are part of the sector problems. Thus, the Nicaragua sectoral analysis includes a chapter on this issue. Based on this experience, criteria to analyze the sector exposure to natural hazards were included in the updated version of the methodological guideline and tools for the implementation of these sectoral analyses.



<sup>3</sup> <http://www.cepis.ops-oms.org/cepis/e/bvsaas.php>