Seismic Risk Mitigation in Cali (with emphasis on vital services)

The earthquake of 18 November 1991 on the Colombian Pacific coast and the earthquake in Paez, Cauca, on 6 June 1994 which, although it occurred over 130 kilometres from Cali, caused damage to the city's infrastructure, combined with historical and seismological knowledge, are fresh proof that the zone is the part of the country most at risk from seismic activity. Settlements can be severely affected, physically and functionally, by seismic phenomena.

An evaluation of seismic risk in the region was completed in 1992 with help and advice from the Swiss Disaster Relief Corps, the University of Geneva and the Swiss Seismological Service; it was carried out by the Observatorio Sismológico del Suroccidente (OSSO) at the Universidad del Valle, the Institute of Geoscience, Chemical and Mining Research (INGEOMINAS) and the Autonomous Regional Corporation of Valle del Cauca (CVC). A representation of the Disaster Mitigation Branch, UNDHA Geneva, was present when the results were presented. The results of phase I and the seismic assessment studies carried out under the Swiss/Colombian cooperation project, GERSCO, showed that more work was needed on the seismic risk to, and vulnerability of, the city. The consolidation of the Observatorio Sismológico del Suroccidente (OSSO) at the Universidad del Valle will help to buttress the work carried out in the city.

It was therefore agreed, in May 1992 at a meeting in Bogotá between Mr. D. Zupka (UNDHA), O.D. Cardona (DNPAD), and H. Meyer (Univalle OSSO), to make the first topic under phase II an assessment of the vulnerability of the city's vital services. Work plans were modified accordingly and the initial document redrafted to take in activities relating to the vulnerability of vital services, the updating and supplementing of the General Plan for Emergency Response, and the reduction of industrial and technological risks in the city.

1. Vulnerability of vital services

The National Department for Disaster Prevention and Relief (DNPAD) mustered participants for work on the seismic behaviour of vital services, distributing the report on phase I to institutions and arranging a number of sectoral and inter-institutional meetings. At that first meeting, the Town Planning Department, the Cali Municipal Business Association (EMCALI), the Local Emergency Committee and the Observatorio Sismológico del Suroccidente (OSSO), among other bodies, were represented. Their combined efforts gave rise to an agreement to press ahead with a study of the vul-

nerability of the public service infrastructure. This took place as follows:

The Town Planning Department drew up the institutional terms of reference and the detailed programme of work.

The Observatorio Sismológico del Suroccidente (OSSO) updated a study on seismic effects and soil characteristics, the vulnerability of elements exposed to risk and the second-order hazards that might affect vital services.

The Cali Municipal Business Association encouraged the establishment of working groups on the subject among the water and sewage, energy and telephone authorities.

In broad terms, the project sought to define a methodology which would encompass, among other things, evaluations of seismic hazard, vulnerability and seismic risk (see Ana Campos and Andrés Velásquez, *Evaluación de la Vulnerabilidad de Líneas Vitales de Cali*, Observatorio Sismológico del Suroccidente, Cali, 1993).

Given the complexity and extent of the city's water supply, sewage, telephone and energy systems, services were evaluated in stages, setting priorities and giving precedence to elements considered critical in view of their situation and physical characteristics.

Evaluation of seismic hazard

In assessing seismic hazard, it is of primary importance to consider not only the vibration of the soil but also concomitant hazards such as ground faulting (liquefac-

SANTIAGO DE CALI, CITY