

Summary of the

PLAN OF INTEGRAL MANAGEMENT OF DISASTER PREVENTION AND EMERGENCY RELIEF OF MANIZALES

This document summarizes the main aspects of an integral project of disaster prevention which has been undertaken by the city of Manizales in Colombia. The summary describes briefly the natural hazards of the city, the conception and philosophy of the project, the results obtained to the date, and the tasks that are aimed in the future.

Natural hazards in Manizales

Manizales is a city located in the Andean mountains, near the Circumpacific Belt, in the western part of Colombia. It has a population of 350.000 inhabitants and its economy depends on both industries and agriculture. It was founded in 1849, and in its short history it has been subjected to several disasters, derived from different sources. These are the following:

1.- Landslides. The medium-to-high level of precipitation, the high slope of the mountains, the softness of the soils and some human factors, have produced frequent landslides, which have caused hundreds of casualties.

A gubernamental office named Corpocaldas was created in 1977 in order to reduce the risk derived from this hazard by the means of civil engineering works.

2.- Earthquakes. Since the city is located in the zone of influence of the Circumpacific Belt, it is often subjected to Earthquakes of magnitudes up to 7.5 - 8 in the Richter scale. This have been cause of high economic losses which have exerted a great impact on the regional development.

For the recording of earthquakes, the city has four digital accelerometers, under the care of the Universidad Nacional, and one analogic accelerometer of the National Seismic Network.

3. Volcanic activity. The city is located near two active volcanos, those of Nevado del Ruiz and Cerro Bravo. The first is an active volcano, which caused the destruction of the city of Armero in 1985, and severe damage in the region around Manizales, specially in roads and bridges. The second is known to have activity in the cuaternary.

In the city a Vulcanic Observatory of the National Institute of Mines and Geology (Ingeominas) monitors the volcanic activity since 1985.

4.- Floods. This natural hazard is mainly expected near two rivers that flow in the north and the south of the city.

Philosophy of the Project

In order to cope with these hazards, an integral plan for disaster prevention in the city was conceived by the Majorship of the city, fostered by the National Bureau for Disaster Relief (ONAD) of the Presidency of the Republic.

The project aims to evaluate the natural hazards posed on the city in their geographical and historical occurrence, the vulnerability of the physical elements as well as that of the institutions and the population, and the expected risk obtained from the convolution of the above factors. The integral conception of the Project means that the risk derived from all the natural hazards posed on the city is to be evaluated, and that the technical results must be incorporated not only into the Development Plan, Building Code and Emergency Plan of the city, but also into the administrative routines of the City as customary activities, in order to update the information continuously.

The project has been designed in such a way that the direction of it depends on the Majorship, and the technical studies are done by the Universities of the city (Universidad Nacional and Universidad de Caldas), national offices (Ingeominas, Corpocaldas), local offices (Planeación Municipal), with the sponsorship of national offices (ONAD, Fondo Nacional de Calamidades) and foreign institutions (UNDRO). The results are translated into an "emergency language" and implemented by the Local Committee for Emergencies.

State of the project

The project has the following chapters:

- 1.- Evaluation of the natural hazards: earthquakes, landslides, floods and vulcanism.
- 2.- Evaluation of the physical seismic vulnerability.
- 3.- Evaluation of the vulnerability to fire risk.
- 4.- Evaluation of socioeconomic vulnerability.
- 5.- Calculation of total risk posed by the different hazards.
- 6.- Implementation of plans of contingency and municipal laws and provisions about the estimated risks.
- 7.- Educational spreading of the necessary knowledge to the population of the city.
- 8.- Reduction of the physical vulnerability of those elements subjected to the highest risk.

Till the date, important results have been obtained in several of the above items. Studies have been concluded on the local geology, the distribution and stress mechanisms of the geological faults, the landslide historical processes, the isoseismal distribution of previous earthquakes, the records of recent earthquakes and the geographical distribution of soil deposits. In regard to vulnerability evaluation, a study has been concluded recently on the probabilistic earthquake vulnerability of houses and buildings, and another one about socioeconomic vulnerability of the different neighborhoods of the city. Some of the results have been already included in the Development Plan and the Building Code of the city.

The studies that are on the way at the present are the following: neotectonism of the identified faults, evaluation of regional earthquake hazard and dynamic parameters of the soil deposits. In the next future, the project aims to undertake the following studies: vulnerability of lifelines exposed to earthquakes; analysis of total risk for the different hazards; seismic microzonation; design of the retrofitting of essential buildings.

Manizales, April 28th, 1993.