

WCDR

**SESSION 1.5: Disaster Reduction Indicators:
Safer critical facilities**

**A HOSPITAL IN THE
CONTEXT OF A
SUSTAINABLE CITY**


Julio KUROIWA

**Scientific Advisor to Peru's Civil Defense.
Professor emeritus Nat. Univ. of Engg. Lima-PERU**

HOSPITALS

A hospital - health care facility - has been upgraded from essential to very essential in the context of Sustainable City Program - SCP - being implemented in Peru since 1998.

A Sustainable City is:

- **Safe.** 
- **Orderly.**
- **Healthy.**
- **Culturally and Physically attractive**
- **Efficient in its functioning and development with no negative impact on the environment or on cultural historic heritage.**
- **Governable.**
- **Competitive.**

URBANISM & DEVELOPMENT

The rapid population growth, the process of urbanization and the economic globalization are creating cities:

- **Hostiles.**
- **Producer of high % of GNP.**
- **Inefficient and no competitive.**
- **Increasingly risky.**



ISSUES IN URBAN SAFETY

- **Influence of site characteristics.**
- **Urban Planning**
 - **Lifelines systems**
 - **Essential facilities**
 - **Urban fire**
- **Vulnerability of constructions.**

SUSTAINABLE CITIES PROGRAM

First stage (SCP – 1S)

It is focused in SC first attribute:

SAFETY

Damage survey on earthquakes, tsunamis, hurricanes, etc., made in the Americas during the last 35 years have shown strong influence of the site characteristics.

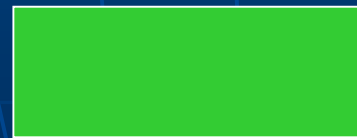
Land-use plan is made on cities & their expansion areas. They are divided into sectors of different hazard degree and are the results of earth science & engineering investigations.



Very high



High

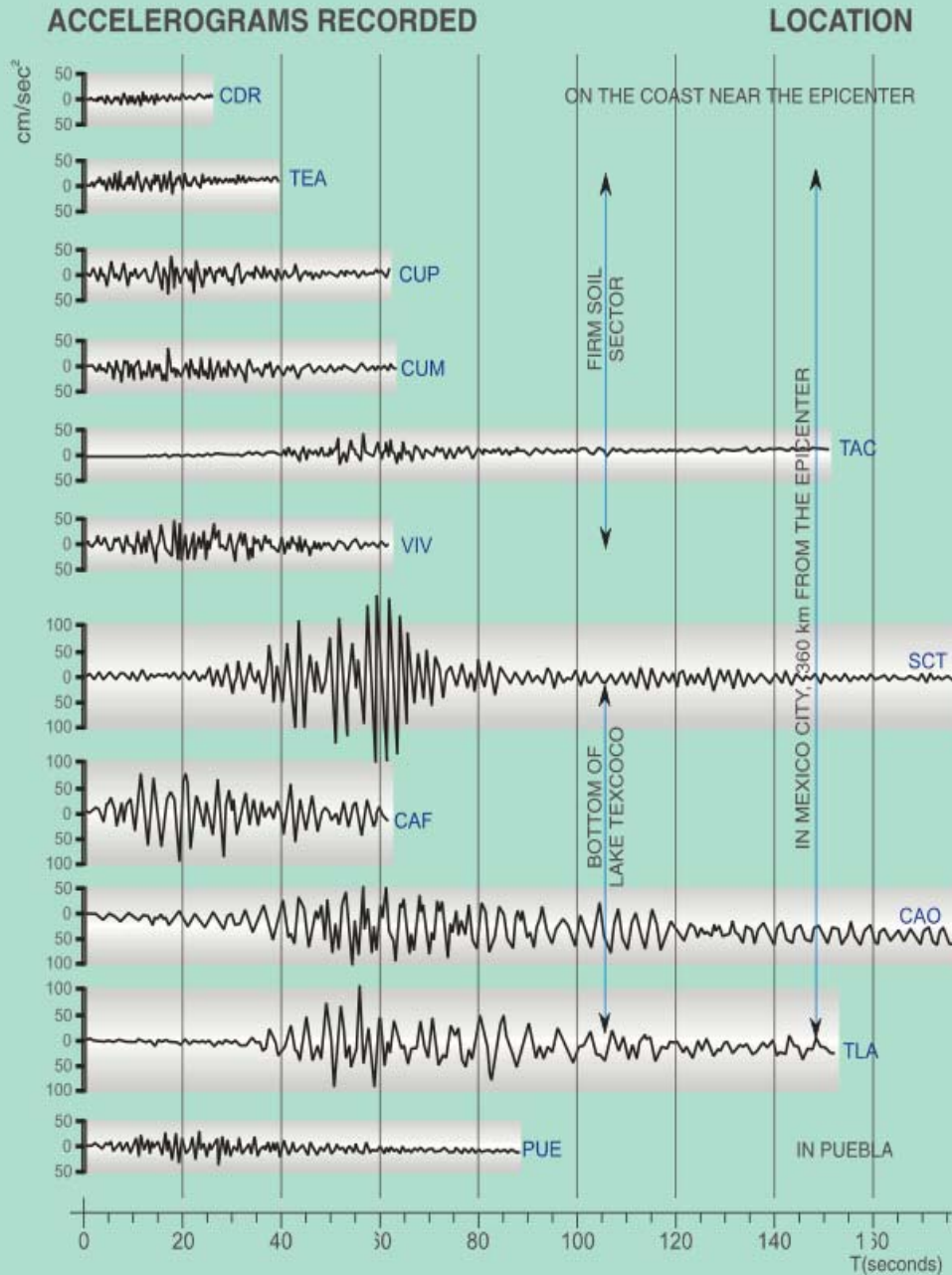


Medium



Low

EARTHQUAKE IN MEXICO, September 19, 1985



SITE INFLUENCE

SEISMIC INTENSITY & LOCAL CONDITIONS (Instrumental Records)

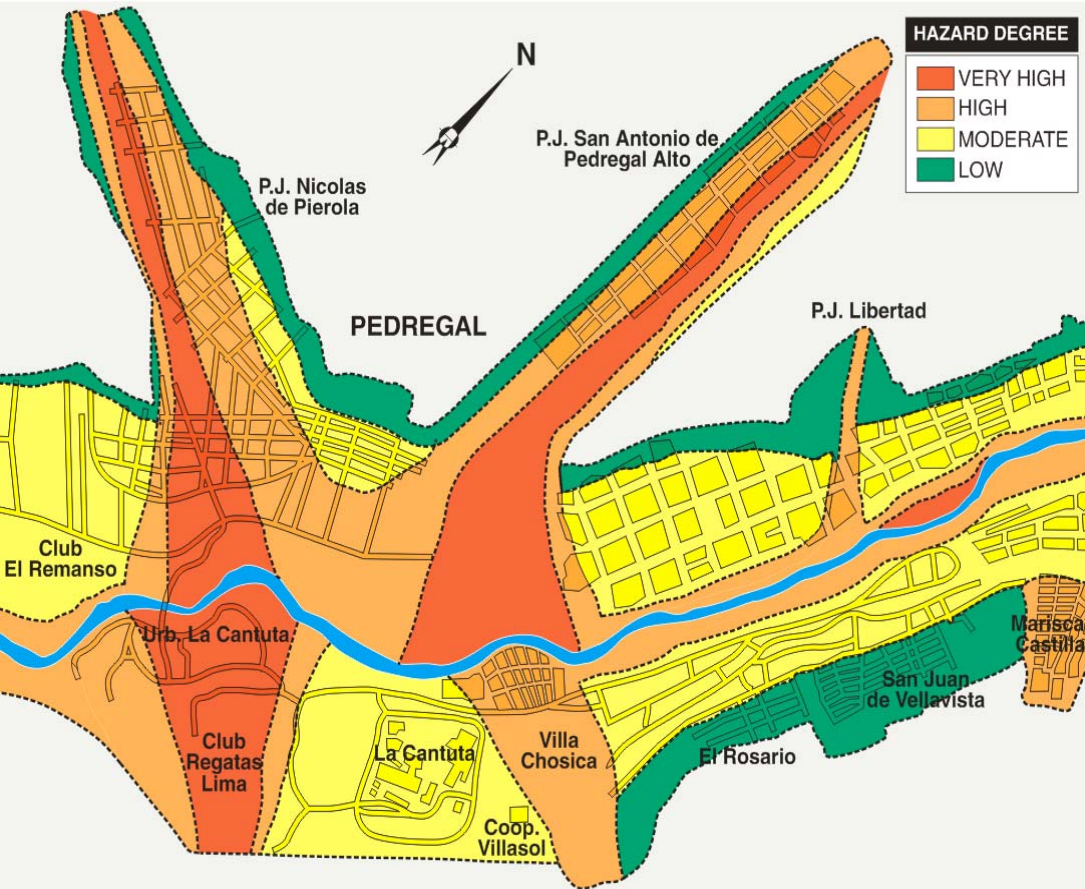
1985, Mexico earthquake



SITE INFLUENCE CYCLONS / FLOODINGS

Antigua Ocotepeque, Honduras

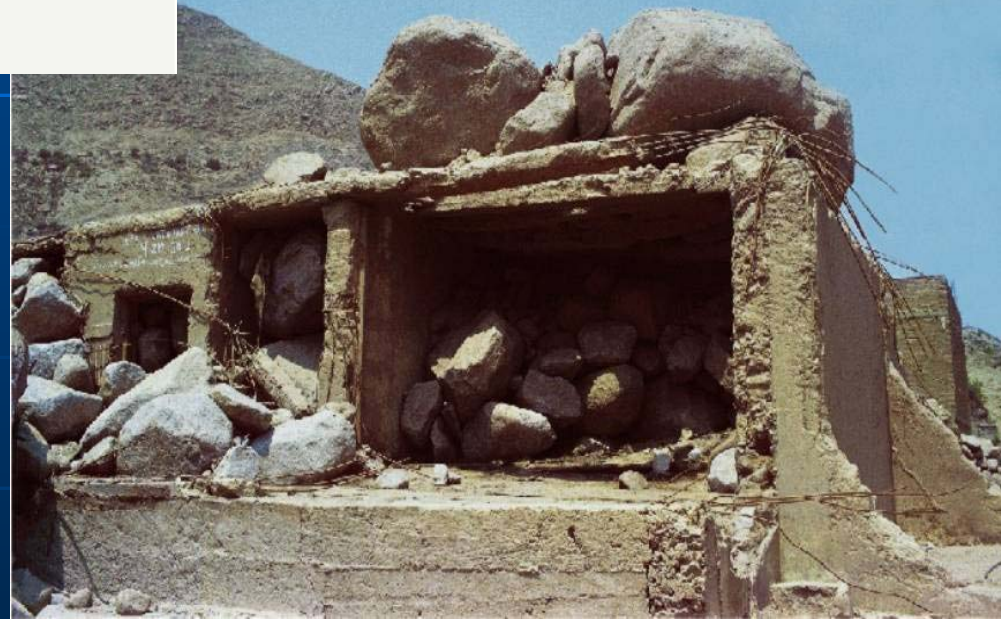




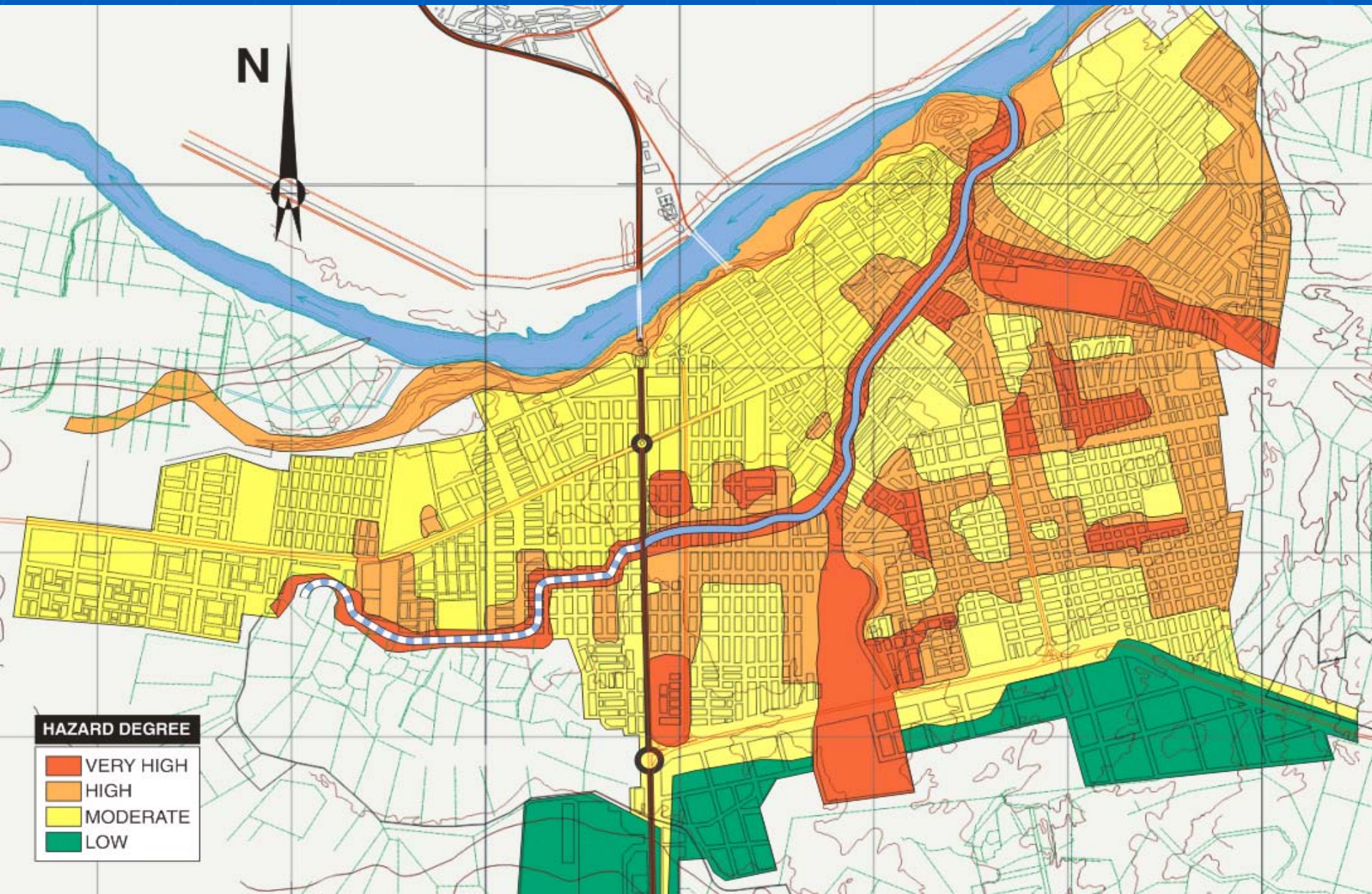
SITE INFLUENCE

GEOLOGICAL - CLIMATIC

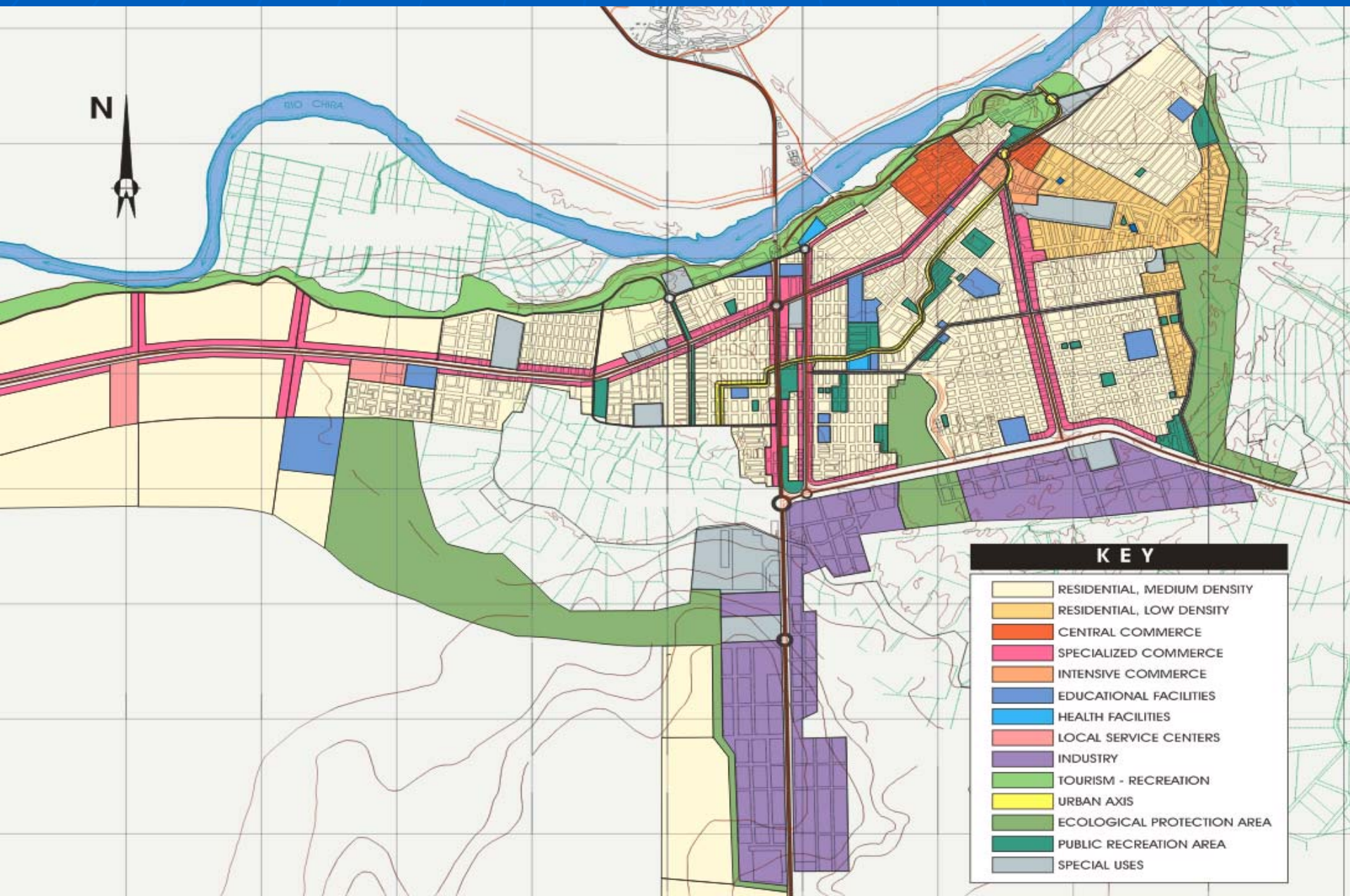
Pedregal - Chosica - Peru, 1987



SULLANA HAZARD MAP



LAND-USE PLAN OF SULLANA CITY



KEY

	RESIDENTIAL, MEDIUM DENSITY
	RESIDENTIAL, LOW DENSITY
	CENTRAL COMMERCE
	SPECIALIZED COMMERCE
	INTENSIVE COMMERCE
	EDUCATIONAL FACILITIES
	HEALTH FACILITIES
	LOCAL SERVICE CENTERS
	INDUSTRY
	TOURISM - RECREATION
	URBAN AXIS
	ECOLOGICAL PROTECTION AREA
	PUBLIC RECREATION AREA
	SPECIAL USES

La Quebrada, 1983



**Example of
Mitigation work,
1998**

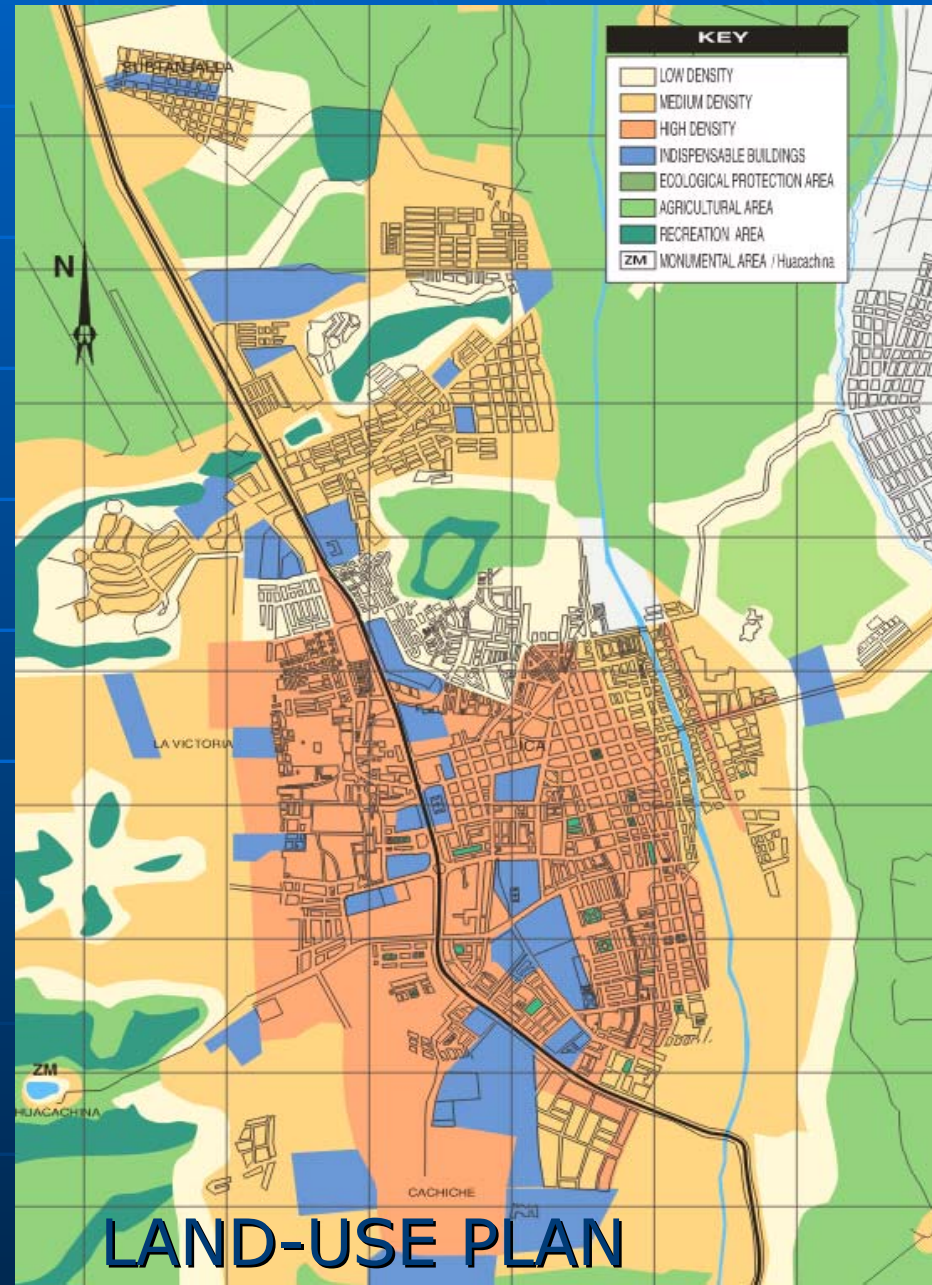
NEW BRIDGE PANAMERICAN HIGHWAY / LA QUEBRADA (Mitigation work)



CITY OF ICA (PERU)



HAZARD MAP



LAND-USE PLAN

SUSTAINABLE CITIES PROGRAM IN PERU 1998 - 2004



- 1 Tumbes, Aguas Verdes.
- 2 **Talara, Sullana, Paita, Chulucanas, Huancabamba, Sechura, Ayabaca, Castilla, Catacaos, Piura.**
- 3 **Chiclayo, San Jose, Pimentel, Eten, Puerto Eten, Santa Rosa, Monsefu, Reque, Lambayeque, Ferreñafe.**
- 4 Trujillo
- 5 **Chimbote, Huarney, Carhuaz, Recuay, Catac, Ticapampa, Huaraz.**
- 6 **Cañete, Cerro Azul, San Luis, Imperial, Nuevo Imperial, Quilmana, Lunahuana, Asia, Mala, San Antonio.**
- 7 **Ica, San Jose de los Molinos, Tinguña, Parcona, Palpa, Nasca, Chincha, Pisco.**
- 8 **Arequipa, Camana, Cocachacra, Punta de Bombon, Dean Valdivia, Chuquibamba, Carveli, Aplao, Callalli.**
- 9 Omate, Puquina, Moquegua, Ilo.
- 10 Tacna, **Locumba, Tarata, Candarave.**
- 11 **Ayacucho, Huanta.**
- 12 **Cusco, Ollantaytambo, Urubamba, Calca, Pisac, Sicuani.**
- 13 **Puerto Maldonado, Iberia, Iñapari.**
- 14 **Cajamarca, Baños del Inca, Jaen.**
- 15 **Moyobamba, Tarapoto.**
- 16 Iquitos.

42 cities & towns (in bold letters) with completed studies and municipal ordinances unanimously approved.

COMPLEMENTARY STRATEGIES FOR THE DEVELOPMENT OF SC (Comprehensive Methodology)

- **Integrated Urban Infraestructure Development – IUID.**
- **Microzonation Methods & Techniques.**
- **Urban Fires Control.**
- **Protection of Public Services - Lifelines:
(water, transportation, etc.)**
- **Essential facilities: (Hospitals, schools,
etc).**

LIFELINES

During strong earthquakes:

➤ **USA & Japan**

Critical elements: Water pipes & elevated highways.

➤ **IRAN & PERU**

Critical elements: Water pipes, bridges & roads interruption in mountainous areas.

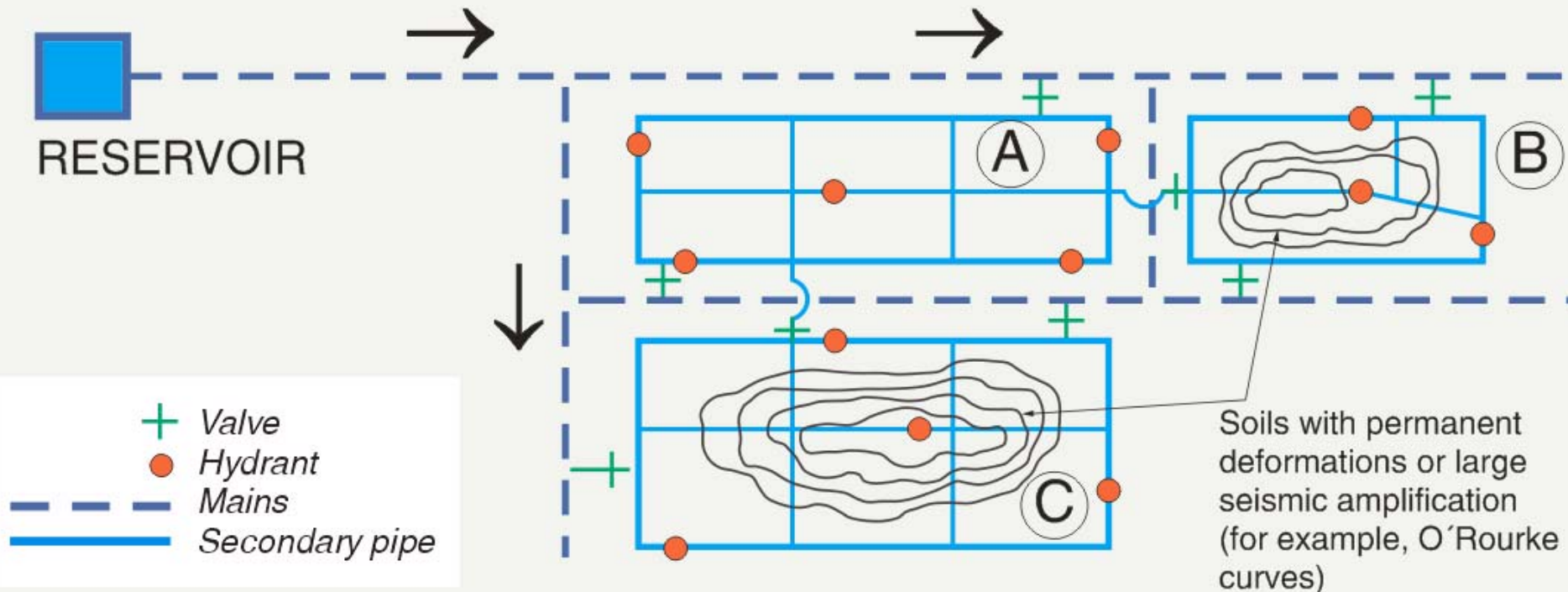


Failure of an elevated highway
in San Francisco, CA. Loma
Prieta EQ 1985

Elevated highway damaged during
the Hanshin – Kobe 1985 EQ.
(Photo Nakanihon Air Service Co. Ltd.)



DRINKING WATER PIPES



Designed by blocks to isolate broken pipes

LIFELINE & TSUNAMIS

CHARACTERISTICS

0,00 m.a.s.l.

Flood area with severe damage

Flood area with moderate or minor damage

OCEAN

USES

Do not locate any type of building here

For recreation and marine works

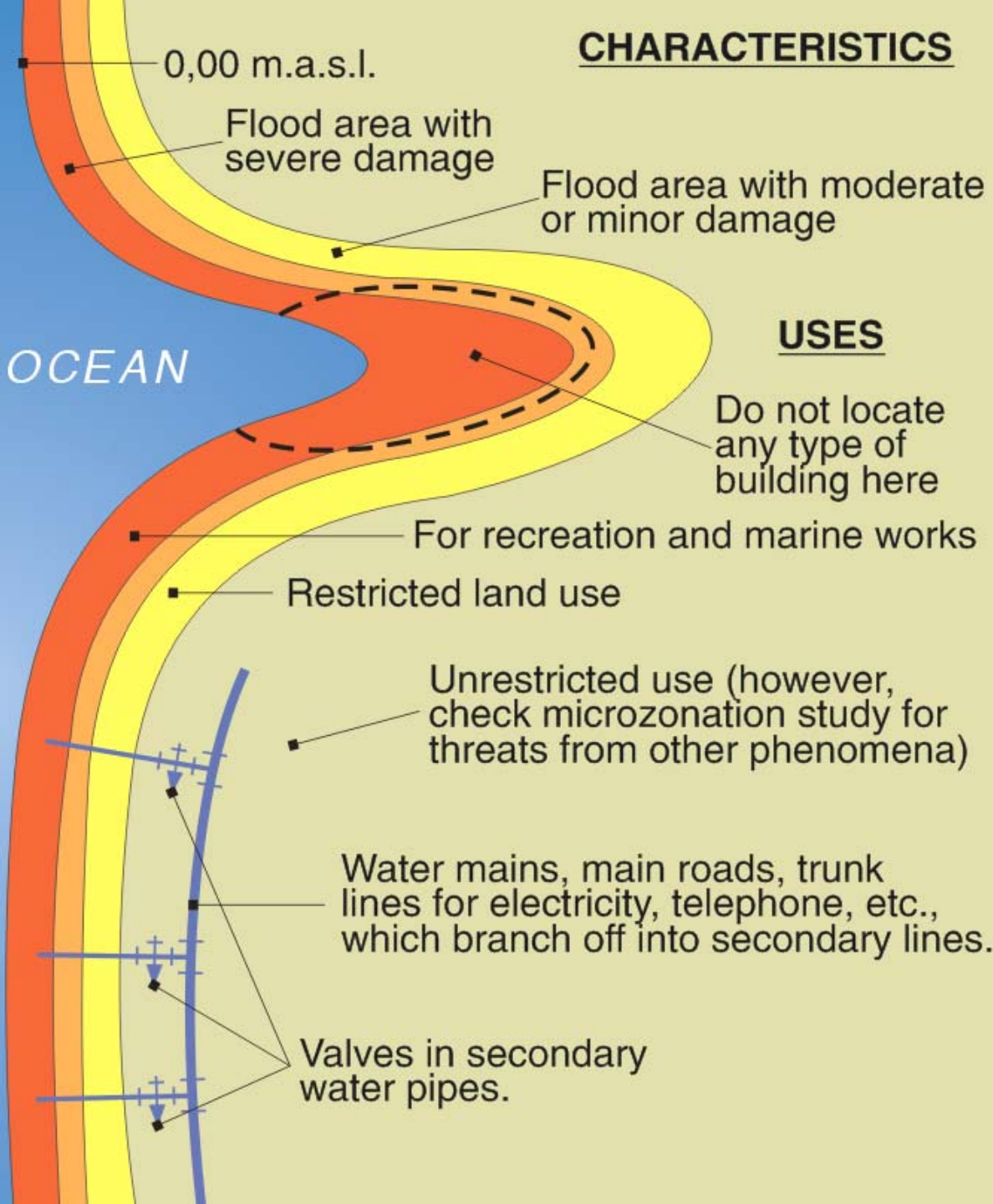
Restricted land use

Unrestricted use (however, check microzonation study for threats from other phenomena)

Water mains, main roads, trunk lines for electricity, telephone, etc., which branch off into secondary lines.

Valves in secondary water pipes.

Land-use plan



ESSENTIAL FACILITIES IN THE EVENT OF DISASTERS

- Hospitals ✓
- Fire stations
- Police stations
- Schools

Play a crucial role during disasters.

Hospitals have been classified as very indispensable facilities in the SCP based on the 1985 Mexico earthquake experience.



DAMAGED HOSPITALS

**Mexico city's
General Hospital,
1985**

**Out Patients
Department, Bloom
Hospital. San
Salvador, ES, 1986**



VERY INDISPENSABLE FACILITIES HOSPITALS

Even in the case of extreme events their services should continue without interruption. This depends on:

- Structural damage threatening their stability.**
- Non-structural damage preventing normal operation, and**
- Organizational and administrative management unaffected by intense events and able to respond efficiently to the emergency.**

LIFELINES & ESSENTIAL FACILITIES

- **Need to be developed (conception, site selection, design, etc.) by top professionals with recognized expertise and honorability.**
- **The processes of professional selection need to be public and transparent. Responsible and respected media can make an important contribution by throwing light on these processes.**
- **Case of dishonesty that have caused heavy losses.**

SUSTAINABLE CITIES A GLOBAL PROGRAM?

- **The UN 2002 Johannesburg Summit on Sustainable Development Action Plan considers SCP a priority action for Latin America and the Caribbean for the next 10 years. It was proposed by the author via Internet in its preparatory phase.**
- **Do you think that SCP is worth being globalized?. If you agree, please support this initiative.**

THANKS