

Making an Institutional System for Disaster Preparedness  
and Risk Mitigation



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**FOREWORD**

Considering that all participants of the Disaster Management and Development Workshop, that is organised by the Oxford Polytechnic Disaster Management Centre during summer of each year, should write a paper (project) during their stay, the author as a participant of the 1991's workshop decided to attempt to describe a model and an example of an institutional organisation to cope disasters. However, it is not a formal paper, may be it could be an outline or a speculative scheme that include, as example, the experience of Colombia, where the author has been working during the last years.

**INTRODUCTION**

According to the criteria of many disaster preparedness experts and planners it is practically impossible to reduce the impact of the disasters without a strong institutional organisation and coordination. Still, it is no easy to find literature about how that institutional organisation should be structured and how it could work.

This document attempt to define a general structure, considering the existing entities and authorities of a country, in order to face disasters taking into account that each entity must do, surely, several activities relate to disaster preparedness and risk mitigation according to its role.

In order to show how these ideas can be implemented, like an example, the colombian experience is ilustrated. Thus, this document expect to be useful to who needs somenthing of theory and a lot of practice.

**THE SYSTEM**

As mentioned previously, disaster peparedness and risk mitigation are the combination of many different activities related to several disciplines and sectors. For that reason, it is necessary to think of a system of institutions that can carry out a diversity of funtions, such as technical and scientific work, planning, education, emergency response, and work with community.

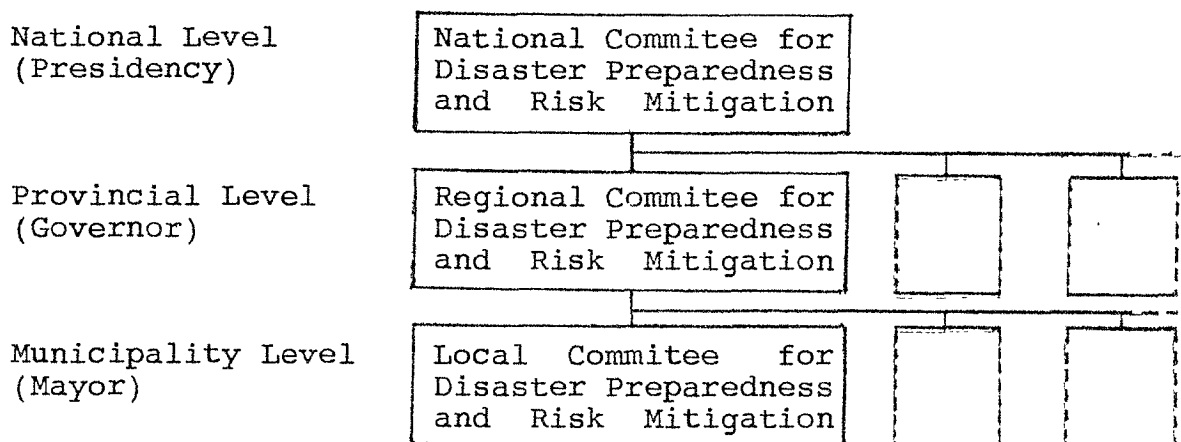
It is very important to remark that the different entities or institutions involved in the latter activities always exist, therefore it is not necessary to create new institutions, although probably, it can be required to define a co-ordinator with enough authority in the top level of the political structure

to avoid duplications and losing of resources. Besides, it is very important to take into account the different sectors involved: agriculture, health, education, housing, industry, mining, army, communications, public works, electricity, and so on. All entities related to them must be concerned with disasters preparedness and risk mitigation, because any way disasters can strike one or several sectors of the country organisation.

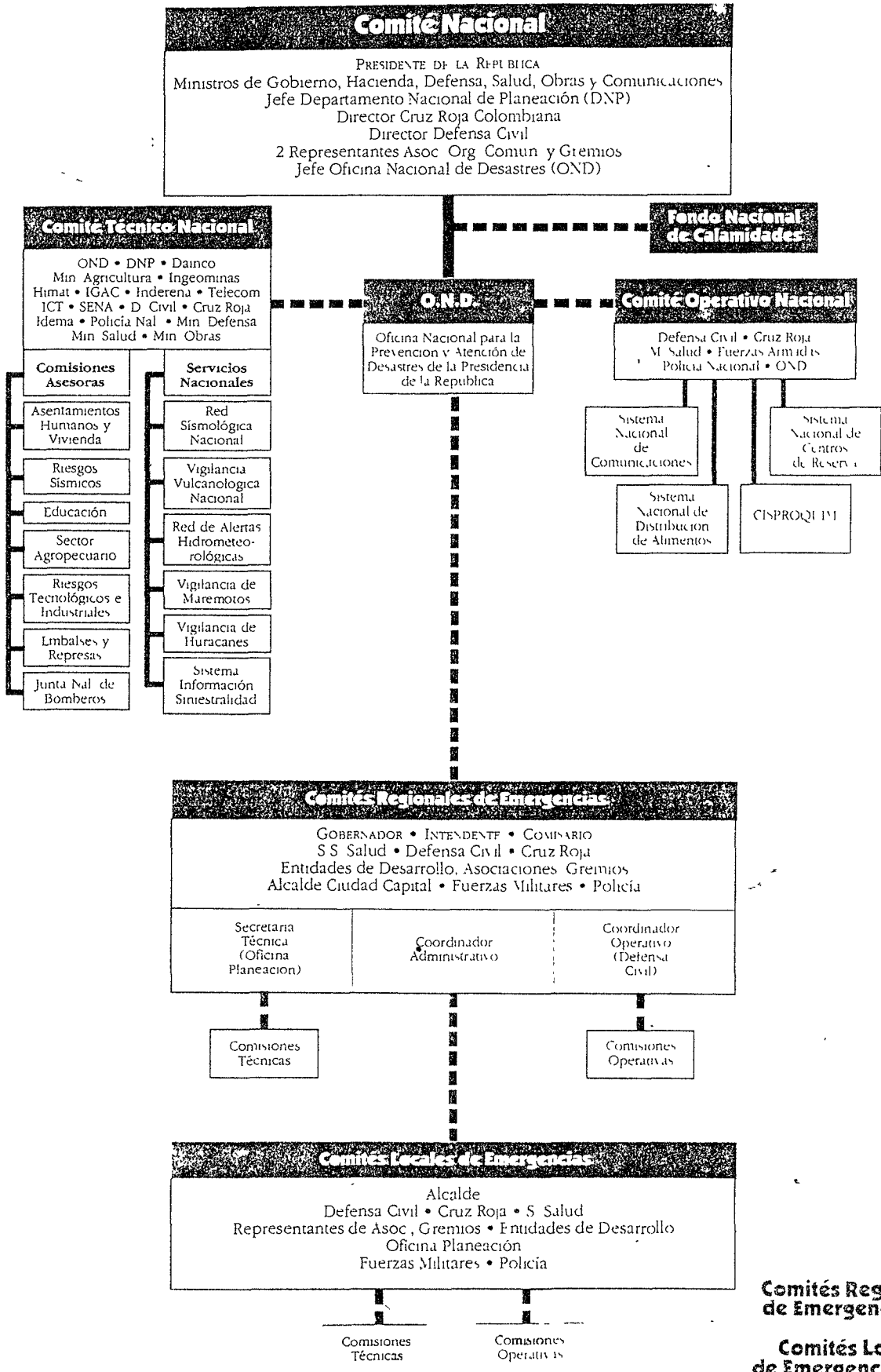
The different functions must be defined by law, however the better way to get successful results it is through the conviction of the importancy of the theme, that only it is possible to obtain by training and awareness or because a severe disaster is striking or has occurred...!

The government of Colombia, as a consequence of different disasters that have occurred during the last decade, specially the one caused by the volcano Nevado del Ruiz (1985), has become aware of the importance of developing adequate policies for mitigation and management of emergencies of natural or anthropic origin, and has identified the need to establish planning and mitigation activities as part of national policies. In 1986, the National Office for Disaster Preparedness and Risk Mitigation (ONAD) was created within the Administrative Department of the Presidency of the Republic; in 1988 Congress approved Public Law 46 (ref.1), which creates the National System for Disaster Preparedness and Risk Mitigation, and in May 1989, by Decree-Law 9919 (ref.2), regulations governing the National System were issued, thus defining functions and responsibilities for all institutions conforming the system, at national, regional and local levels.

The system is co-ordinated by the National Office ONAD, since the Presidency of the Republic, and is made up of public and private entities which deal with these issues. The entities should carry out, on a decentralized manner, disaster preparedness and risk mitigation through Regional and Local Committees. These activities are undertaken from not only operational response points of view, but also from the technical, scientific, and planning angles, according to each entity's role.



# Sistema Nacional para la Prevención y Atención de Desastres de Colombia



**Comités Regionales de Emergencias: 32**  
**Comités Locales de Emergencia: 1.022**

<p style="text-align: center;">COMMITTEE FOR DISASTER PREPAREDNESS AND RISK MITIGATION</p>
<p style="text-align: center;">President, Governor, or Mayor</p>
<p style="text-align: center;">Administrative Co-ordinator</p>

<p style="text-align: center;">TECHNICAL AND PLANNING COUNCIL</p> <p style="text-align: center;">Technical Co-ordinator Planning Office</p>
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<p style="text-align: center;">EMERGENCY RESPONSE COUNCIL</p> <p style="text-align: center;">Operative Co-ordinator Civil Defence</p>
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<p>Institute of Housing Institute of Cartography Institute of Transportation Secretary of Agriculture Institute of Hidrology Institute of Enviroment Institute of Geology Water Resources Office Secretary of Public Works Institute of Electricity Secretary of Education Secretary of Public Health Food Supply Office Institute of Communications Institute of Industry Secretary of Treasury Private Sector</p>
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<p>Fire Department Red Cross Institute of Transportation Secretary of Public Health Secretary of Public Works Food Supply Office Police Army Institute of Industry Institute of Communications Community Representers</p>
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FIGURE 1

<p style="text-align: center;">TECHNICAL COMMISSIONS</p>
<p>Human Settlements Agriculture Seismic Risk Tsunami Risk Landslides Risk Floods Risk Volcanological Risk Dams and Reservoirs Technological Risk Education and Training Health and Sanitation Fire Departments Board Public Awareness</p>

<p style="text-align: center;">NATIONAL SERVICES</p>
<p>Seismological Network Vulcanological Network Hydrometereological Network Tsunami Warning System Huracan Warning System Chemical Information Centre Food Supply Network Communications Network Reserve Emergency Centres</p>

FIGURE 2

## CO-ORDINATION AND FUNCTIONS

There are two models to co-ordinate a system as mentioned above. With a co-ordinating office within the President or Prime Minister administrative department, and with a co-ordinating council of representatives of the different sectors and entities. In both cases the leadership should be done from the top authority, due to his political power and influence. On the other hand, it is very important that each ministry, entity or sector have an administrative unit involved, thus they can be able to plan activities and resources according to their responsibilities.

As above was mentioned, disaster preparedness and risk mitigation are several integrated activities along a common objective that is beyond this that deal with immediate help or relief. For that reason, it is necessary to assign to each entity, according to its role, responsibilities such as scientific research about natural and man-made hazards; phenomena instrumentation; land regulation taking into account the hazard and risk; investment planning taking into consideration the infrastructure and community protection; inclusion of environment and agriculture measures into the territorial development plans; public education, information and training to aware the community and the public officials; and emergency response preparedness not only at the institutional level but at the level of the community.

The structure of the colombian system is made up of a National Committee for disaster preparedness and risk mitigation, headed by the President of the Republic, by Regional Committees presided by the Provincial Governors, and by Local Committees led by the Mayors of each municipality.

Each committee, in each level, has a Technical and Planning Council and Emergency Response Council, the former has in charge the promotion of risk mitigation activities and the latter has in charge to promote all preparedness and co-ordination activities for assistance in case of a disaster. (fig.1).

Besides these councils in charge of technical and operational aspects, at the national level the committee and councils count on National Services and Technical Commissions for specific tasks. (fig.2).

This National System was created with existing state entities at all levels, and designed so that its actions would be carried out on a decentralized way, has been implementing a large number of risk mitigation and rehabilitation projects in affected areas with the support of the central government and by international organisations as UNDP, UNDRR, PAHO, CIDA, AID/OFDA, the EEC, and JICA.

Several disasters have occurred after this system was created, such as hurricanes and floods in 1988, volcanic emergencies in 1989, various mudflows and landslides in different places every year, forest fires in 1990, and the epidemic of cholera in 1991. Although the difficult experiences were instrumental to verify the need and the utility of a basic organization as the one here described, it also served as a mechanism to identify the difficulty that is faced when trying to organize and co-ordinate several entities along a common objective, with specific responsibilities assigned to each. A very difficult task because, as a rule the tendency was that of assigning disaster activities only to those organizations in charge of relief and immediate help, leaving out important entities that work in the fields of planning and rehabilitation.

Because this is an evolutionary process, the structure that has evolved is not completely defined, nor is it permanent or present in all ministries and official entities. This situation, however, has provided the opportunity for spontaneous mechanisms to appear due to the nature of disasters. But these procedures so created do not always remain to help strengthen mitigation programmes and long-term efforts aimed at the management of new disasters.

The same occurs in local and regional political subdivisions where the creation of technical units, with established budgets, leading to well founded mitigation planning institutions, is only an initial process characterized by regional inequalities and very different levels of development.

#### **PLANNING ACTIONS**

Any type structure should count on a plan in order to define the different activities to do in time and in the space. A national system for disaster preparedness and risk mitigation need also to have a plan of coherent proposals and programmes to be undertaken. On the whole, a national plan for disaster preparedness and risk mitigation compiles proceedings to strengthen and promote actions of sectorial, regional and local character, considering among others the following aspects:

- Legal, financial, economic and institutional approaches.
- Intersectorial and interinstitutional co-ordination.
- Researches and scientific and technical studies.
- Education, mass information, and community participation.
- Integral information and communication systems, at national, regional and local levels.
- Preparedness, response and rehabilitation phases in case of disaster or public calamity.

Presently, risk mitigation and preparedness, as a global planning concept, should be part of the country's development policies.

In Colombia the new norms and regulations previously described, reinforced with the Presidential Directive 33 of 1990 (ref.3),

created the obligation on the part of national organisations to incorporate this concept in their development plans, in the design of regional and urban projects, civil works of great magnitude, and in industrial activities that could present any kind of threat to the population, keeping in mind the fact that recent and growing ecological degradation, together with a lack of strict and efficient environmental protection, have contributed to enhance and precipitate disasters. In addition, planning offices at all levels of government have now the obligation to define and initiate actions aimed at risk prevention and mitigation. The Urban Reform Law (ref.4), recently enacted, and the Code for Earthquake Resistant Constructions issued in 1984 incorporated this concept also.

Within this framework, greatest importance has been given to urban disaster mitigation programmes in which the activities of different entities and institutions involved with these issues are integrated. In addition to local and regional support important financial contributions are being provided by UNDP, CIDA, and UNDRR to undertake this type of projects in several cities of the country. Some examples are Cali and Manizales, with respect to seismic risk; Tumaco, with respect to tsunamis, in Ibagué with Tolima and Machin volcanos; along the Combeima river, with respect to sudden floods; in Paz del Río, with respect to landslides; in several parts of the country with respect to industrial risk; and an integrated programme that includes all types of risk in Medellín.

In addition to these efforts, important progress has been made in the elaboration of a national inventory of risks; more than 800 municipalities, out of a total of 1020, have provided the necessary information.

In the field of research and technology, at present, Colombia counts with national networks via satellite for seismological and hydrometeorological surveillance, and other telemetric networks at regional level such as volcanologic observatories and the tsunami and seismologic observatory in the southwest. Some of these projects have been supported by UNDP, UNDRR, CIDA and other programmes with developed countries.

In order to include truly the preparedness and the mitigation concepts into the culture in Colombia, a programme has been defined to incorporate, in several stages, mitigation issues in educational programmes at all school levels, both under formal and non-formal education structures. Efforts are also being made to include in all school textbooks the same issues according to the specific conditions, a programme is being prepared to begin curricular adaptation in some professions more involved with the subject.

In the area of public information, the aim is to provide stimuli for the population at large to participate, actively, in local processes of risk mitigation and preparedness, with information provided at the national level for mass distribution; such as

audiovisual materials, radio programmes, TV campaigns and printed brochures and leaflets.

By other way, keeping in mind that emergency management requires an appropriate communication network, comprising all entities of the system has been integrated into a true emergency network. In different parts of the country, and in order to maintain the basic elements needed in an emergency, Reserve Emergency Centres are being created, strategically located in special areas with easy access. The elements stored in these centres belong to the nation and are given under custody to local authorities to be used when required in each region.

In several occasions the Local Committees have been in operation, together with committees at higher levels and adequate public information campaigns, thus creating the conditions for a successful mitigation phase and adequate response programmes in health, fast supplies, and temporary shelters.

With respect to temporary settlements which usually are established as an answer to disasters, a new different approach to this problem has been applied when it is possible: the classic and traditional temporary shelters have been eliminated. The many types of problems created by this kind of response are well known. Under the new approach the affected population is housed in the homes of those not affected that voluntarily would offer their homes. A small fee is paid to the host family.

Finally, in the field of relocation or partial or total house reconstruction it is of priority to have these homes located in low risk areas, with reconstruction programmes that involved an important element of community participation, and with efficient institutional support. The new housing solution that is provided corresponds to the basic unit required for immediate occupancy, leaving all accessory refinements, additions and subdivisions for later stage and under established credit programmes. With this approach the concept of free housing has been eliminated.

#### FINANCIAL ASPECTS

Considering the previously described type of organisation for risk mitigation and disaster preparedness it is important to be aware of the fact that disasters are not a problem that falls exclusively on the local population and on the local authorities. These emergencies must be addressed by the nation in general and all state entities are thus responsible to face them along their own line of responsibility.

In the Colombian case, according to law, each national entity must include in its national budget the resources necessary to initiate and maintain, on a permanent basis, disaster mitigation programmes, and to provide for necessary funds to cover additional expenses which are required when a disaster arrives.

In addition to the institutional budgets just mentioned, a National



Calamities Fund was organized to complement and support those initiatives of the different entities that make up the system. As a compliment to the norms and regulations that established the fund, additional regulations have been enacted to provide for greater agility and efficacy in the application of fund's resources, which is what disaster conditions require.

It is worth mentioning that in the medium and long run great financial effort is required to reduce risk among the population and the economy in general. To this end, permanent and planned efforts in the field of preparedness and mitigation are required, with corresponding investments and resource allocation for several decades.

## CONCLUSIONS

While much undoubtedly remains to be done in this field, certain valid and useful conclusions can be drawn for the system described herein, for the purpose of exploring with the benefit of insight, the "how": that is, in what manner could a developing country such as Colombia undertake such an institutional organization and obtain practical and effectively applicable results?

1-On the whole, the most important result to date has been the ongoing convergence between three factors: technical and scientific work, political and administrative will, and community acceptance: without the last, the most advanced hazard and risk assessment could not achieve its goal.

Convergence is basically the result of inter-institutional organization, including national, regional, and local levels, leading to multisectorial integration regarding intentions and decisions in order to achieve a common goal, with each entity assuming responsibilities and task in accordance with its role.

2-It was always accepted that no individual and isolated measures could be effective. Risk mitigation and disaster preparedness are a matrix of technical, scientific, legal, administrative, marketing, informational and other variables. Because of this, whoever wishes to contribute must permanently translate his or her goals and results, in an effort to understand the systematic variables of the person who receives the information.

The projects do not generate political organization and will, but this is well-nigh impossible if the projects do not result from a convergence of wills and do not consider the participatory character of its users.

3- The work has been characterized by ongoing expansion of its scope, emphasis on partial but applicable results which could establish the system's credibility, and optimal use of local resources. One of the system's most heartening experiences has proven that the first step can be taken with a will and the available information, and after the first step has been taken,

more ample support quickly materializes.

The perfect is the enemy of the good. While it is true that a more or less complete programme for risk mitigation and disaster preparedness requires a large investments over fairly long time periods, this fact itself has frequently checked useful intentions and skills.

#### AKNOWLEDGEMENTS

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- 4.Law 9, Urban Reform, December 1989.
- 5.Decree-law 1400, Colombian Code for Earthquake Resistant Construction, June 7th, 1984.

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# RISK MITIGATION

Mitigation measures can be of different kinds, ranging from physical measures such as flood defences or safe building design to legislation, training and public awareness.

• STRUCTURAL MEASURES

• NON-STRUCTURAL MEASURES

$$R_{ie} = H_i \cdot V_e$$

$R_{ie}$  : Probability that a loss affecting element  $e$  should occur as consequence of an event of an intensity equal to or greater than  $i$

$H_i$  : Probability that an event of an intensity equal to or greater than  $i$  during a period of exposure  $t$ .

$V_e$  : Intrinsic predisposition of an element at risk to be affected or to be at risk of suffering a loss upon the occurrence of an event of  $i$  intensity

MITIGATION

STRUCTURAL  
MEASURES

NON-STRUCTURAL  
MEASURES



RISK

=

HAZARD

.

VULNERABILITY

## STRUCTURAL MITIGATION MEASURES

### - PROTECTION WORKS FOR HAZARD CONTROL

#### ENGINEERING WORKS TO FACE FLOODS:

- Embankments
- Dykes
- Levees
- Storing dams
- By-passing channels
- Dredging
- Realigning

*WARNING: They can modify the local environment conditions. They can give a false idea of security.*

### - OTHER ENGINEERING WORKS

- Terracing of hillsides, drainage trenches, retaining walls, and horizontal pipe-drains.
- Sabo works
- Coast walls
- Irrigation channels
- Sanitation works

## - PHYSICAL AND FUNCTIONAL VULNERABILITY INTERVENTION

- structural retrofitting of existing key-buildings and dwellings
- Flexible connections in pipelines
- Network redundancy
- warning and security systems in industrial facilities

## - RELOCATION OF ELEMENTS AT RISK

- Dwellings
- Lifelines
- Other facilities

WARNING: As a rule, in order to get effectiveness actually, the structural mitigation measures must be complemented always by non-structural mitigation measures. Indeed, some of them can only be implemented as a result of non-structural mitigation measures application.

## NON-STRUCTURAL MITIGATION MEASURES

### - PASSIVE MEASURES

- Legislation
  - x Legal framework
  - x Codes for design and construction
  - x Land use regulation
- Planning
  - x Urban - physical
  - x Territorial
  - x Agricultural
  - x Sectorial - Budgets
- Warning Sys.
  - x Instrumentation networks
  - x Alarms
  - x Monitoring and research
- Tax incentives, grants, subsidies
- Insurance

### - ACTIVE MEASURES

- Institutional organisation and co-ordination
- Training
  - x Public officials
  - x Communities
- Education
  - x Elementary and highschool curricula
  - x Undergraduate
- Public awareness
  - x schools
  - x Communities
- Emergency preparedness

## Planning Actions

- Legal, financial, economic and institutional approaches
- Intersectorial and interinstitutional co-ordination.
- Researches and scientific and technical studies
- Education, mass information, and community participation.
- Integral information and communication systems.
- Preparedness, response and rehabilitation phases.

## Integral Projects

- Hazard evaluation in prone areas.
- Inventory of elements at risk.
- Vulnerability assessment.
- Loss estimation of future events (Risk scenarios).
- Monitoring and warning systems.
- Emergency and contingency plans.
- Education, training and public information.
- Urban planning and land use regulation.

## Financial Aspects

- Each entity must include in its budget the resources required to undertake the projects.
- National Calamity Fund.

## Conclusions :

- Convergence is basically the result of inter-institutional organisation, including national, regional, and local levels, leading to multisectorial integration regarding intentions and decisions in order to achieve a common goal, with each entity assuming responsibilities and tasks in accordance with its role.
- The projects do not generate political organisation and will, but this is well-nigh impossible if the projects do not result from a convergence of wills and do not consider the participatory character of its users.
- The perfect is the enemy of the good. While it is true that a more or less programme for risk mitigation and disaster preparedness requires a large investment over fairly long time periods, this fact itself has frequently checked useful intentions and skills.