# THE CHILEAN TSUNAMI WARNING SYSTEM AND APPLICATION OF THE *TIME* PROJECT TO THE CHILEAN COAST

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Chilean coast is frequently exposed to the effects of near and far field tsunamis generated in the Pacific Ocean For instance, the catastrophic events of 1868 and 1877 overwhelmed the coast of the northern region of the country During this century, the most important disaster was the 1960 earthquake and tsunami of Valdivia. It is well known that this event had a great impact on the coasts of the coastal states in the Pacific Ocean, mostly in Hawaii and Japan. The most recent event recorder in the Chilean coast was the "good tsunami" occurred in Antofagasta, 1995

The historic situation has contributed to an awareness of the tsunami threat and therefore to the development of the research on several aspects of this phenomenon in Chile. In the last few years, new developments in technology have made it possible to improve the quality of the information to assess the potential risk of a tsunami event of Chilean coast. Since 1995, the TREMORS system has been operating in Chile. This is a seismic monitoring system that improves the existing seismic network and tsunami warning system in Chile, giving information in real time of seismic parameters and their relationship with some of the parameters of tsunami generation to estimate the risk. A very good example of the application of this technology was the tsunami warning issued by SHOA for the 1996 Chimbote tsunamigenic earthquake in Peru.

As a very important complement to the operative work, inundation maps by tsunamis for the Chilean coast, following the techniques of the TIME project have been developed. The first maps for the four largest port cities in the northern part of Chile, namely Arica and Iquique, Antofagasta and Mejillones have been completed during 1997 and 1998. Arica and Iquique are located in a "seismic gap" zone. These inundations maps are being used for tsunami hazard planning by the national civil protection agency (ONEMI) and other government institutions

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**TOWARDS A NEW PREVENTIVE CULTURE**
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***PANEL***: **EL NIÑO SOUTHERN OSCILLATION**

***SUBJECT***: **AN OUTLOOK ABOUT EXPERIENCES ON FOREST FIRES**

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**5th ADMINISTRATIVE REGION**

## I. GENERAL INFORMATION

The MOST important factors acting on forest fire behavior are:

a. Topography
b. Weather
c. Fuels

Therefore, all the planning processes intending to be successful in the actions directed to the control and extinction of forest fires should necessarily consider a permanent assessment of these three components.

Topography, or land form, is the most constant factor. For that reason is easy to predict the influences of topography on forest fires, that those of fuels and atmospheric conditions will have on them.

Altitude, exposition, forms and slope are the main characteristics of topography.

The weather, which qualification is based on the presence and characteristics of meteorological factors or "meteors", has a great importance in the initiation and behavior of forest fires. Meteors like wind, temperature, relative humidity, atmospheric pressure, for example, are considered as regulating agents of seasons of forest fires occurrence, and the hours of great risk and danger due to its effects on moisture and temperature of vegetation.

Forest fuels are all those plant materials that we find in forests, shrub lands, prairies, pasture lands, etc., susceptible to catch fire because of heat application, allowing fire propagation through them.

Of these three factors, topography is the only static one, it doesn't change; however, the other two, that is to say, the weather and the fuels, both change according to the time of the day

The characteristic of dynamism showed by fuels and specially by the weather will determine the severity of occurrence and behavior of forest fires in a given time.

## II. FOREST FIRES: A PROBLEM

### A. Situation of occurrence

Forest fires in Chile, and specially in Valparaíso Region, are completely caused by man through voluntary or involuntary ways, and they constitute the major deterioration factor of natural renewable resources.

In all the region and particularly in Valparaíso Province, the forest fire problem has two remarkable meanings:

1. The major occurrence of forest fires is recorded in Valparaíso Province (71.6 %) and within this latter in Valparaíso, Viña del Mar, Quilpué and Villa Alemana Communes (94.3 %).

2. In addition to this, in the borders of Valparaíso Province's cities there is no an agricultural belt surrounded those places like in other parts of the Province that avoids public access through forest lands and prevents the propagation of forest fires towards the urban boundary if a forest fire occurs.

### B. Special situation

Because of those former characteristics, the potentiality of that forest fire affects other non-forest goods (settlements, industrial infrastructure, etc.) is extremely high.

Therefore is important to mention that forest fires can lead to three well determined problems as follows:

1 Forest Problem Itself

This is produced when a forest fire occurs and it develops in rural areas and only affects to the forest resources.

2 Social Problem

In this case, forest fires, independent of its characteristics of location, dimension and behavior, can produce a great damage to peripheral

populations on the cities, destroying houses, facilities and another kind of personal goods.

3 Problems concerning to public order

Forest fires occurring near population centers produce an alteration and uncertainty in inhabitants living in the cities and villages affected by a great amount of human and technical resources used to control forest fires planes, personal, firemen, military forces, policemen and others, in addition to the proper characteristics of fires. This picture causes a great disorder provoking a complete disturbance in the normal development of cities and villages.

## C. DAMAGE POTENTIALITY

In general losses caused by forest fires can be classified in two major categories.

**Direct Injury**: It is related to the loss of all those tangible goods with a monetary cost that is easily to identify and evaluate after the fire or within a reasonable period of time. These losses include timber and other forest products, fences, bridges, livestock, horticulture, buildings, rural infrastructure, etc.

***Indirect Injury***: This comprises that kind of intangible goods that are difficult to evaluate and quantify. In this case we are talking about the ecosystem and social benefits.

# III. INFLUENCE OF EL NIÑO SOUTHERN OSCILLATION ON FOREST FIRES

A. Climatic Alteration

From Atacama (26° S) to Araucania (39° S) regions, El Niño phenomenon provokes an increase of winter rainfall, which in some opportunities are produced in a warm environment. Also could happen a precipitation out of normal period (for example in October or November).

With this information it is necessary to indicate that development of vegetation will be different and distinct with the influence of ENSO than in a normal rainfall period

Therefore, there will be a full development of herbaceous and shrub cover increasing leaf density of arborescent species preferably of scrub strata.

This effect undoubtedly changes the normality factor of some physical properties of vegetation as follows:

1. Quantity. It refers to the weight or load of available fuel existing in the surface and subsurface strata.

2. Continuity. It deals with direct contact between fuel particles regarding the flow and transfer of heat that is needed for fire propagation:

   Aerial
   Superficial
   Subterraneous
   Vertical
   Associated

3. Distribution. This concept refers to the disposition, arrangement or uniformity that plant materials show in a stand or sector.

4. Compactness. This concept refers to the proximity between fuel particles considering the opportunity or difficulty for oxygen circulation which is necessary for combustion.

## B. REVIEW OF ORGANIZATION FOR FOREST FIRE CONTROL

This aspect forces to restate Planning and Organization schemes for the protection against forest fires in the guidelines for Prevention and Control to face the occurrence's season.

Prevention

The fuel management programs will be emphasized, giving preference to the establishment of firelines and enable them in peripheral areas of cities or villages to protect people and their properties.

1. Operative Plans

   It will be necessary to review the operative plans for fire control, making the corresponding adjustments in order to administrate the resources:

   - Operation periods
   - Criteria for the dispatch
   - Strategies for initial attack and expanded attack

   Who is responsible to control forest fires in Chile?

   In our country the Chilean Forest Service (CONAF) is the responsible institution through Forest Fire Control Office in permanent collaboration with Fireman Department in Valparaíso Region.

## IV. ORGANIZATIONS FOR FOREST FIRE CONTROL IN VALPARAÍSO REGION

Now, there not exists a single institution capable to face and give solution by itself all the problems caused by forest fires in a given region or country.

This problem must be understood by the community to the effect that it is necessary a great amount of human, technical and monetary resources to control forest fires showing extreme situations because of their magnitude, behavior, and valuable properties affected, or that threaten health and goods of people.

That is the reason why our region has two operational schemes to face this problem:

1. Normal Organization

   This organization is put on practice when the situation provoked by a forest fire has a relative control by normal means that the Chilean Forest Service makes available with the participation and primary assistance of Firemen Department.

2. Special Organization for Emergency Situations

In this case, this scheme is applied when the situation caused by a forest fire, due to its magnitude, extension or threaten goods, or that menaces life, health or properties of people constitutes a catastrophe because or its proximity to population centers and public infrastructure and which cannot be controlled with normal means available in CONAF through normal plans, so those fires should be attacked through the action and massive means of other organizations.

## NATIONAL PLAN FOR COOPERATION IN DISASTER PREVENTION

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The Plan to which the preceding title refers to, as it may really be surmised, is focused to those vulnerable to the occurrence of a disaster in this country. But it has a set and clear purpose: To mitigate the consequences on individuals and, whenever possible, on their possessions from the effects of catastrophic events that have their origin in a natural phenomenon.

For this purpose, and under the financial support of both the International Federation of the Red Cross and Red Crescent Societies, the Southern Cone Delegation of the Federation, based in Buenos Aires, Argentina, together with the Chilean Red Cross administrative staff, through the National Office of Rescue Operations and its Department of Disaster Prevention, has developed a Community Disaster Education Plan. Duly planned actions have been pragmatically added to this plan, in order that the community as a whole receives, directly or indirectly, the intangible benefits to which they can refer when the natural phenomena in fact threatens their life, their most priced possessions or their physical integrity. A threat that has consequences resulting in injuries, physical handicaps, rehabilitation, medical treatment, psychological treatment, illness or loss of property, purchase of prosthesis, medications, psychological treatment, reconstruction and other non-visible costs.

For this, it will be specified if it is so determined considering the assigned time, if this presentation changes into a lecture, with respect to the following:

- Community Education Plan, with the appropriate motivation, training of Facilitators and Evaluation stages.
- The above mentioned plan will continue with the Workshop-Seminar for Facilitator Training on the need to develop "TEMPORARY SHELTERS", which will train them to learn exactly what is and how to organize a shelter as well as to enable them to train other volunteers.
- Creation and implementation of the " Action Plan 0 – 6000" by the National Office of Rescue Operations throughout the country.
- Development, organization, operation and training of the Volunteers of the Department of Rescue and its Divisions throughout the country, to act in normal as well as emergency moments
- Implementation of "MAPIRR – 98 Cruz Roja Chilena" which is the development of a national map library on RISKS and RESOURCES in the jurisdictions where the Branches of the Chilean Red Cross are located.
- Complementary programs such as "Safe Community" in two cities in the country
- Implementation of five specific plans for a neighborhood or defined sector, with complementary and indispensable assistance from the Municipalities and Carabineros de Chile.

Subsequently to this, which will be presented in a brief but thorough coverage of its actions and achievements, we will hear the Conclusions and Suggestions related with the subject

# From probabilities to profits – an Australian success story combining climate forecasting with cropping systems analysis and on.farm decision making

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## Background

Seasonal rainfall in many areas of eastern Australia is strongly influenced by the ocean/atmosphere El Niño/Southern Oscillation (ENSO) phenomenon (Allan, 1988). Particulary Queensland in the northeast of the country as one of the most variable climates in the world. This creates stress on the resource base and competitive disadvantage on international rural markets, highlighted by the $US 4 billion cost of the 1991-95 Queensland drought. However, managing for climate variability has only recently become a feature of the Australian farming system. Significant, physically based lag-relationships exist between an index of the ocean/atmosphere El Niño/Southern Oscillation phenomenon (ENSO) and future rainfall amount and temporal distribution in eastern Australia and many others areas across the globe (Stone et al., 1996). A skilful seasonal forecast provides an opportunity for farm managers to better tailor crop management decisions to the season.

It is a challange for scientists and farm managers alike to identify decisions that can usefully be aided by climate forecasting. For a forecast to be effective, such decision making ultimately has to improve the long-term performance of the farming enterprise either by increasing profits, by improving sustainability indicators (eg. Erosion, soil organic matter) or by reducing production risks.

Timing and frequency of future rainfall events strongly influences dryland crop growth and yield but the usefulness of rainfall events in terms of their contribution to crop production is difficult to assess. Physiologically based crop simulation models using regional climatic records can quantify the relationship between crop performance and phases of the SOI.

Using the 1997 El Niño event and its subsequent breakdown in 1998 as a case study, we will demonstrate how seasonal climate forecasting combined with a cropping systems simulation capability and substantive adviser and producer interaction can aid farm managers in their decision making processes. Further, we show how the technology can also be applied to aid policy decision-making. At the farm level, these decisions range from fertilizer application, crop choice, cropping frequency, disease prevention and harvest techniques to marketing strategies. At the policy level this approach allows, for instance, to identify and quantify "exceptional circumstances" of drought impact on agriculture (frequency and severity) and can add objectivity to such issues (Meinke and Hammer, 1995; Keeeting and Meinke, 1998). As simulated agricultural drought reflects the impact of factors such as rainfall timing, intensity and amount and effects of soil water storage on cropping system performance, it is considered a superior measure of drought severity on farm performance. The approach can also be used for land management and planning decisions.

During the lecture we will

- outline the climatic conditions in north-eastern Australia from early 1997 to present,
- describe the probabilistic rainfall and crop forecasting systems employed,
- discuss some of the on-farm management implications of such forecasts,
- demonstrate how the same technology can be applied to assist policy makers,
- and show how the information is currently disseminated and adopted.

Specifically, we address the question whether the current long-range climate forecasting capability can be used effectively in cropping systems management, i.e. decisions that go beyond single crop issues.

The forecasting system

Phases of the Southern Oscillation Index (SOI) are used in conjunction with dynamic simulation models to quantify climatic risk to agricultural production in Northern Australia (Meinke et al., 1996). Dynamic simulation models can be used to forward estimate production risk based on historic climate records and known atmospheric conditions prior to planting a crop. The SOI phase analysis provides skill in assessing future rain fall probability distributions during the growing season and thus allows an estimate of likely crop performance (Stone et. Al., 1996; Meinke and Stone, 1997). This is achieved by categorizing historic rainfall records according to proceeding SOI conditions. Information about the monthly SOI PHASES GOES BACK TO 1860. Thus, we construct 'analogue' years, i.e. years that had the same SOI phase as the one we are interested in. The implicit assumption in this approach is that rainfall patterns are more likely than not to follow the patterns in the same analogue years. Hence, the system can be used operationally for forecasting. Such knowledge can provide valuable information for producers and processors (Meinke and hammer, 1997).

Applications

During the last decade a major paradigm shift has occurred among primary producers of northern Australia. During this period many producers went from no knowledge of climatic variability to fully embracing the new technologies available. Many know consider seasonal climate forecasts in nearly all their decision options. This shift was the consequence of a series of prolonged El Niño and El Niño-like events in the early 1990s and their effect on agricultural production. Only recently have scientist begun to unravel the physical basis for this phenomenon. Combining this new scientific insight with a simulation capability of the entire agricultural system resulted in a very powerful tool that is ideally suited to assist decision making under uncertainty (McCown et.al., 1996; Meinke and Hochman, 1997).

General climate information and scenario analysis that are not grower specific are disseminated via general media outlets. This includes issuing of 'El Niño alerts' early enough for producers to alter some of their crop management decisions. In conjunction with this general climatic information, production risks of the forthcoming season are quantified using crop simulation models. More site-specific information is derived from case studies of individual growers. These are documented and published to demonstrate how probabilistic climate forecasts can be used operationally in on-farm decision making. These case studies not only address production and marketing issues, but also take account of long-term sustainability issues (e.g. the risk of soil erosion or organic matter run-down) and financial risk (e.g. the risk of making a loss). Thus, the approach addresses tactical and strategic decision issues. Detailed examples of this will be presented at the lecture.

Organizational infrastructure

Major scientific and technical break-through in systems approaches to agriculture and agro-climatology have lead to the establishment of the Agricultural Production Systems Research Unit (APSRU) and the Queensland Center for Climate Applications (QCCA). In close collaboration, the two research groups now provide one of the most innovative and successful services to rural industries in Australia. This is achieved through the unique combination of probabilistic seasonal climate forecasting and risk assessments based on simulation models.

APSRU brings together expertise from various state and federal government departments. APSRU's key technology is the dynamic simulation of farming systems and their management. The focus of APSRU is the dryland farming systems (mainly grain/grazing production systems) but also includes cotton and the sugarcane production systems of coastal areas of northern Australia. However, while maintaining the focus on this regional mandate, APSRU also undertakes national and international projects.

QCCA's main role is to enhance the climate-related work of the Queensland Department of Primary Industries and the Queensland Department of Natural Resources. QCCA has a mandate to improve the long-term economic viability of Queensland Agriculture and has strong linkages with the Australian

Bureau of Meteorology (BoM), CSIRO and other Departments of Agriculture and Universities throughout Australia. A Consultancy Division, which will have an international focus and will draw on QCCA's expertise as well the expertise of all of the groups mentioned, is currently being established.

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# Central America: A Region Multiple Threats

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"Reality is not on the one hand the environment and on the other the individuals occupying it, but a great dynamic and complex system, made up of biotic and abiotic elements, and by their relationship as well as by immaterial, but no less real, tangible and identifiable, elements such as relationships of power, the formal and informal institutions that rule the lives of the community, the feelings, values, hopes, fears and prejudices of its members, etc. In other words: Politics or the political..." Then, the analysis, the understanding and explanation of the natural and social environment is, more than anything, an activity that implies a unitary relation, and interaction between these, which, isolated from their dialectics, lack any sense.

## *The regional context.*

The Central American isthmus has the particular feature (unique in the world) of acting as a barrier between two large bodies of water and bridge between two continental masses. The geodynamic processes in interaction with the atmospheric phenomena typical of the tropics have configured a territorial mass characterized by a morphology of high mountains, intermountain valleys and alluvial and coastal plains.

The convergence of six tectonic plates, whose vigorous activity is manifested in the dynamism of accumulation and liberation of energy, ignites extensive volcanic activity (27 active cones) and the presence of a network of regional and local faults of high seismic potential.

The tropical climate, characterized by the constant movement of the Inter-tropical Convergence Zone, the alternate incursion of trade winds from the northeast and the southeast, the hurricane season in the Caribbean and the cyclical appearance of the ENOS, complicate the climate dynamics, much more so if the variations pertaining to altitude of the climate's patterns are considered.

The particularities of the climate and the isthmus' lithosphere, as well as its dynamics and interactions, has constructed and modeled a unique landscape, over which an environment defined by the extensive ecological, cultural and landscape diversity, whose processes typify the Central American region, the nations that conform it, its population and the politico-territorial organization that determines its form and content.

The rapid processes of occupation and transformation of the geographical space, coupled by economic expansion, the demographic explosion and the irrational exploitation of the resources, have had undesired results for the social and ecological environment. These processes, eminently social, are the result of centuries of colonialism, dependence, lack of autonomy and all of that which underlies this condition, which is manifested in the extractive culture, the excessive exploitation of social and natural resources, the short term vision and the class, ethnic and gender discrimination.

From the physical point of view, the history of the occupation and transformation of the Central American geographical space is typified by the accelerated commercial deforestation. By the subsistence and the agricultural usage of the land, which have resulted in the degradation of the basins, with notable impact in terms of the intensity of the floods, mudslides and drought. Additionally, the rapid and spontaneous process of urbanization, the inadequate structural designs, the deficiency in the basic services, the unplanned industrialization, the inadequate management of wastes and the abuse in the use of hazardous materials and unsafe production processes, have driven the evolution of the territorial dynamics towards coordinates ever more harmful and uncertain.

Currently, the region concentrates the highest levels of poverty in the American Continent, worsened by the economic crisis and the political and military conflicts of the '80s in Nicaragua, El Salvador and Guatemala. In the early '90s, Honduras, Nicaragua, Guatemala and El Salvador had absolute poverty levels which, in all cases, encompassed more than 70% of the population.

Between 1960 and 1988, close to 70 disasters have been reported, of these, the most destructive and onerous are associated to the seismic activity, although the most recurring ones have been caused by hydro-meteorological phenomena (Hurricanes, tropical depressions, intense rains and river flooding). During this period, an exponentially higher number of events of small and medium magnitude occurred, which are not registered and affect the same communities and municipalities that suffer the impact of the larger disasters.

Between 1988 and 1996, 30 events have been reported, showing a relative increase in the number of disaster per year in comparison with the previous period (1960-1988), while the number of small and medium disasters include, with more frequency, anthropically induced events.

***From responding to emergencies and disasters to the management by local government for control of the environmental risk.***

"The view of disasters as dangerous, difficult to prevent and control natural phenomena has been the thinking that has prevailed for a long time. It has generated policies and actions geared towards taking care of the emergencies when they occur. However, today we know that these policies and actions have been insufficient to significantly diminish the resulting damages and losses. We also know that when a disaster occurs, the 'unsustainable' conditions of coexistence between a human community and the environment that it occupies become evident, and that the disaster in itself goes much further that the instant of the emergency. This acknowledgement shows the need to have a new vision with regards to disasters, which also goes much further than responding to the emergency: RISK MANAGEMENT"

In Central America, the large majority of municipalities and their communities are located in areas of multiple threats, given the characteristics of the physical environment. While the decisions that affect the use of the land, the exploitation of natural and social resources located in the territory of the municipality, are made, most of the time, in locations geographically distant from the locality where they are carried out, without taking into account the social and ecological particularities of the municipality, that is, of the environment comprised by this territory.

Moreover, the municipalities have shown a lack of capacity to prevent, manage and control the risk derived from this situation, and even, of those situations of risk locally generated as a result of misguided decisions or simply from the fact of not considering the occurrence of risk from implementing a development initiative. At the same time, the population demonstrates insufficient awareness and organization in that regard, which contributes to aggravate the problem.

It becomes necessary, therefore, to generate the capabilities of the local social players to transform the conditions of vulnerability and risk, generated by internal or external decisions that do not consider the occurrence of threats in the decision-making inherent to the use of the social and natural resources contained in the municipality.

The preceding implies coordinating the actions, initiatives, plans, programs and projects of local government, the state institutions present in the municipality, the private sector, the organized community, and the NGOs, towards the management of risk for the benefit of the environmental safety as a framework for sustainable development.

***A proposal for co-intervention in the local management of the environmental risk.***

The objective of the proposal is given by our intention of contributing to the recovery and development of the social and ecological environment for all the inhabitants of the region through the development of new knowledge and the social co-participation in the reinforcement of the local structures and capabilities, geared towards local risk management as a base over which sustainable development is guided, with social equity and economic growth.

Reinforce and strengthen the local structures, functions and capabilities implies conducting a process of participation, coordination, and enunciation of the goals and objectives that the principal social players define in the territorial dynamics. The incorporation of the threat and vulnerability variables in decision-making, in the territorial social and political policies and administration, constitutes a firm step towards Environmental Security.

It is likewise intended, that the strategy designed and put in practice serve as a model to be followed in other population areas of the region, in accordance with the particularities of each municipality.

The proposal combines the unique characteristics of a research project (the production of knowledge) with that of a social participation project by proposing objectives geared towards facilitating the efficient territorial planning and administration, and to find safer ways of development in the dimensions of risk prevention and management.

# DesInventar – DISASTER INVENTORY SYSTEM

**Presented by: LA RED**

The increase in the world-wide vulnerability is generally demonstrated in disasters caused by events of great magnitude. However, there are thousands of small and medium disasters that are not duly registered, on their impact over small communities, oftentimes a result of very localized events, but which in the aggregate, represent great harm to development.

The prevailing ideas tend to confuse physical - natural or technological events (the threats) with the disasters. An event is generally translated into multiple disasters, depending on the conditions of vulnerability of the different settlements and property affected.

The absence of systematic, homogeneous and comparable records of the disasters is obvious, as well as the conception of "officially" considering as disasters only the effects of those events of great magnitude, turning invisible the thousands of small and medium disasters that annually occur in the developing countries.

There are organizations and individuals interested in the subject in many countries, that utilize diverse tools to compile information on disasters, generally databases or physical archives designed with specific criteria and specific or sectorial interests, in dissimilar formats. Additionally, a large amount of information to be gathered and systematized is available from media sources. This dispersed information has to be compiled, homogenized and analyzed. But, furthermore, must be geographically indexed, as disasters (affected communities and infrastructure), as the effects of each type of event (threats) are space variables.

The Inventory of Disasters in Latin America project, DesInventar, was begun during late 1994 as a *regional applied research project.* It is the result of the research work, in the field and in archives, of trials and corrections, international workshops and debates, and of software engineering condensing the dedication of several thousand man-hours.

## OBJECTIVES

A common objective in the regions and countries of Latin America and the Caribbean, Asia and Africa is to generate the capacity for analysis and of space-time representation of the threats, vulnerabilities and risks in a retrospective and prospective manner, to be applied in the management of risk – from the tasks of mitigation to those of post-disaster assistance and recovery. For the qualitative and quantitative assesment of the increase of vulnerabilities and risks, it is necessary to have a solid document and registry base, both of past disasters, as well as those that are occurring daily and the ones that will occur in the future.

In answer to the preceding, the DesInventar project posed the following objectives:

- Development of an empirical base to evaluate hypothesis on the occurrence of disasters (presented at the beginning of this paper)
- Gather and homogenize information on the occurrence of disasters
- Design and test a methodology for the creation of inventories, and develop a software tool.
- Provide an instrument for research
- Provide the decision-makers, the planners, those responsible for emergency planning and disaster prevention, with a useful tool for the management of risks.

## THE PRODUCT

DesInventar is a conceptual and methodological contribution for measuring the impact of small, medium and large disasters, developed by researchers in organizations located in 9 Latin American countries, within the framework of LA RED[1], as a contribution to the International Decade for the Mitigation of Natural Disasters. It proposes a framework for the conceptual and methodological unification of disasters, with the following criteria:

- Basic homogenous listing of events and unified variables to measure effects.
- Th gathered and processed information is fed to the time scale and in a geographically indexed spatial level.

Inventories are treated analytically, through system tools, to produce comparative research and for support in decision-making on mitigation actions, and generally, in the management of risks.

## CHARACTERISTICS

The need for a methodology and instruments for the gathering, analysis and space-time representation of the thousands of disasters that occur on a daily basis has posed several requirements which we have tried to meet:

- To be fast and easy to use by any user.
- Provide comparable, integral information applicable at local, national and continental scale.
- Adaptability to cultural and idiomatic conditions particular to each country, without losing the coherence and comparability of the reports.
- Allow, at the same time, the gathering of existing information in dissimilar analog and digital formats, such as archives and databases, and become a common work tool into the future.
- Serve the purposes of research and action in the field of risk prevention and mitigation, including local communities, decision-makers and local, domestic and international organizations.

DesInventar is also an instrument that permits the visualization, in space and time, of the reported phenomena, through a complementary instrument, the **Consult Module or DesConsultar**.

The user can choose types of events, focus his questions on one or several regions in particular, or a specific period of time, or even restrict it to a series of events that meet a series of conditions. The user can also obtain summary statistics, generate reports, obtain theme maps or generate inquiries using the SQL language.

## APPLICATIONS

LA RED has developed this instrument to supply the different players in disaster prevention and mitigation activities (researchers, research organizations, governments and national organizations for disaster planning and assistance, rescue organizations, local and regional prevention organizations, international and bilateral agencies, as well as organized communities and the press) with a product for the gathering, processing, analysis and homogenous representation of disasters, understood as the adverse effects on the population, property and infrastructure vulnerable to socio-natural and natural phenomena.

[1] DesInventar is the result of a joint Latin American effort around LA RED, with the coordination and development of the software in Colombia, (OSSO-U. Del Valle, CompuArte-PROMAP), and in Peru (ITDG), and the participation of Mexico (CIESAS), Guatemala (FLACSO – General Secretariat), El Salvador (PRISMA), Costa Rica (FLACSO. National Commission for Emergencies), CEPREDENAC, Panama (SINAPROC), Ecuador (EPN), and Argentina (CENTRO).

The design and structure of DesInventar, flexible and adaptable in its conception, makes it applicable to political and administrative, planning, or management units or of operation of institutions, from national levels to minor levels, such as in a city represented by neighborhoods and blocks.

**PROGRESS**

DesInventar is being used by national disaster management authorities in Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Antigua, Ecuador, Bolivia and Paraguay, and there are conversations taking place to expand its use in Latin America and the Caribbean and its expansion into Asia and Africa. At the local government level it is being used by the municipalities of Bogota, Boyaca and Risaralda in Colombia and by the Committee for Emergency Operations in the Grau Region in Peru.

Currently, as part of the LA RED project, there is a completed database with more than 36,000 registries from eight countries (Mexico, Guatemala El Salvador, Costa Rica, Colombia, Ecuador, Peru and Argentina) which covers at least the last decade, including the effects of the 97-98 El Niño phenomenon.

Note: For more information on LA RED and the graphic results of using DesInventar please visit our web page: http://www.itdg.org.pe/lared