

## GeoSemantica: An Overview of Functionality

As a digital library prototype, GeoSemantica aims at developing awareness and understanding of geologic hazard issues within the member countries of the MAP:GAC project. Specifically, the GeoSemantica initiative creates a focused digital library framework to help promote the integration of geologic information for the purposes of collaboration between MAP:GAC member countries.

Traditionally, the fundamental roles and responsibilities of libraries have been to endorse stewardship of shared information resources, to promote both scholarly research and involvement in decision making, to manage and archive large volumes of information, to stimulate new thought and thus to foster growth of our collective knowledge resources. In an effort to transform this functionality of traditional libraries into a digital or Internet environment, four core modules were developed that compartmentalize this functionality and represent it in a meaningful way that will be useful for the user. These four modules include News and Information, Knowledge Browser, Library Collections and Projects.

### News & Information

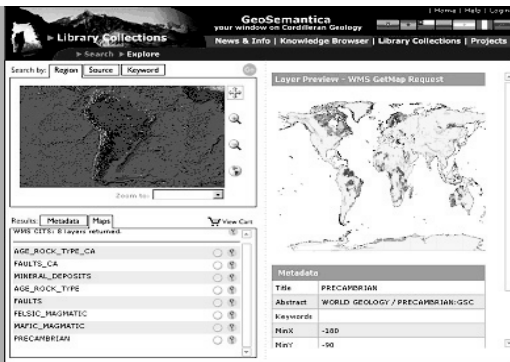
As a forum to learn and explore hazards-related issues, the News and Information module provides current news stories and a vast array of website resources. News content in the module is updated automatically by syndicated Internet news sources. Website resources in the module are organized under earth science headings. By selecting a heading of interest, all associated websites are available for viewing.



### Library Collections

The Library Collections module provides access to existing web-enabled information sources in a distributed networked environment to promote the integration of information to support access, discovery and the generation of new ideas.

There are three main components to library collections module: (1) Creating a search filter, (2) Viewing search results (3) Accessing Information. Filtered searches are performed by specifying a region, source and keyword. Once the filtered search has been initiated, the metadata content of the library catalogue is queried and the titles of the search results are categorized and displayed as metadata or maps. The user can delete a result if it is not appropriate to the desired search, add a result to a library cart (which allows access to the result on a later visit to the site) or view an abstract and other related metadata information.



### Knowledge Browser

The Knowledge Browser module helps the user transform information into knowledge through the integration of semantic networks, Web GIS and hypermedia to provide a rich and multi-faceted context for exploring ideas and issues within the MAP:GAC project. Concepts in the semantic web are linked to objects in the Web-GIS and hypermedia frames through the use of a Thinkmap™ Java Applet and dynamic database queries. The organization of these concepts in a semantic network promotes the understanding of linkages and relationships between concepts. As concepts are selected from the semantic network, related spatial data and documentation can be viewed.



### Projects

As a meeting and collaboration point for members of sub-projects within MAP:GAC member countries, the Projects module allows researchers to keep updated on project progression and status. Powered by Microsoft's SharePoint Team Services, this module provides project members with the ability to organize project information, manage and share documents and enables efficient collaboration. Access to project workgroups and content is limited to project members. The project leader administers each individual project site.



The GeoSemantica prototype is still under development and has yet to be officially launched on an Internet site. All of the functionality discussed above will be demonstrated at the MAP:GAC executive council meeting in Toronto, March 9<sup>th</sup> to the 14<sup>th</sup>.

Ms. Shannon Denny

# MAP GAC



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## From the Manager's Desk - March 2003

February turned out to be a very busy month for everyone. As we geared up for the Executive Council meeting (March 9-14) a great many things still needed to be done in order to be fully prepared! Work on GeoSemantica progressed steadily, and the team has a great presentation in store for the Executive Council (see also the article in this Newsletter by Ms. Shannon Denny). Mr. Roberto Gonzalez has nearly completed his work on the emergency preparedness aspects of the Project and will also be presenting at the Executive Council meeting. Dr Matthias Jakob spent most of early February preparing a 60 hour short course on landslide hazards for Bolivia, which unfortunately had to be cancelled at the last minute due to the political situation in La Paz. The course, however, is complete and can now be delivered on short notice (depending on Jakob's availability).

Mr. Mike Ellerbeck, Gonzalez and I were in Ecuador in mid February. We met with representatives from the UN. Through these meetings, together with contact made with Dr. Pedro Basabe of the UNs International Strategy for Natural Disaster Reduction (ISDR) secretariat in Geneva, we have begun to set the stage for collaborative work and partnerships with some of the UN agencies. While in Ecuador, we also met with the new Director of DINAGE, Dr. Guillermo Rosero, as well as the Head of the Instituto Geofisico, Mr. Hugo Yepes. These meetings, as well as meetings with staff of both institutions, proved very productive. The week also included a conference on volcanoes and the community.

The volcano workshop in Quito brought together university researchers, geologists, volcanologists, Civil Defence members, mayors, government officials and dignitaries for three days of discussions on volcanic hazards and their impact on people and communities. Several overview talks were given. The most interesting for me, and the most relevant to our Project, were

those from the community leaders in areas impacted by volcanic hazards. The overwhelming conclusion of these speakers was the critical importance of involving the community in all aspects of hazard work and mitigation, from the beginning. It was also stressed how important it is for hazard specialists to work with community leaders, providing information upon which decisions (evacuation, land-use planning, etc.) can be made, but not to make those essentially political decisions themselves. The importance of this close working relationship between mandated agencies and other government authorities, especially at the community level, was stressed in several talks. One specific example demonstrated how the lack of direct involvement of the local population and leaders in a community evacuation order resulted in lingering animosity that lasted for many years, and is only now being overcome. The task of conveying scientifically solid and robust information is not easy, and political leaders must be willing to listen.

Any hazard that has a negative impact on a community has huge economic repercussions. Communities living in the shadow of hazards for years, with no ill effect, are not necessarily going to readily accept the reasoned voices of hazard specialists who say "something needs to be done". Dr. Fernando Muñoz Carmona's article in this Newsletter gives an excellent example of a situation where community leaders have chosen to ignore a specific threat, with the potential long term impact of increasing the level of risk the community faces. The complex issue of communication between local authorities, the public, and hazard specialists will be one of the topics of discussion at March's Executive Council meeting – and an issue MAP:GAC will need to grapple with over the coming years in order to effectively show the importance of geoscience information in good decision making.

Dr. Catherine Hickson

## Geohazard Series No.4

For this month's Geohazard Series we have a contribution from Dr. Fernando Muñoz Carmona, of Colombia's INGEOMINAS. Through a series of historic natural disasters, the INGEOMINAS group has learned first hand the importance of effective communication with communities in order to mitigate risk. Muñoz Carmona has taken the unusual step of obtaining a post-graduate degree in communication, and has been able to examine the philosophy of disaster communication to a depth well beyond that in most geohazard work. Communication of hazard information forms a fundamental part of the project work in MAP:GAC, and so we are pleased to have Muñoz Carmona discuss the topic and reflect on one of the recent experiences of INGEOMINAS, at this early stage in the project.

Dr. Mark Stasiuk  
Editor, Geohazard Series

## Cordilleran Roundup 2003



The 2003 British Columbia Cordilleran Roundup took place at the Bayshore hotel in Vancouver from January 27 to 30. MAP:GAC was represented by a booth staffed by MAP:GAC staff from GSC Vancouver. This year's conference had the highest attendance ever with over 3000 attendees. Attendees (from North and South America) showed much interest in the activities of MAP:GAC.

The MAP:GAC team prepared project promotional material (posters and handouts) in English and Spanish and will distribute copies of this material to all participants for use at conferences and events in South America.

Mr. Mike Ellerbeck

For further MAP:GAC information  
please consult the project Web page at  
<http://www.pma-map.com>

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## Communication and Natural Risks

In this paper, communication is not only presented as a tool for exchanging information about natural risks, but also as a fundamental process that contributes in the creation of those natural risks. Similarly, it is shown that risk, more than a mathematical expression, is a condition modeled to a large extent by decision processes.

### What is meant by “communication”?

The notion of *communication* comprises a multitude of meanings. There are, for example, ideas that emphasize on the description or representation of the communication process, making frequent references to the “components” of communication (e.g., transmitter, receiver, medium, message, feedback) and to the form in which these components interact or participate in the process. These perspectives have given rise to general definitions of **communication**, such as, *the activity that involves the use of signs, symbols and transmission of messages that are constructed and deciphered by assigning them different meanings according to the mental (internal) and environmental (external) conditions of the participating individuals or groups*.

Other notions put emphasis on the critical analysis of the generative conditions or factors, as well as on the results or products of the communication process. In these notions, **communication** is frequently understood as *the fundamental process in the construction of meaning at an individual and collective level*. In other words, it is the process by which people obtain and give meaning to the world around them. In these definitions, **communication**, more than a process that can be represented, is “action” with a transformative power. According to Mumby (1988), communication is understood as the basis for social formation, transformation, and legitimization; it constitutes a process that produces and reproduces people, groups, and social organizations.

These definitions also take into account that the exercise of communication does not take place in a neutral context and, that on the contrary, there exist a variety of forces of social and individual order (power) that permanently influence and shape not only the process of communication, but also the individuals and communities that participate in it. [Note 2: These forces of individual and social order are in turn influenced by communication processes.] Thus, for example, from this perspective, a person’s style of dress not only projects (or communicates) something about the person (e.g., youthful, traditional, extravagant), but also the style of dress is a synthesis of the effects of the external environment conditions (e.g., fashion, consumption) as well as the internal conditions of individuals. These conditions, in turn, are defined and shaped by social and individual forces.

Without ignoring the importance of the perspective that emphasizes the representation of the communication process, the ideas presented in this paper emphasize the concept of communication as a process with transformative power.

### What is meant by “natural risks”?

Similarly with the concept of communication, the word *risk* is understood in many ways. In every day language, the meaning of *risk* is frequently confused with the words *danger* and *hazard*. [Note 3: This confusion is also found in the Spanish language with the words *riesgo*, *peligro* y *amenaza*.] In the same way, the word *risk* sometimes refers to the consequences of certain actions or process (e.g., the risk of catching AIDS), whereas in others, it is the actions and processes themselves (e.g., smoking) that constitutes the risk (Holzheu & Wiedemann, 1993). Also, depending on the context or the particular discipline from which risk is considered, the concept of risk presents different interpretations. Thus, while some people understand and represent risk as a mathematical expression (e.g.,  $R = A \cdot V / C$  [Note 4: Risk = Hazard times Vulnerability divided by Capacity, (ISDR, 2002)], others understand it as an individually and

socially constructed process whose complexity escapes precise mathematical representation (see Krinsky & Golding, 1992). This situation often leads to a confusion, that although in common language is of no major importance, at the level of experts, leaders, or those involved in risk management, might present an obstacle for effective and efficient risk management. Therefore it is important, before any study, design, or implementation of strategies for risk management, to arrive at an agreement on the terminology to be employed, based on a solid conceptual support. It is also important to make sure that the terminology proposed is well known, and shared by those who live or experience the condition of risk.

In this presentation, **risk** is defined as *the condition that is produced when considering the possible negative impact of an event or hazard in a given context and where that negative impact is mediated by a decision that is constructed communicatively*. [Note 5: Given space limitations, the conceptual basis of this definition is not presented in this document. Much of this information is presented in Muñoz-Carmona (1997), Muñoz-Carmona (1999), and recently in Muñoz-Carmona (2001).] One of the important aspects of the context where hazard occurs is **vulnerability**, which is understood as the characteristics (or condition) of a person, group (or structure) in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a hazard (Blackie, Cannon, Davis, & Wisner, 1994). **Hazard**, on the other hand, is understood as *the agent(s), condition(s), or event(s) that have the potential to cause harm or damage*. It can then be said that **risk** is what happens when hazard and vulnerability occur concurrently, involving a decision-making process.

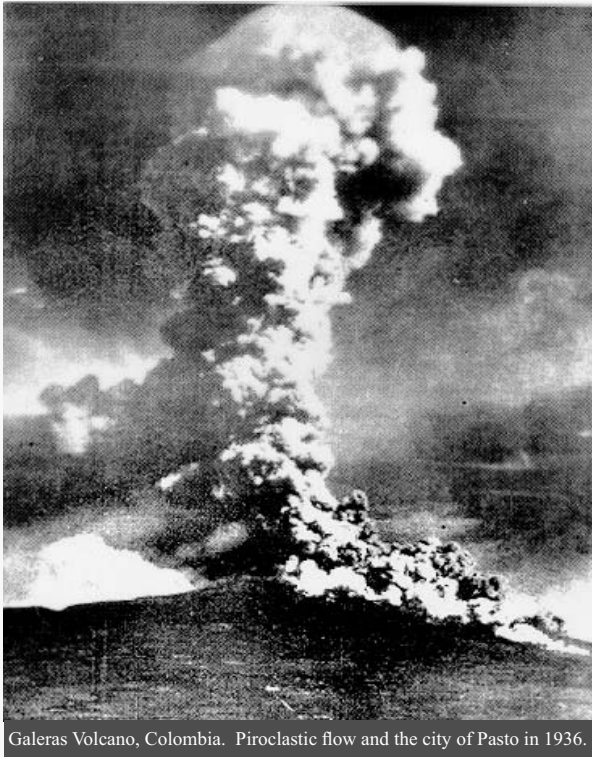
In the previous definitions, the use of the term “probability”, so frequently used in definitions of hazard and risk, has been omitted deliberately in favour of the terms “condition” and “decision”. One of the reasons for this position is the need to emphasize that although one of the fundamental characteristics of hazard and risk is the possibility of occurrence (of the hazardous event as well as the damages or impacts), this is only one aspect of the many that characterize these processes. In fact, aspects of hazard and risk such as genesis, distribution, magnitude, intensity, and duration are equally important and it is necessary to take them into account for suitable identification and management of risk. Additionally, there are psychological, cultural, economic, biological, and sociological aspects that participate and contribute in creating a changing and complex risk. Aspects, like those mentioned, modify the field of knowledge of those affected by risks, and influence particularly the decision-making processes regarding hazards. Once the characteristics of hazards and of the context in which they operate (e.g., vulnerabilities) are known, the decision-making processes regarding this information are to a large extent responsible for the construction of risk.

Additionally, the possibility of occurrence (of the event or the impact), usually put in terms of probabilities, is not understood in most cases by those who live with and construct the risk process, and therefore it does not constitute one of the fundamental aspects for the decision making processes associated with risk management. In fact, the preconceptions about the accuracy and validity of the outcomes of probability calculations based on prestigious scientific methods has led, in many occasions, to the reduction of risk management to a search for predictions. This approach fails to acknowledge that, by the same evidence of hazards and risks, the fundamental problem is not in knowing the probability of hazards and risks to become a reality, but in identifying and implementing preventive measures, as well as, effective coexistence with an ongoing phenomenon or condition. Even in the case that the state of knowledge is sufficient to allow the prediction of the moment of occurrence and magnitude of an certain event, this would not exclude the need for identifying and implementing preventive actions.

As to the “natural” character of risk, it is proposed to use the classification suggested by the United Nations in its

International Strategy for Disaster Reduction (ISDR, 2002; <http://www.unisdr.org>). In this classification, it is indicated that the “natural” hazards can have a geological, hydrometeorological, or biological origin. Geological hazards are identified as earthquakes, tsunamis, volcanic activity, subsidence, surface collapse, fault activity, and mass movements such as landslides, rock falls, liquefaction, and submarine landslides. Hydrometeorological hazards are considered to be floods, debris flows, mud flows, tropical cyclones, storms, tornadoes, hailstorms, rain, blizzards, drought, desertification, forest fires, heat waves, dust storms and sand storms, and snow avalanches. Biological hazards are represented by disease epidemics, contagious plants and animals, and massive infestations.

Based on the previous classification, a **natural risk** is understood as *the condition that occurs when considering the possible negative impact of an event or geological, hydrometeorological, or biological hazard in a given context and where that negative impact is mediated by decisions that are constructed communicatively*.



Galeras Volcano, Colombia. Piroclastic flow and the city of Pasto in 1936.

### Why are natural risks also the result of decisions that are constructed communicatively?

Generally, the association between communication and risk is understood as a relationship in which the concept of communication is subordinate to the concept of risk. Effectively, communication has usually been understood as an appendix or *one part* of the risk process. As a result, it is not rare to listen to proposals such as “let’s apply communication to solve the risk problem”. Thus employed, communication is usually understood as a *device* to “illustrate”, “guide”, or “correct” people with “less” culture or who do not have the expert knowledge to manage risk. In this case, communication is understood as a linear process where the “correct” knowledge flows from the expert towards the user of the information. In this type of scheme, communication is frequently associated with educational processes.

Nevertheless, in the risk process, communication plays a role that goes beyond offering information about a particular risk. Communication is in fact the process by means of which the condition of risk is built. In order to demonstrate this assertion, the following example is presented.

In 1997, the Municipal Government of Pasto, Colombia [Note 6: Pasto is a city of approximately 300,000 inhabitants located

in the southwest Andean region of Colombia close to the border with Ecuador.] seeking to improve service to the constituents, who until then had to make innumerable trips between dispersed branches of the municipality to conduct any bureaucratic proceeding, *decided* to use abandoned facilities belonging to another government organization. This *decision* gave rise to transferring the governmental operations to the western sector, in the outskirts of the city, very close (less than 6 miles) from the active crater of Galerás Volcano. However, this *decision*, although translating as a sensible improvement to user services, insofar as many procedures could be done in a single site, also modified and constructed a new condition of risk toward the clients of the municipality and the adjoining neighborhood (Muñoz-Carmona, 1999).

It is important to mention some aspects of the social context that influenced this decision. In 1988 Galerás Volcano was reactivated, producing an important social disturbance, especially in relation to economic investment. The possibility of a volcanic eruption that affected the city of Pasto signified, among other things, a very important loss of property values. In response to the new situation, city authorities, under pressure especially from the powerful economic establishment, promoted the “degalerization” [Note 7: A strategy through which the topic of volcanic activity was eliminated from government and community agendas.] of Pasto, searching to elude the spectre of impending volcanic hazard for the city and its surroundings. Subsequently, the decision on the part of the highest city authority to move such an important branch office to a site in the vicinity of the crater of an active volcano was marked by important symbolic content. Effectively, the highest authority was not afraid of the volcano, and instead of maintaining a prudent distance, approached nearer. This action sought to send a message of optimism and of confidence in the volcano, and made a step in favor of stimulating the economy of the region.

In addition to the misinformation process [Note 8: More than using the information provided by the scientists for prevention purposes, the information was used to make the technicians in charge of monitoring the volcanic activity responsible for the economic crisis that became evident especially after the reactivation of the volcano.] the decisions and actions by the authorities (modulated and mediated also by the communication exercise under particular conditions of power) served to modify the condition of risk not only for the inhabitants of the zone at the moment of decision but also for future generations.

An example of the effect of the modification of the condition of risk for the inhabitants in the vicinity of the new City Hall, at the time of the decision, is the increase of economic risk for the the inhabitants of the San Diego Condominium (located 200 m below the new City Hall). Effectively, in a 1998 survey, the value of the house of the Condominium complex practically doubled when the Municipality moved into the neighbourhood (Muñoz-Carmona, 1999). The argument of various inhabitants of the sector, in addition to the security of the protective presence of the Municipality, was that the new locality of the Municipality constituted a focus for development that automatically translated to an increase in land prices. [Note 8: In fact the mayor at that time informed the author that on various occasions he received pressure on the part of investors to provide construction licenses in the neighborhood of the new Municipal facilities.] Therefore the impact of moving the municipality offices into the new neighbourhood, rather than being a risk, offered an opportunity for property owners to double the value of their property. Insofar as the properties were located in the neighbourhood of an active volcano, the condition of risk did not disappear. The analysis of risk from an economic perspective (and assuming other risk factors are constant –e.g., physical, psychological, cultural loss), would show that the economic loss (the risk) would increase with the increase in price of the affected properties.

Insofar as the increase in risk for the future generations, it is clear that the new location of the City Hall could focus development toward the volcano. Although the recent eruptive activity of Galerás has fundamentally been confined to the crater area, in the past violent eruptions occurred with great destructive power, some of them accompanied by pyroclastic flows (Figure 1). As observed in 1936 (the year that the photograph was taken), there were no buildings within the flow trajectory. A much different situation could be generated with continuation of development toward the volcano, even with an eruption of the same magnitude.

### Final Comments

Although a quantitative or probabilistic perspective of risk can be very useful for certain audiences (e.g. financial organizations), or in particular circumstances (e.g. as the only element for the decision-making in situations of reaction facing imminent events), it is important to remember that risk, more than a probability or a mathematical expression, is rather a condition with a latent character influenced by complex aspects. Psychological, sociological, cultural, economic, physical aspects, among others, influence the decision-making processes that take place in the construction of risk. These aspects, in turn, are also influenced and mediated by communicative processes that take place under particular conditions of power.

From the previous example, it is clear how the *decisions* of an administration (under specific conditions of power) dramatically modified the condition of risk (present and future) for a sector of the population of Pasto. With this example it is also understood the importance for those persons involved in the process of risk of knowing the hazards and the conditions of the context in which they operate. With a population informed and conscious of the importance of the exercise of their power for decision-making, in the face of the existence of an active volcano, a situation like this may never have happened.

Dr. Fernando Muñoz-Carmona

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