CREATION D'UN OBSERVATOIRE POUR LA GESTION D'UN RISQUE NATUREL MAJEUR.

AN OBSERVATION SYSTEM FOR MANAGING A MAJOR NATURAL HAZARD.

By

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SUMMARY

We present here the organization of a team created for managing a major natural hazard in the French Alps. Initially only technical investigations were done, but as the project developed, the necessity to expand the team by including other sciences (hydraulics, law, urban planning, social science, historical research and economics) became apparent. At this point in time, the team is structured and the duties of each participant are well defined. The objective of this team is to produce a very powerful information system, to bridge the gap between specialists and the menaced population and to enhance confidence in the specialists in order to avoid misinformation that might occur through the media. This organization is called '*the observatory*'.

1. INTRODUCTION

In the French Alps has a long history of big landslides. Many of them have been mapped by geologists, even in the past. One of the most impressive, which took place in the middle-ages (1272), devastated a large area near Chambéry. This hugely destructive phenomenon was used by the Count of Savoy for political purposes, saying that the buried population had been punished by God for having, some time before, seceded to become part of another county.

Today, we are facing other impending landslides that have the potential to be equally as destructive. However, through the use of technology, we intend to minimise the devastation that they might incur. (Faure et al, 1993)

A little over ten years ago, geologists, along with the population of a little town, discovered that a part of the mountain near the town, was near collapse. Because of the layout of the valley in which the phenomenon is taking place, if this event occurs, it will be a major disaster. At the beginning of the studies, only earth scientists worked on the topic. The case become quickly a very important laboratory for remote sensing and a huge amount of data was collected. But the exchanges with the local politicians were very poor, and the population has been badly informed. Consequently, a lot of unfounded rumours have appeared. One of the main difficulties associated with this problem is to explain that the experts are sure about the

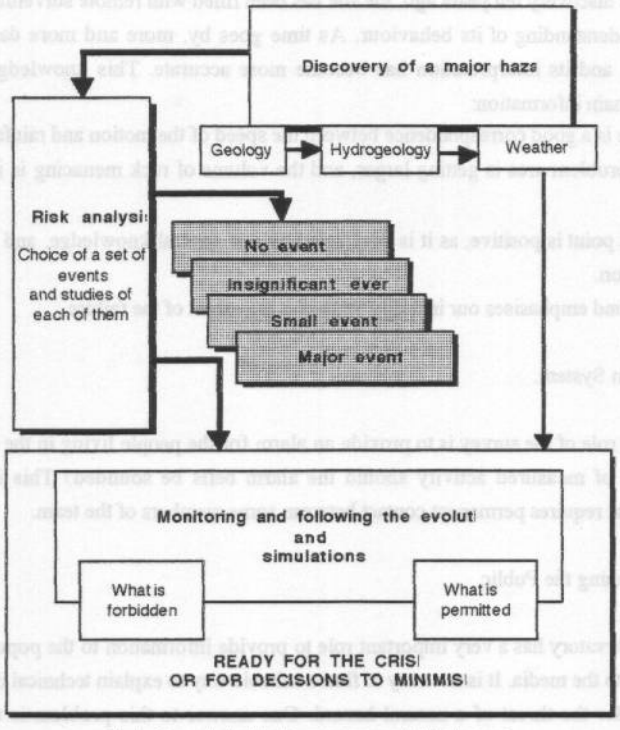

Fig 1 : General chart for the management of the hazard

Fig.1: Chart representing the general philosophy behind the management of the hazard.

slide, but are not able to tell when it will occur. In addition, the idea that, after a slow evolution the failure may be sudden, seems to be difficult to explain.

2. THE BASICS OF AN OBSERVATION SYSTEM.

2.1 The Objectives of the Observatory.

Fig.1 shows the flowchart representing the philosophy adopted in this study for the management of the crisis in question. The local government administration decided to develop a system based on this philosophy that has the following objectives:

2.1.1 Surveillance.

Since its discovery ten years ago, the site has been filled with remote surveillance systems to enhance understanding of its behaviour. As time goes by, more and more data is stored on computers, and its interpretation has become more accurate. This knowledge gives us the following main information:

- There is a good correspondence between the speed of the motion and rainfall.
- The problem area is getting larger, and the volume of rock menacing is increasing with time.

The first point is positive, as it is confirmed by our general knowledge, and it may be used for prediction.

The second emphasises our inability to predict the extent of the failure.

2.1.2 Alarm System.

Another role of the survey is to provide an alarm for the people living in the locality. But at what level of measured activity should the alarm bells be sounded? This is an important question that requires permanent contact between some members of the team.

2.1.3 Informing the Public

The observatory has a very important role to provide information to the population and also to respond to the media. It is not easy to find a suitable way to explain technical data to someone who is under the threat of a natural hazard. One answer to this problem is the information system which we shall describe in part three.

2.1.4 Decision Aid During the Crisis.

The last aim for the observatory is its ability to provide efficient help for managing the crisis, when it occurs.

2.2 Who is Involved in the Observatory.

Under the manager and his assistant, several (25 - 35) people are involved in the project. One can find the four domains that are necessary to provide a good understanding and efficient management of this kind of problem. Fig.2 illustrates the relationship between these participants and the objective of the project.

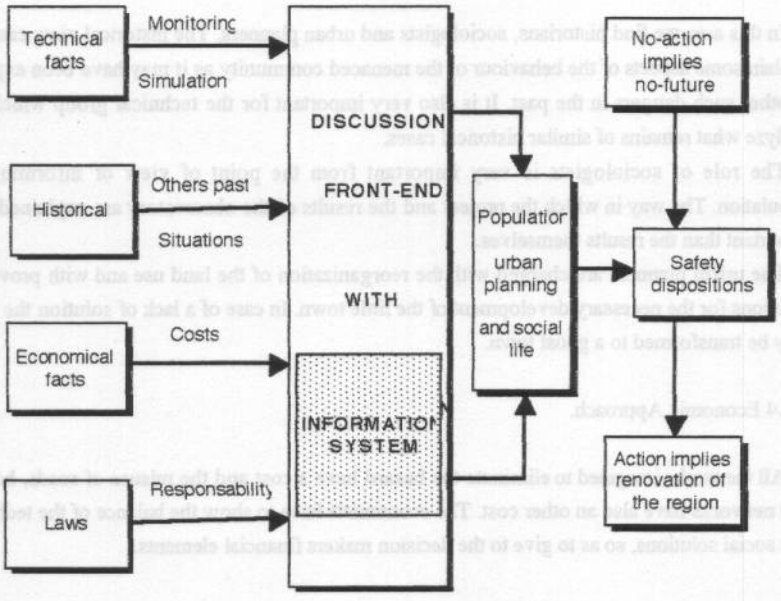

Fig 2 : All the actors for a new development of the menaced area

Fig.2: All the participants for the development of a menaced zone.

2.2.1 Technical Domain.

In this domain we have engineers and geologists. The topics covered are geology, rock mechanics, hydrology and computer sciences.

2.2.2 Legal Domain

The job of the lawyers involved here is to document all the laws, rights and all kind of texts which can shed light the obligation of the local administration and the rights of the menaced community. A very important part of this work is to define the chain of responsibility in the administration and also the responsibility of everybody involved in the management of the impending hazard.

2.2. 3 Social Domain.

In this area we find historians, sociologists and urban planners. The historical view can help explain some aspects of the behaviour of the menaced community as it may have been exposed to other such dangers in the past. It is also very important for the technical group which can analyze what remains of similar historical cases.

The role of sociologists is very important from the point of view of informing the population. The way in which the project and the results of the observatory are explained is as important than the results themselves.

The urban planners are charged with the reorganization of the land use and with providing solutions for the necessary development of the little town. In case of a lack of solution the town may be transformed to a ghost town.

2.2.4 Economic Approach.

All the works imagined to eliminate the hazard have a cost and the misuse of roads, houses and networks have also an other cost. The economists have to show the balance of the technical and social solutions, so as to give to the decision makers financial elements.

2.3 Organisation of the Observatory.

The extensive team described herein meets on many occasions as a working group. A general meeting takes place every six months and partial meetings as often it appears

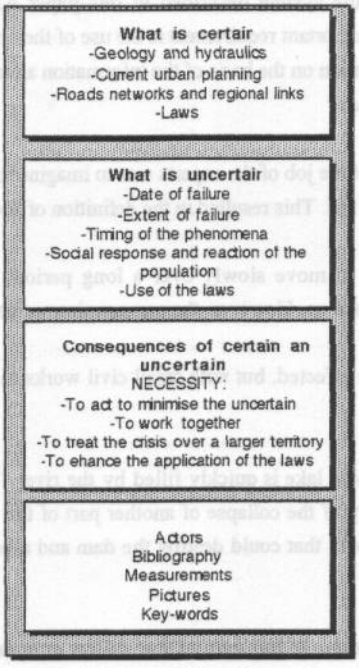

Fig 3 : Principle of the opening page of the information system

Fig.3: Principle of the opening page of the information system.

necessary. Some members of the group belong to public administrations, but most of them are contractors under the authority of the manager.

The permanent links are by fax or telephone, although the computerised system of information can be put on Internet. Three computers (Pentium PCs) are devoted, in three establishments, to the storage and the input of the information.

3. THE COMPUTERISED INFORMATION SYSTEM.

3.1 Structure of the System.

One of the major requirements for the information system is its easy to use approach. A decision maker has to be efficient when using the system and has no time to waste in learning it. The interface has to be natural, and this is an significant challenge. Fig.3 is a schematic layout

of the opening page of the system described in this paper which responds to this basic requirement. The second important requirement is the use of the system when the crisis occurs. This necessitates its simulation on the basis of the information already available.

3.1.1 Selection of Scenarios.

A very important part of the job of the experts was to imagine the behaviour of the slope and predict in what way it will fail. This resulted in the definition of four scenarios.

Non event.

The mountain continues to move slowly over a long period, and, with the exception of intermittent rockfalls, it stays up. However, the menace also continues.

Insignificant event.

The road and the river are effected, but with small civil works the normal situation is quickly restored.

A minor event.

A small dam is created and a lake is quickly filled by the river. The menace is consequently increased by the possibility of the collapse of another part of the mountain into the lake. That would result in a huge wave, that could destroy the dam and a big part of the narrow valley downstream.

A major event.

The dam is now 40 m high. A big part of the valley upstream disappears under water. However, we know that this kind of dam doesn't last long, and when it will collapses the section of the valley downstream will be entirely destroyed for kilometers.

All these scenarios are shown in the data base along with all theirs aspects.(economical, urban planning, social costs etc.).

3.1.2 How to use the Observatory.

As described above, the front-end used to access the information system is very friendly. This is achieved in part by the use *Hyper Text Markup Language*. Consequently, the path used to explore the data-base is built by the user himself. We provide a glossary to get directly to the information, and also from within the text itself, but the most important aspect is the use of images and maps to access to the information. The user just has to click on selected zones and he his directed to the information belonging to that zone. That information may be in the form of either text, images, sketches, charts or maps.

3.1.3 Presentation and Study of the Scenarios.

The information system described herein provides an easy method of consulting the scenarios, allowing the users to study each scenario, and to ask the experts for more information. The system is dynamic, allowing the information base to be augmented easily. It appears to be a powerful means for presenting the work of all the team members of the group, taking into account all the past information and the possibility to understand the behaviour of population under threat.

For the study of the scenarios, we were obliged to find, and also to develop, numerical codes that allow simulation. This is also an important part of the observatory.

3.2 Updating the Observatory.

As indicated above, the information is growing with the time. Because of the large amount of data and the temporary impossibility of access to Internet for the whole group, we decided to store the data on CD-Rom. Every three months a new CD-Rom is pressed with complete information. During the three month interval the new information is stored on a standard computer hard disk, with connections using modems and the telephone network for checking the uniqueness of the data. This approach also ensures confidentiality of the information. At the end of the first year, the amount of data over 500 Mb.

4 - CONCLUSION.

The work of the multidiscipline group is very interesting, providing a melting pot of experiences and approaches, and it seems to be the good way to produce an information system that will be accepted by all. The role of the manager of the group is very important, sharing out the studies, and, above all, providing a permanent link between the state authorities and the local administration.

We hope that the management approach that we have opted for in this case may be a model for the management of other hazards.

5 - BIBLIOGRAPHY

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