NATURAL AND TECHNOLOGICAL RISK MANAGEMENT BY PRIVATE INSURANCE IN ROMANIA, INCLUDING MINING RELATED DISASTERS

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ABSTRACT

Generally, any damage assessment is made in order to ensure adequate compensation to the affected persons. Currently in Romania, insurance companies have little involvement in the preventing and reducing the impacts of natural and technological hazards, including those related with mining. Presently, the only financial resources for mitigating damages caused by the natural disasters are the funds from State budgets and external credits. Generally, these funds are insufficient to cover the damages of natural disasters; hence, increased use of insurance is needed to indemnify disasters victims. To encourage disaster insurance, the insurance companies should be able to more accurately set their insurance premiums depending on the estimated risk for each property. This risk information should be compiled in Geographical Information System (GIS) maps based on multiple disaster risk evaluation methodology. The priorities targeted by this paper are: a). Expanding the use of natural and technological risks analysis including mining related disasters by private companies; b). Encouraging the use of private insurance companies services; c). Implementing vulnerability and risk methodology for GIS hazard mapping in Romania including mining facilities.

1. INTRODUCTION

This document identifies major advantages of a better involvement of insurance companies at the local level in Romania based on a standard risk identification and quantification methodology.

Commonly, the damages produced by a natural disaster can not be fully covered by State funds. Consequently a better use of insurance will indemnify disaster victims. Insurance companies can more accurately estimate their insurances premiums for every property and facility, using risk maps based on the newly implemented multi-disaster risk evaluation methodology.

2. SCOPE

This paper addresses the advantages of using GIS methodology for developing county-wide vulnerability and risk maps for various hazards (natural disasters such as: floods, severe storms, earthquakes, landslides, forest fires and technological disasters such as: industrial accidents, transportation of dangerous goods, contaminated lands). A pilot project of this nature require a county with a currently implemented GIS system in its public administration.

A follow up project is to be implemented, for multi-disaster risk maps of the entire country. These newly implemented risk maps assist the stakeholders and insurance companies to evaluate the total disaster insurance needs from a single source of information.

3. CONSTRAINTS

The insurance companies are unwilling to insure goods and properties located in natural disaster-prone areas, vulnerable to different kind of natural or man-made disasters (table no. 1). The only financial resources for minimizing the damages caused by the natural disasters are the funds allocated by the State budget and external credits.

Table 1. Disaster profile of Romania

Disaster	Floods-drought	Land-slides	Storms	Earth-quakes	Forest Fires	Contami-nated Lands	Industrial Install-ations	Transport of Dangerous Goods
Severity								

Legend:

high risk

medium risk

The natural disaster which produced the greater human losses and material damages in Romania, are: floods, earthquakes, landslides and storms. History of the most catastrophic disaster of Romania in the recent history are presented in the Table no. 2, below (generally the insured damages are less than 1% from the total damages recoreded due natural disasters).

Table 2. The most important damages ever recorded due to natural disasters in Romania

Year/data	Type of disaster- feature	Human life	Injured	Homeless	Affected	Damages (mil USD)	Insured damages (percentages from the total damages)
4 March 1977	Earthquake – 7.5 Richter scale magnitude	1641	11300	175000	386300	2000	0
May 1970	Flood	215			238755	1000	0
July 1975	Flood	60			1000000	750	0
11-12 July1999	Landslide (mudflow)	13					0
April-September 2005	Flood	78			30800	1958	<1%
April-May 2006	Danube river Flood	1		16350		225	<1%
July 2008	Floods due a retrograde cyclone	5			27000	830	<1%

*NOTE: before 1990, the private insurance didn't exist. After 1990, in Romania the insured damages are reported to be very small (source: Munich Re)

4. ADVANTAGES

In Romania there is a true need in supporting the local authorities in promoting a sustainable development in environmental factors management and land use development and planning. In this action, a good informational system projection and implementation for natural and technological disasters are of main importance for local authorities, environmental protection agencies and water management systems.

The cartography of risk areas for damaged areas inventory will help to organize the local development, to promote projects for local protection of the population and economical objectives, and will update the actual risk evaluation of the existent vulnerable areas (fig. no. 1).

The tight connection between Romanian experts in the different fields of activities according to the different hazards, natural and technological, will led to innovative aspects in the field of disaster mitigation and protection, in order to create sustainable development of local communities (Mara, 2004).

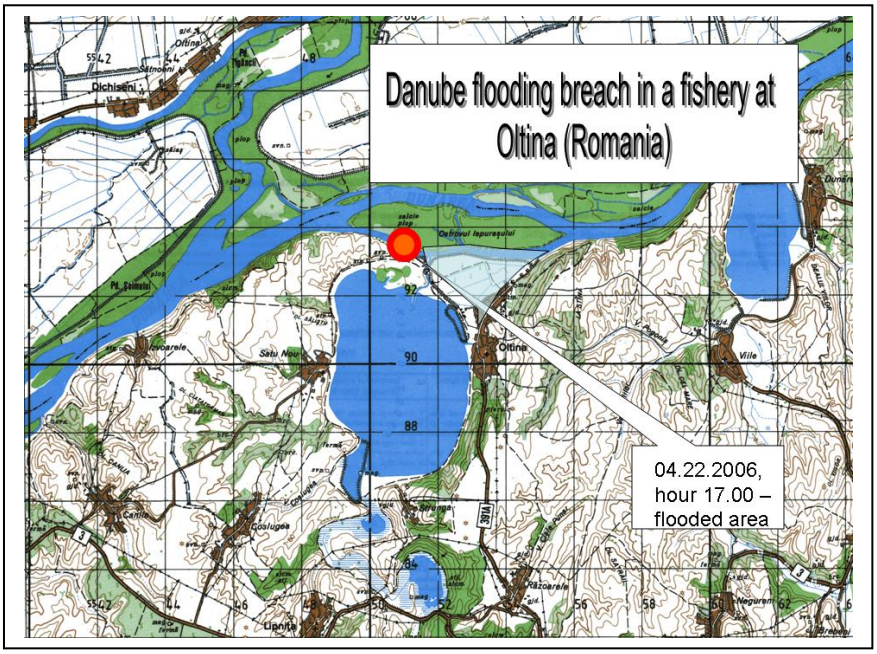

Figure 1. At present time the available maps used in case of disasters in Romania missed the areas prone to natural disasters in the inhabited areas. (example: the case of the Danube River levees over-flooding)

In Romania there are a limited number of accepted methodologies for drawing up the hazard maps. The methodologies are available for floods, earthquakes and landslides. Even for these fields, the methodologies have a limited range of applications. The results are not always represented on the same map, since the maps are differentiated on each type of disaster.

5. THE RISK MAPPING METHOD FOR NATURAL AND TECHNOLOGICAL HAZARDS

According to the generally accepted definition, Risk equals the product of Probability and Vulnerability:

Risk = Probability x Vulnerability

While the probability of generating a disaster is generally known, the assessment of the consequences is difficult and involves numerous unknown elements. A special attention will thus be given to the “vulnerability assessment".

6. REQUIREMENTS

A geographical information system (GIS) that combines natural hazards, (e.g. floods, earthquakes, land slides, frost-defrost conditions) population and the surrounding environment resources is highly recommended. Such an approach could lead to establishing priorities in terms of specific measures and needs, which the authorities involved in the natural or technological risks management must address. An improved management of the areas affected by natural and man-made disasters, will allow accurate analyses for making decisions, assuring an improved activity of prevention, mitigation and restoration of the areas affected by disasters, increasing the safety of the public and the confidence in the safety measures taken by the public administration.

7. EXPECTANCES

A common methodology for evaluation and mapping the risk posed by the natural and technological hazards, to be implemented under a pilot project at the county level in order to elaborate vulnerability and risk maps, using a dedicated GIS for storage and information dissemination to decision makers at various levels. The newly implemented methodology for estimation of the vulnerability and risk that threatened the different forms of property, as illustrated in the Fig. no. 2, below, will better establish the responsibilities and the rules of land use development and planning of the territory (Mara, Tanasescu, Vlad, Ozunu, 2006).

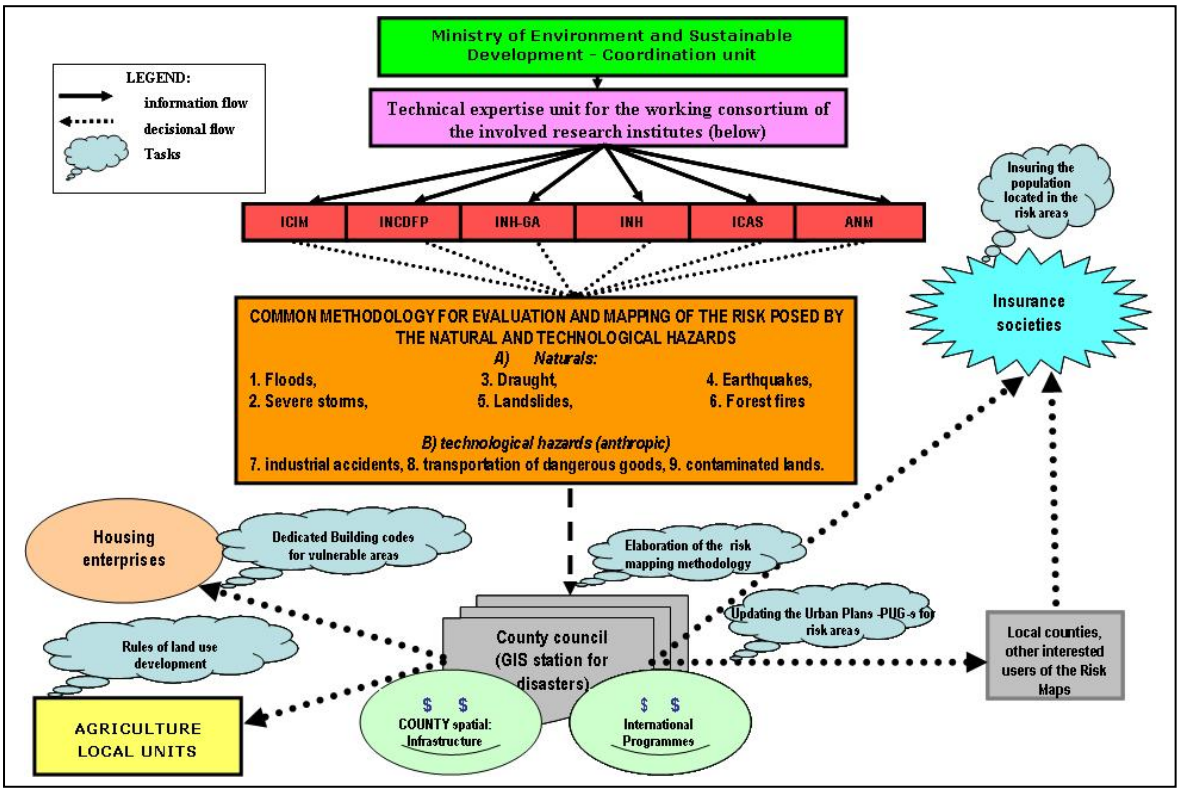

Figure 2. Hazard mapping project scheme at the county level, involving the private insurance firms based on the risk maps, using GIS for the vulnerable areas at natural and technological hazards

The main advantages of this project are the following:

-The implemented methodology for estimation of the vulnerability and risk that threatened the different forms of property will better establish the responsibilities of the administrative bodies and will help the future decisions related to land use and planning of the territory.

-The newly implemented system of risk mapping provides the stakeholders and the insurance companies a unique source of information to assist their decisions: the GIS risk map from the county or local public administration.

-The tight connection between Romanian experts in different hazards, natural and technological, will led to innovative aspects in the field of disaster mitigation and protection.

-The stringent problem of indemnifying the people or institutions affected by natural and anthropogenic disasters will be more fully addressed by the use of disaster insurance.

- Delimitation of the areas prone to natural risks, using GIS maps, also for prevention and attenuation of the effects, which are produced by the destructive natural phenomenon and to the risk posed by the technological hazards, will enhance the public safety.

The NATECH (technological disasters due to natural hazards) type hazards can be effectively presented using GIS techniques. Currently, there has been limited assessment of this type of disaster in Romania. Even the multiple risk term has been only recently implemented in Romania.

8. CASE STUDY OF A RECENT NATECH EVENT: OVERFLOWED TAILING DAM UPSTREAM AN INHABITED VILLAGE, IN 2006

Tarnicioara tailing dam nearby the Calimani National Park, became a NATECH risk zone due to severe rainfall during the period 06.27.2006-07.02.2006. Heavy rainfall led to torrential flows on the slopes surrounding the dam from the north-east, which formed a temporary lake on the top of the tailings pile, threatening almost 5000 people located nearly 3 km downstream, in the village of Ostra, as indicated in the Fig. no. 3, below. The Tarnicioara tailing dam belongs to the mining company SC Minbucovina, and was decommissioned in 2001.

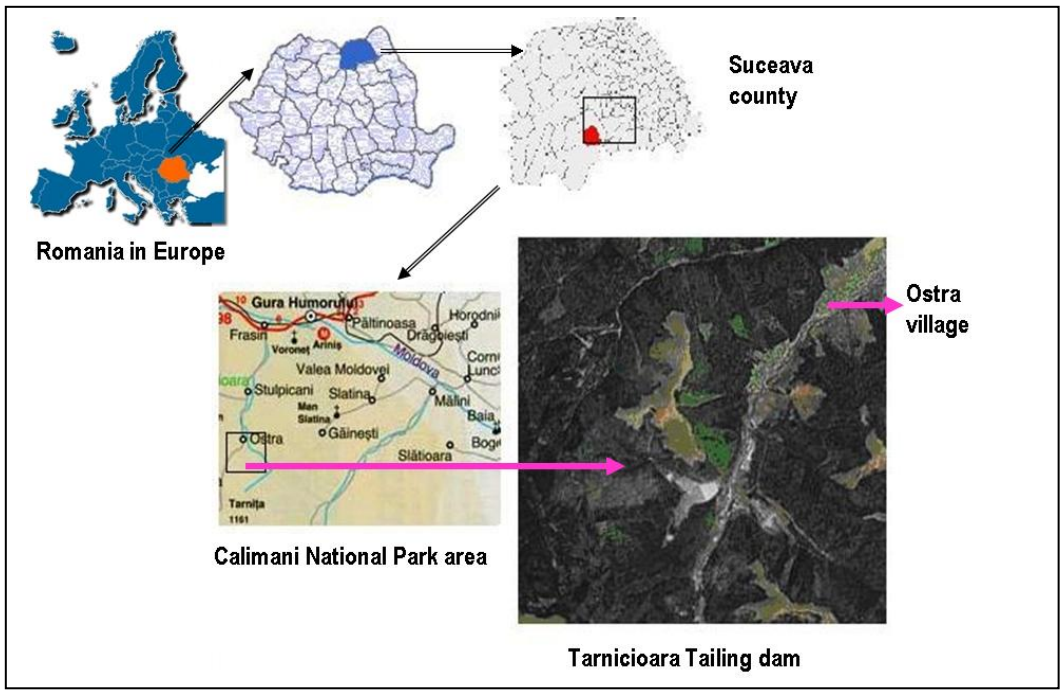

Figure 3. Localization of the Tarnicioara tailing dam, upstream of Ostra village

Since decommissioning, the tailing dam has a significant impact on the quality of environment, because of heavy metal soil contamination downstream of the tailing dam, which are exceeding the thresholds for heavy metals, regarding Cu, Zn, Pb and As, mostly 30 cm below the surface. Therefore an imminent collapse of the dam could significantly worsened the environmental conditions, because of the presence of the heavy metals, well known as for the mutagenic, theratogenic and carcinogenic effects over the whole food chain, including human and biota.

As a result of the heavy rainfall in the area of Tarnicioara tailing dam, excess water from the nearby creek accumulated on the top of the tailing dam, creating a reservoir of 12 m water deep, as ilustrated in the Fig. no. 4, below. Because of the strong gusts of wind accompanying the heavy rain storm, large waves started to battered the tailing dam crest, creating a danger to overflow and flood the downstream village, Ostra.

Figure 4. Temporary lake formed on the top of the tailing dam endangering the downstream inhabitants and tourists located in Ostra village (detail of the diverting tunnel of the creek from the upstream area of the tailing dam, partially blocked with debris)

The upstream water course, Scaldatori creek is normally diverted around the tailings dam via a tunnel; however, the stream overflowed the discharge tunnel, which was clogging with debris, branches, and up to 2,5 m thickness of sediment. The inflow of the Scaldatori creek reached almost 2200 l/s (aprox. 7920 cm/h).

Prevention Measures

In the frame of the global disasters preparedness and current events caused by mining activities, significant activities were undertaken by the National Emergency system, as illustrated in the Fig. no. 5 given below. On the national level the following measures accomplished:

- Assure the organisation, supervision and control of public disaster preparedness instruction;
- Propose the allocation of technical and financial resources for assurance of the civil protection;
- Initiate scientific research, and designed instructions plans and researches themes in the field of civil protection.

It is well known that mining activities can lead to modifications of hydro-geological conditions, drainage works, deviation of water bodies, abandoned works without environmental reconstruction, and modifications of the infrastructure. Reduction of agricultural and forestry activity by occupying the surfaces intended for the waste dumps construction and the impact over the natural heritage is significant in the mountainous areas (Mara, Vlad, 2005). The impact over the downstream soil and vegetation could be severe, if the waste dump fails; hence, appropriate in-situ remediation measures must be established.

Because of the risk posed by the temporary water reservoir from the top of Tarnicioara dam, resulting from the heavy rainfall during the period 06.02.2006 - 07.02.2006, the intervention team tried to clean up by debris the diverting tunnel of the inflow creek. This activity was halted due to the imminent risk of the collapsing the roof tunnel due to water pressure, because the sudden de-clogging by the debris. The collapse risk could have been produced in the exact location where in 2001 a subsidence pit was formed and endangered the tailing dam stability.

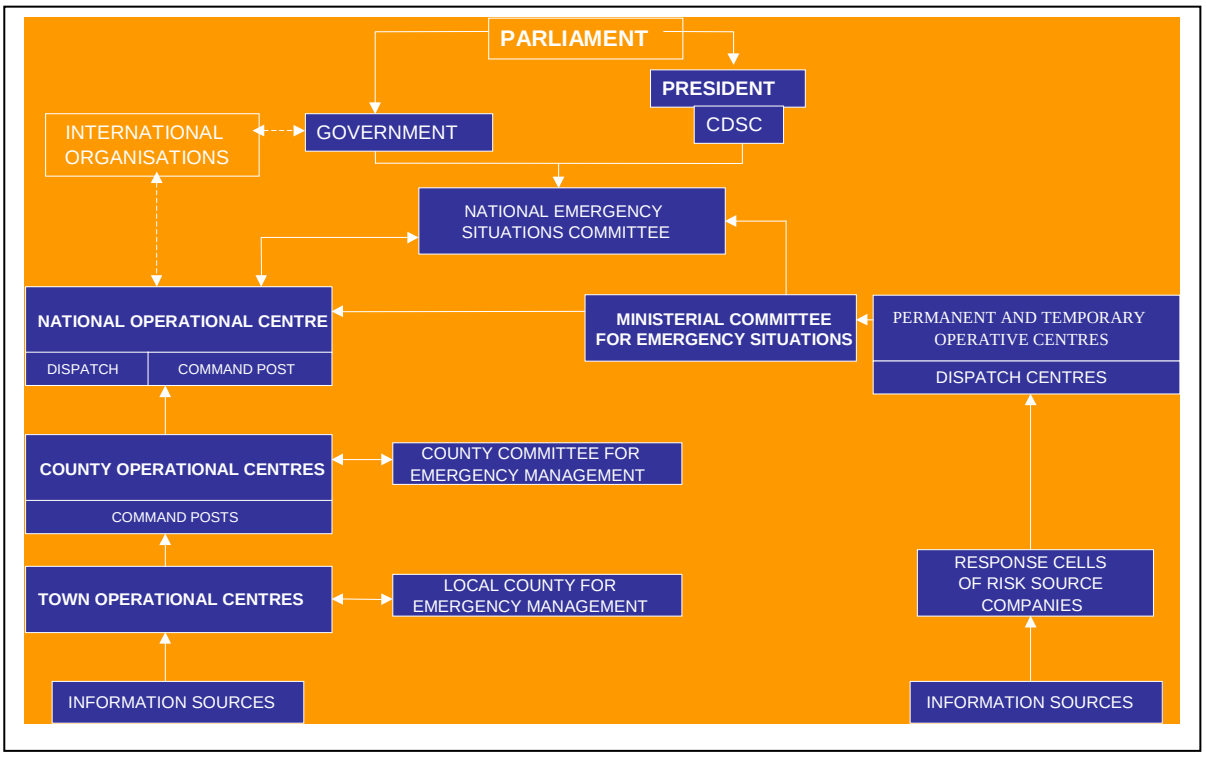

Figure 5. Emergency services organization at national and local level in Romania

Response Action

The National Agency for Land Reclamation (ANIF) put in place 6 special pumps normally used for flood control in irrigation systems, with a discharge over 1100 cm/h, and a higher capacity pump (1600 mc/h) from a coal mine, to remove the temporary lake formed on the top of the tailings dam, as shown in the Fig. no. 6, below. Also three additional pipes were installed upstream of the diverting gallery, in order to diminish the inflow to the tailing dam. These pump were operated at their entire discharging capacity, until the flooding phenomena was diminished.
A combined team of specialists from Suceava Water Management System (county branch of “Romanian Waters” National Agency), Inspectorate of the county emergency system and Tarnita preparation unit took action at the dam for few weeks, until the normal flow within diverting tunnel was completely restored.

Figure 6. Mitigation measures in order to evacuate the excess water from the top of the Tarnicioara tailing dam

Lessons Learnt

- Implementation of the Aquis communautaire (the entire body of EU laws) is important, especially in the acceding or candidate countries, for integration in the Communitarian structures, and has profound implications at all social-economical levels. A particular aspect of this relates to the safety aspects of existent industry processes. One of the most sensitive industrial activities is mining, especially in countries like Spain, Turkey, and Romania, where gold mines exist (Mara, Tanasescu, Vlad, Ozunu, 2007).
- Appropriate risk assessment and management is required to assure safe exploitation and operation of mine waste tailings dams, which can contain environmentally dangerous substances. The implementation of the Seveso II Directive, recently amended, regarding the prevention of major accidents involving dangerous substances, induces supplementary uncertainties due to the lack of risk assessment and inventory data at the European level, for tailings dams that may contain potentially dangerous substances.
- The quantification of risk associated with tailings dams and industrial waste deposits requires the use of a unified system of categorisation, for better correlation of the characteristics of varied sites and their potential hazards. Managing such risks requires that the obligations of dam owners and operators be defined so that they can be operated safely and so that adequate measures can be taken to reduce the risks of an accident. The nature of required controls will vary, based on the degree of potential risk and their potential environmental impact. A useful tool for dam owners would be the use of a common methodology based on quantification of the risk components, using a standardised system of criteria, indices, and notes.
- Romania experiences a wide range of temperatures between warm and cold seasons, with a lower evaporation rate than other countries with similar extractive industries, such as Australia, Spain, and Turkey (Mediterranean Region), that are more arid and therefore do not have the same problems that Romanian operations have with the deposition of the waste materials in settling ponds.
- Proper monitoring systems must be in place to assess structural performance, allowing accurate risk analysis and assessment of the operating functions for the tailing disposal facilities for the mining.

9. CONCLUSIONS

The most relevant ways in which the insurance companies can be involved in the reduction of the risk are the promotion of working safety norms and by relocation of some economical and social activities into the low risk areas, through insurance premiums that are differentiated by risk level or classes.

To encourage insurance companies to extend their activity into the disaster insurance, these specialized companies should be able to set their insurance premiums depending on the estimated risk for every property and facility.

The stringent problem of indemnifying the people or institutions affected by natural and anthropogenic disasters can be mitigated through the use of insurance. The geograpical risk determination can be supported by the involvement of Romanian experts in different natural and technological hazards.

The public consultation can be realized more efficiently with county-wide GIS hazard maps, as a result of the information visualization regarding the new development for industrial facilities with increased risk for major accidents.

Using GIS hazard maps will increase the accuracy of the decisional factors involved in the territorial planning, enhance programs for population protection, improve risk accountability in area development. It will also lead to promoting lower lever risk projects through the whole country.

Promoting a private insurance mechanism to cover the major part of disaster victim indemnification in Romania will lead to:

- Extending the interest of private companies for natural and technological disasters at the county level.

- Encouraging juridical and physical persons potentially affected by disasters to use private insurance company's services.

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