INVENTORY OF ANTHROPOGENIC SOURCES OF RISK THAT CAN GENERATE EVENTS OF INSECURITY FOR THE POPULATION OF THE JIU VALLEY

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Abstract: *In the paper are outlined the potential sources of risk of the Jiu Valley, generated artificially, by human activity and will adversely affect human life, property or socio-economic status of the area.*

1. Introduction

The beginning of the III millennium finds humanity in front of a number of unresolved issues. One of the most serious, by the immediate and long term, is related to protecting people and the environment.

International scientific community must respond today as convincingly and effectively to questions that the public opinion puts them more often related to climate change, the frequency increasingly more of the devastating earthquakes, long-term rainfall or rainfall and more , long-term atmospheric precipitation or rainfalls and more. What binds these problems is the direct and negative impact on human society, the character of disaster that you can get those phenomena. This situation illustrates the need and timeliness of natural hazards research, based on discerning intrinsic , underlying extreme phenomena up to outlining strategies to reduce the consequences.

When is speaking about the security of a system in a given area, that can have several meanings: danger, risk, safety, reliability, gravity and more.

By system means all the elements (human, material, logistical) interdependent organized to fulfill a given role in a given environment.

2. Danger and risk

In the absence of consensus definitions is used several notions of danger and risk. Therefore according to the rules and the literature in Romania [2]:

Danger / hazard is the intrinsic property of working materials, of the sources of energy or capacity of technical equipment, of methods or work practices, to cause damage to human health and / or environment.

Risk is the probability / possibility that the damage (injury or damage) to achieve in accordance with realization of an specific effect in a specific period or under specific circumstances and can be expressed analytically by the relation:

$$\mathbf{R = P \times G} \quad (1)$$

where: **P** - the probability of a potential accident and **G** - gravity (consequences) of this potential accident. The gravity is a measure of the consequences of a potential accident.

The consequences on people or properties can be: severe (severely wounded, dead, partial destruction of production facilities), support (property damage, minor injuries, etc..) Immediately repairable, etc.

It can be said that the risk is:

• the likelihood of a harmful effect for health , as well as the severity of this effect , as a result of exposure to the danger ;

• the unwanted event that can lead to failure (partial or total) of the project scope , when requested , on a qualitative level required and to the determined cost.

The risk is present in all natural and human activity. For many millennia , until the industrial revolution, the risks remained somewhat the same, known and identifiable by the community. They can be divided into:

• Natural collective risks: earthquakes, landslides, fires etc;

• social collective risks: war, epidemics etc.

• Individual risks: collisions, falls, diseases etc.

• collective technological risks : collapse bridges, dams, houses etc.

Risks to be taken into consideration for classification of the territorial - administrative units, public institutions and economic operators in terms of civil protection are set by Government 642/29.06.2005, as follows:

a) Natural risks: earthquakes, floods, landslides and land collapses, dangerous meteorological phenomena;

b) technological risks: chemical accidents, nuclear accidents, fires, mass, casualty inland transportation, failure of public utilities;

c) biological risks: epidemics, epizootics / zoonoses.

The disaster is a serious degradation of human society creating major losses, material or significant changes to the environment, which exceed the

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response capacity of society (community) affected , using their own means. The disaster can be viewed as a particular type of emergency. It represents a climax (a period in which negative events are high intensity) and some level of emergency. While a disaster is limited to a certain period of time , in which human life and property are subject to an immediate danger, an emergency cover a period of time longer than the responsiveness of a group or a community is clearly damaged or responsiveness of this group or community initiative is supported by time or by external intervention.

According to the terminology adopted by the Coordination of Humanitarian Affairs (OCHA) / United Nations (in Intenationally AGREED glosary of basic terms related to disaster management, Geneva 1992) by disaster is meant : a serious disruption of the functioning of society, causing human losses, material or adverse environmental changes that can not be restored by resources.

For easy and accurate interpretation of the previous definition, the Office for the Coordination of Humanitarian Affairs (OCHA) / United Nations (UN) also uses the following alternative form of definition for the term disaster [2]:

Disaster = Vulnerability x risk factor (2)

The vulnerability refers to the ability of a person or social group to anticipate, resist and recover from the impact of a disaster.

In terms of the North Atlantic Treaty Organization , disasters are classified as follows:

natural disasters: earthquakes, tsunamis, volcanic eruptions, landslides, tropical cyclones, floods, drought, environmental pollution, deforestation, desertification, disease outbreak, epidemic.

technological accidents: nuclear accident at nuclear power plants, chemical and industrial accidents, plane crash, train crash, crash shipping, acts of terrorism.

This risk analysis is a method of quantifying the risks based on their identification, determining the frequency of events and consequences on the exposed elements of each event for each specific risk and comprises three interrelated components [2,3]:

• risk assessment
• risk management and
• risk communication

The environmental risk assessment is a scientific method for risk assessment of substances, activities, lifestyles and dangerous natural phenomena that may have detrimental effects to the environment or human health.

The risk management is main stages:

• identify hazards / hazards as a starting point for the risk assessment;
• Qualitative and quantitative risk analysis;
• Cost-benefit analysis related to change management and decision making.

The communication problems have a major importance, even the current practices must be discussed in this regard. Public perception of environmental risk induced by pollutants, has been less studied by specialists. Most times the importance of recognizing the role of the public and, in general, the need for collective involvement of all factors that have functions, powers and responsibilities and a broader communication level is underestimated by both makers and industriue and scientists.

3. General presentation of Jiu Valley mining basin

Jiu Valley mining basin is asymmetric triangular shape of a trough, oriented west-southwest and east-northeast (Fig. 1) and is disposed longitudinally on the upper Jiu. Has a length of about 60 km between localities Cimpa-rebellion in the east, and Neag's field, west, and a width of 9 km east from Petrila and Livezeni, and 1.5 km west of Field Neag, occupying a total area of 1281 km2 and is framed on all sides by the Southern Carpathians (Retezat Mountains in the north and north-west, north-east Şureanu Mountains, Parang Mountains in the east and south-east and south Vâlcan Mountains) [1].

The landscape presents geologic foundation on crystalline schists belonging to the Danubian Autochthonous and blade ciency, which penetrated marine waters lodging, first salted water sediment characteristics, and rivers coming from the mountains, the sweetened waters have become lakes. There are five horizons indicating as many sedimentary cycles attributed to the Upper Cretaceous,to the Paleogene and to the Neogene.

Jiu Valley mining basin is one of the most typical areas of discontinuity of order and also geological evolution of the Romanian Carpathians and the physical structure distinct geographical defined over several morphogenetic stages.

Jiu Valley takes place along two ancestrys of Jiu , they share practically the depression in two plates (fig.no.1):

a) the Petrosani plateau in the east, crossed by Jiu East passing through settlements Cimpa, Lonea, Petrila , Petrosani , Livezeni , belonging Jieț and Banita.

b) the Vulcan plateau, west, crossed the West Jiu passing through settlements Campu lui Neag, Uricani Bărbăteni, Lupeni, Paroşeni, Vulcan, Coroeşti, Iscroni , belonging Crividia, Dealu Babii and Aninoasa.

Fig. 1 *Positioning of the localities of Jiu Valley Basin*

Bottom of this depression is relatively high (at the confluence of the Jiu 556m, 800m to the east and west edges) forming thus a high mountain depression which explains its relatively cold climate.

Jiu Valley is a micro-region consists of three municipalities: Petrosani , Lupeni, Vulcan and three cities: Petrila, Uricani , Aninoasa.

The tectonic evolution of the Depression Petroşani (Jiu Valley mining basin) was held in a long time, with different effects at different stages and different parts of the basin, so it is affected by a series of rupturale and plicative movements both before, during as after submission sediments. Tangential pressure forces oriented northwest-southeast, respectively by the frame forwarding crystalline trends, occurred during a series of folds and fractures, which gives the appearance of a graben basin current, thus forming a central anticline fold, raising aquitanian chattiene sediments and their roof, dividing the basin into two synclines cute with general NE-SW direction, transverse to the direction of the front.

The lithological evolution of the sedimentary deposits of Petroşani Depression is the result of interaction of exogenous and endogenous processes, physical and geographical conditions specific to each floor. Main factors are the formation of deposits land topography, morphology foundations, regional climate, the influence of water flowing eddy currents, oscillatory movements, the existence of bodies, the chemical nature of the sedimentary environment.

Geomorphologic, training the Jiu Valley mining basin began during the Meso-Cretaceous orogenic phase of the carpathian overthrust, much later occurring sinking and sea invasion, so it did start the cycle of sedimentation in the basin.

In the Depression relief, by romanian-quaternary evolution, there are terraced foothills and valleys and plains, foothills with slopes of 3-9°, the most extensive landforms.

The terraces are fragmented, individualized in five levels, the first two being alluvial, alluvial third is local and the other two (in the west) are carved into the piedmont layer, representing a low degree of conservation as a result of soft rock that is grafted.

The meadows are more developed areas along the two Jiuri basins, partially flooded.

The Depression leaning towards two Jiuri valleys due to clogging them, with coluvio-proluvione deposition and erosion on mountain frame for minor beds. The average elevation of the basin is 620 m.

The charcoal across the basin was formed in an environment marsh, mixed lacustrine and paral or continental and heavily under the influence of an typical mode of subsistence.

In terms of the tectonic the Jiu Valley basin is characterized by a transverse dominant faults style and less longitudinal faults.

The geological prospecting, exploration and exploitation revealed the existence of 22 coal layers, numbered from 0 to 21, characterized by areas of distribution, thickness and quality variables (from area to area and from layer to layer) . Economic importance submits layers 3, 4, 5, 7, 8, 9, 13, 14, 15, 17, 18. (Fig. 2).

Following geological surveys carried out in the Jiu Valley mining basin has revealed a variety of sedimentary rocks, which have been classified into five principale and distinct categories : sandstone, clay, marl, marl and microconglomerates.

The climate for the study area is characterized as rough, cool and wet.

Wind regime is determined both by features of the general circulation of the atmosphere, as well as those of the active surface and the direction of landscape features. West circulation is present in all seasons, winds west manifested especially in the extremities of depression area (north-west, west, south-east).

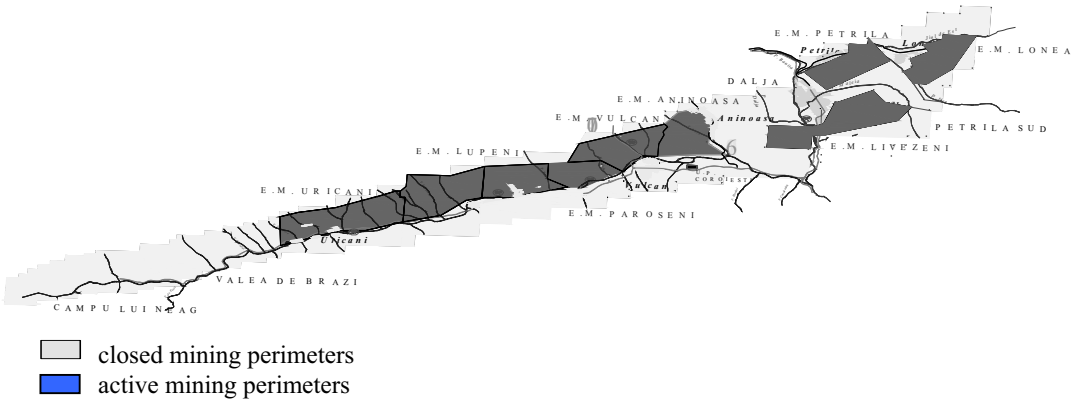

Fig. 2 *The mining perimeters in the Jiu Valley mining basin*

These characteristics fall weather the Petroşani depression in high hilly floor at the crossroads of three types of topoclimate: mountain, depression and urban.

The hydrographic network consists of surface water and groundwater.

In the first category detaches the 2 springs - tributaries of Jiu - Jiu East / Transylvanian / West of Petrila and / Romanian / VALCAN that confluence of the locality Iscroni after entering the gorge Livezeni-Bumbeşti.

The east Jiu with a course totaling 28 km, has its source on the southern slope of Şureanu Mountains (1430 m), its major tributaries and streams Jieț the River Taia, and uprising bushel.

The west Jiu, having a length of 51 km, comes from glacial Scorota – thw small Retezat (1760 m), its main tributaries are streams Buta, Lazarus, Sterminosu, Pilugu, Mierleasa, belts, Sohodol, Valley of fish.

The two Jiu and their tributaries is 1/6 of the total catchment of Jiu.

Under **biogeographic** aspect, the Petroşani Depression is characterized by vegetation and fauna elements corresponding floors meadow and deciduous (beech and mixed beech and softwoods).

4. Potential anthropogenic sources of risk in the mining basin of the Jiu Valley

4.1. The waste dumps

The total area occupied by the activities of CNH-SA is over 16,000 hectares (over a distance of 40 km). The largest areas of land are occupied by dumps, which are totally unusable for other purposes. Soil pollution by landfills involves occupation of agricultural land, forests and degradation of natural landscape and deposit slip risk sometimes hydrogeological conditions change.

After driving the Environmental Protection Agency (EPA) Hunedoara "red dots" on a map of pollution remain Hunedoara County Jiu Valley mines, but not because of mining activity, but the dumps, which are not in conformity with the protection of environment.

Million cubic meters of tailings threaten cities in the Jiu Valley. Tens of waste dumps located in the Jiu Valley pollute the environment and there is always danger of slipping over houses built nearby. Active or inactive, stable or not, are now impregnated with water dumps heavy rain.

Some of these dumps are still active. Other no longer used recently, but many of them are stabilized. In fact, large amounts of rainfall recorded in the Jiu Valley in recent years have led to water saturation of rock waste dumps, and now there is a danger of slipping them over homes. Although their design was observing the rules in this area, taking into account rainfall recorded in the last hundred years, lately they have exceeded the few times

According to official reports, there is no city in the Jiu Valley where you will not be stored after sterile processing of coal. Thus, there are more than 35 waste dumps in operation or not. For example, Dâlja were performed greening their work, they assumed and stabilized. At Lupeni dumps are preserved even if one of them still in use. Most dumps are registered in Petrosani and seven, followed by Lonea, four such objectives. The best situation is to Petrila, where there is only one heap. In total, there are nearly 200 hectares of land occupied by waste deposits.

The most dangerous dumps prove to be those of Lupeni, which were carried by floods twice before over homes, destroying their earnings in a lifetime.

In the summer of 2002, thousands of cubic meters of water, coming from Green Lake, located about three kilometers upstream mining Lonea were poured over the streets and households, and the flood has brought huge amounts of silt, clay and

ash, precipitation washing waste dump located nearby. When the water reached the streets exceed half a meter in some places the flood was even three feet tall. (Fig. 3)

Fig. 3 *E.M. Lonea dump*

So far have been taught by local councils of cities in the Jiu Valley, land area of over 570 acres which included the land on which dumps no longer used for tailings dump.

Some of inactive dumps and taught were rehabilitated:

E.M. Petrila South
- West Jieț pit - ecologically 2001
- Pit Expansion 4 - ecologically 2001

E.M. Lupeni
-old Ileana - greening

E.M. Campu lui Neag
- Șesu Serban - greening
- Poiana Mare - greening
- Ash - greening
- Yellow - greening
- Buta - greening
- Jiri - greening
- Area E - greening

A special problem is encountered by the ash deposit of Coal Preparation Plant in the city Coroiesti , Vulcan, which is "a huge risk, as can be swept away by water. Part of the ash deposit is made retaining wall , but failed to arrange bank throughout its length "[EPA].

Moreover, EPA representatives monitor and explosive deposits of mining subunits, although equipped with alarm systems are considered extremely dangerous.

4.2. The hydrotechnical constructions

Valley of Fish Dam was built on the Fish River Valley between 1967 - 1973 and has a height of 56 meters, which ranks it 35 among the 246 dams in Romania.

Fish Lake Valley is a reservoir with a volume of 4.5 million cubic meters of water, an area of 31 ha, maximum depth of 53 m and a length of 2.5 km and lies at an altitude of 830 m. The lake, arranged near the town Campu lui Neag, Hunedoara, aims mainly water supply in the Jiu Valley, and during periods of high water has aimed to produce electricity and to mitigate flood waves. In the document entitled Strategy for supply with thermal energy of the city Lupeni , from 2008, provided, among other thingsinstallation of an electric generator on the feed pipe Dam-Station for water treatment Valley of fish. To complete the water supply of the city Lupeni , is used the bus of 800 mm, with adduction of the dam Fish Valley, is fueling two tanks of 1,500 m3 and two tanks 500 m3. From reservoirs through distribution networks, the drinking water is distributed to all consumers.

4.3. The landfills

Another factor of pollution are also the dumps of garbage which do not comply the European legislation. The 12 municipal and urban landfills , with a volume of 34.67 million cubic meters, not only occupy a larger area of land, but there are outbreaks of pollution.

"All existing Dumps are not comply. They have no well defined area, not compacted trash and waste get mixed, "said EPA Director Hunedoara.

4.4. The soil contamination

The inspectors of Environmental Protection Agency West Region said in a monitoring report that soil is polluted in Hunedoara with chromium, nickel and cadmium.

In the Jiu Valley were recorded exceeding maximum allowable concentrations of lead, copper, cadmium and nickel.

Conclusions

The potential anthropogenic sources of risk presented in the paper does not exhaust the analyzed problematic, but it wants a warning of the those responsible for carrying out environmental risk management to identify potential hazards as a starting point for assessing the risk of making a qualitative and quantitative analysis to evaluate them and to avoid costs hazards.

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