

# **GEOGRAPHICAL RISKS IN THE TOURISTIC REGION OF TUȘNAD-BALVANYOS**

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## Geographical risks in the touristic region of Tuşnad-Balványos

Ana-Maria Talos

**Des risques géographiques dans la zone touristique Tuşnad-Balványos.** Les régions volcaniques représentent un élément d'intérêt majeur tant pour les spécialistes, du point de vue de l'étude de diverses caractéristiques, que pour les touristes qui les apprécient particulièrement pour leur potentiel curatif. Pourtant, ces régions attirent et à la fois exposent les touristes à certains risques. Dans la région que nous avons choisie, les risques sont extrêmement variés et les principaux éléments de dangerosité peuvent être classifiés dans deux catégories comme suit : naturels (glissements de terrains mineurs, solifluxion, inondations, torrentialité) et anthropiques (l'absence des panneaux informatifs, l'aménagement inadéquat, les sources d'acide laissées sans surveillance, l'exploitation irrationnelle des ressources). Bien que la région ne soit pas affectée par des risques majeurs, il est impératif de mieux gérer la région et les ressources afin d'améliorer la qualité de l'acte touristique et de renforcer la sécurité des touristes. Cette étude se propose de présenter la majorité des risques mentionnés et de fournir plusieurs suggestions de prévention, de solution et d'aménagement.

**Mots clés :** vulnérabilité, risques, région volcanique, tourisme, repères touristiques, impact, prévention, amélioration

**Riscuri geografice în arealul turistic Tuşnad-Balványos.** Areele vulcanice reprezintă un element major de interes, atât pentru specialiști prin studierea diferitelor caracteristici, cât și pentru turiști, în primul rând pentru potențialul curativ. Aceste areale deopotrivă atrag turiști și îi expun unor riscuri. Acestea sunt extrem de variate în arealul ales, iar principalele elemente de pericolozitate pot fi separate în naturale (mici alunecări de teren, solifluxiune, inundații, torențialitate) și antropice (lipsa panourilor informative, amenajarea necorespunzătoare, nesupravegherea unor izvoare de acid, exploatarea irațională a resurselor). Deși zona nu este afectată de riscuri majore, se impune o mai bună gestionare a zonei și resurselor, pentru a îmbunătăți calitatea actului turistic și sporirea securității turiștilor. Studiul de față încearcă să contureze majoritatea riscurilor și să ofere o serie de soluții de prevenire, soluționare și amenajare.

**Cuvinte cheie:** vulnerabilitate, hazarde, regiune vulcanică, turism, obiective turistice, impact, prevenire, amenajare

## **1. ARGUMENT**

The volcanic areas had always represented a curiosity for both experts and tourists, especially those supposed to be inactive. This interest comes from the fear of disaster, the past damages or post volcanic manifestation with curative effects.

No doubt that the volcanoes have a lot of potential threats that include strong explosions, toxic gases, piroclastic waves, hot clouds, ash, but also hazards appeared after floods, earthquakes, mud waves, burnings, earth slide etc. There are also regions in which elements like mofettes, mineral-water springs, boiling springs, organic sludge and peat moor that succeed to change all over into a natural treatment base, very appreciated by those with healthy problems or those who are looking for rest, relaxation and amazing nature.

An example in this sense is also the region Tuşnad-Ciomatu-Turia-Balványos (Figure 1), known as a touristy area that concentrates an impressive number of sights (springs, lakes, mofettes, forest, animals etc.) spread on the surface of two districts- Harghita (Lăzăreşti, Cozmeni, Tuşnad, Băile Tuşnad) and Covasna (Turia, Balványos, Bixad). Beside these, the area has also geographical risks that can affect the touristy activity, and these risks are presented in the next research, trying to avoid the possible troubles caused and to suggest some solutions for prevention, adjustment and appliance.

## **2. METHODOLOGY**

For the geographical risks evaluation in the Tuşnad-Balványos area, were followed some steps, beginning with the documentation about the terminology (risk, hazard, vulnerability, disaster) and about the chosen area [1]. Very important is to understand the difference between risk and hazard: the first should be seen as an exposure possibility at extreme acts, and the second as a pre-phase of the risk, a probability that the area's phenomena to become extreme and to be a potential danger for man and environment. Grecu [2] shows that a hazard represents "a potential threat for people, but also the impact of an event over the society and environment; is a product of human perception and experience. Moreover, people tend to exaggerate and modify the hazards." Through risk we should understand "the possibility to be in danger, to have to confront with a grief or to endure damage, danger" [3]. In the research were also used terms as "vulnerability" (degree of loose, resulted from the potentiality of a phenomenon to make victims and damages) and "danger" (for example the earth slide), used as Grecu [2] sees them.

After revealing the main sights in the area, the chief dangers were shown on a map, using the observation method, the interview with local people, scientific articles, national

projects and tourist's opinion. Also were proposed some directions for preventing and was created a map with the main hazards using a topographic map of Romania, 1:25000 scale, year 1980, and the Arc View 3.2a program.

### **3. DESCRIBING THE TOURISTY AREA**

The Ciomatu-Balványos area is located in the south-eastern part of Harghita district (Lăzăreşti, Cozmeni, Tuşnad, Tuşnad Spa), including also places from Covasna district (Bixad, Balványos Spa, Turia). Geographically, it is situated in the central group of Oriental Carpathian, more precisely the south-east part of Harghita Mountains and the low division of Ciuc Basin. Part of the volcanic chain Călimani - Gurghiu - Harghita, the massif area was born along a fracture system shaped between Carpathian Mountains and Transylvanian Basin. The basins appeared as a result of volcanic manifestation and their water drained through open ditch drainage towards low basins, resulting a volcanic dam hollow, from which the Nordic division of Ciomatu is part.

As Pilbath [4] states, there are two main steps, one of piedmont and the other of volcanic cone, but also three different divisions for the region: Ciuc Basin, Narrow Pass of Olt and Harghita Mountains. The climate is specific for middle-high mountains, with annual temperatures of 4-6° C, 800-900 mm/year rainfall, a snow layer maintained 80-100 days. The hydrographic network is Olt tributary: Şugaşău, Pârâul Mare, Mitacul, Ozunca, Tuşnad. Each element of the natural frame is important for the local tourism: the climate is sedative at 800-900 m high and tonic on the peaks [5], the landscape is recreating, the hydrographic network is exploited, also the flora and fauna. The nature worked hard to create a nice place, by combining fresh air, green forests, fine shapes and ecosystems.

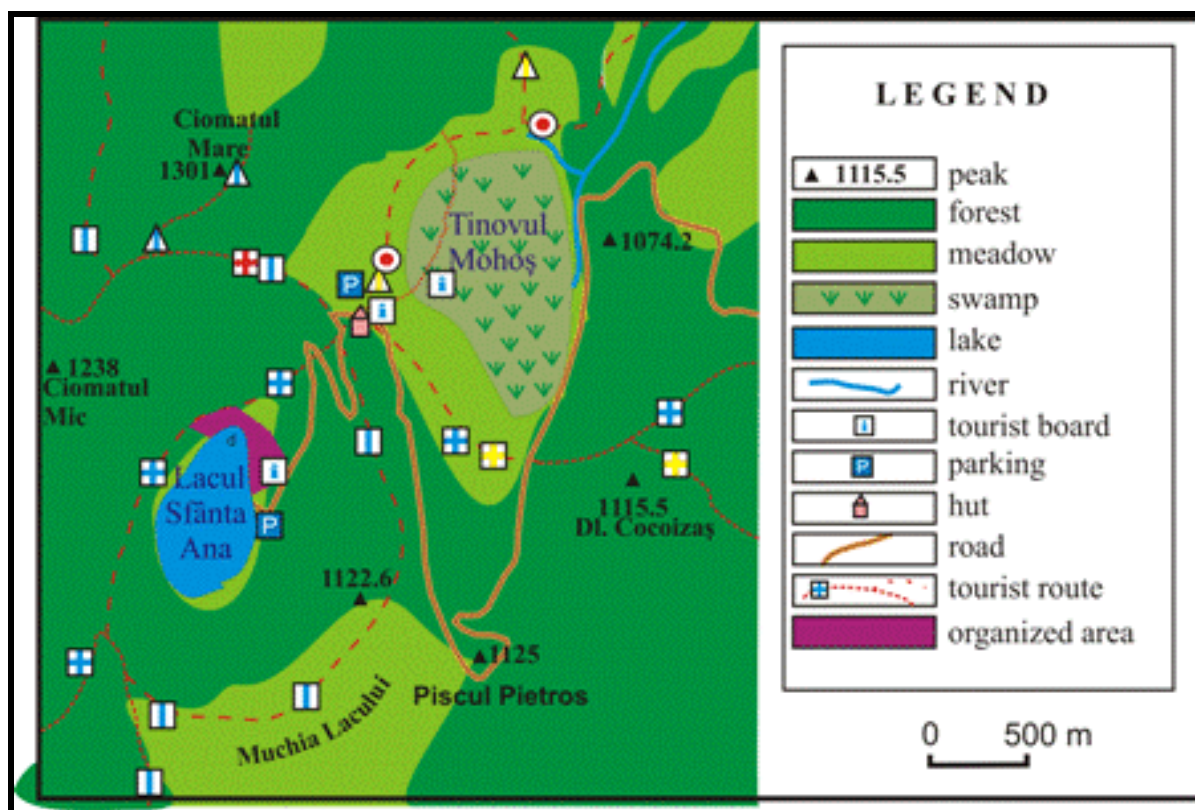


Figure 1. Localization of Tuşnad-Balványos (after tourist map, 2008)

According to Schreiber [6], in the landscape of the area, lakes have a special touristry importance. First of all is Lake Saint Annie, a volcanic lake appeared in the impoundment of a volcanic vent. In his north-west part is Mohoş Swamp, individualized by aquatic growth. The Ciucaş Lake is situated in Tuşnad Spa, artificially created at the beginning of 20 th century for entertainment. As a result of post volcanic manifestation appeared the CO2 emissions (for example, Budos Cave), the mineral water springs, thermal springs, calcium springs like Ileana, Mikes, Apor.

Many plants were here preserved: glacial relicts (small birch- *Betula humilis*; *Ligularia sibirica*; *Carex dioica* etc.), endemic plants and ancient forest, and because of these 11 areas were proclaimed protected. Local specific vegetation is the peat bog. In the forest, live animals like Carpathian bear (*Ursus arctos*), Carpathian deer (*Cervus elaphus carpaticus*), wild cat (*Felis silvestris*), fox (*Vulpes vulpes*), squirrel (*Sciurus vulgaris*) and birds like mountain woodpecker (*Picoides tridactylus alpinus*), titmouse (*Parus ater*) etc.

The humane infrastructure is represented by health services, tourist safety and protection, and the technical infrastructure includes district accessibility, communication ways, transportation, distribution network of water, green areas etc.

The access infrastructure is low developed in the Harghita district: there are good divisions like that between Miercurea Ciuc and Tuşnad (E578/DN 12), and parts like that to Lake Saint Annie- bad upkept- and the road can become unpleasant as tourist claim [7]. There is also a railway (the railway station is Băile Tuşnad), an airport at Târgu Mureş (140 km far) and county, forestry and ordinary roads.

The accommodation infrastructure is varied in Tuşnad Spa: hostels, 16 guest houses (for example, Raza Soarelui, Vila Şoimul, Szurdot, Vânătorul, Panorama, Casa Verde etc.), inn (like Hotarul Ciucului), hotels (Tuşnad, Fortuna, Ciucaş), but limited in the rest of spots. Two important hotels are in Balványos: Best Western Balványos (three stars, 78 rooms) and Transylvania (three stars, 23 accommodation spaces). Nowadays, many rural and agro touristy hostels have an important percentage at the national level, they are matching very well with the natural and local landscape, traditions and lifestyle; moreover, these hostels have a lot of services to offer.

The main touristic area is Ciomatu area (Figure 2), because there are some of the main sights (Lake Saint Annie, Mohoş Swamp), but in the study area there are also other sights like caves, spa, ruins, peaks etc (Figure 3).

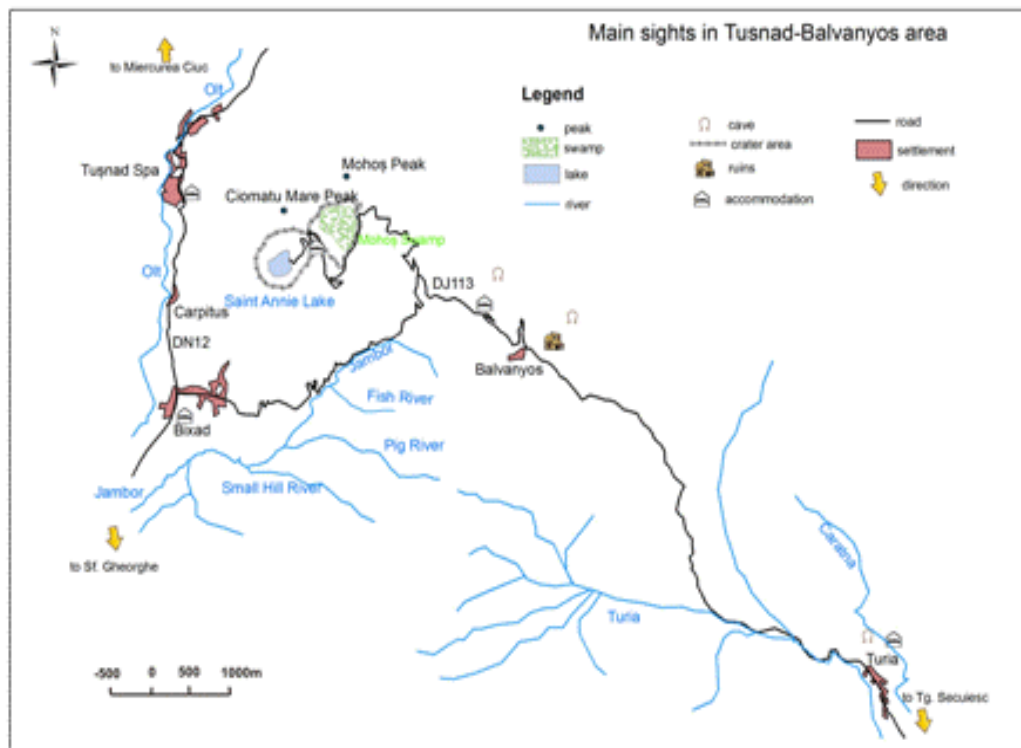


Figure 3. Sights in the study area (after topographic map of Romania, 1:25000 scale, 1980)

According to a research made by Harghita County Council, the number of tourists from the central districts varies through years. Harghita and Covasna districts registered 100.000 tourists in the period 2000-2007, while in Braşov district the number is over 550.000. Regarding the average length of staying, Covasna district is on the first place with an average of eight days, because the share of spa causes a longer stay comparing to cultural tourism. In 2007, in Harghita district, were registered 273.000 overnights [8]. There are also other tourist centers: Miercurea Ciuc, Odorheiu Secuiesc, Borsec, Topliţa, Gheorgheni from Harghita, and Covasna, Sf. Gheorghe, Tg. Secuiesc from Covasna district.

About the costs in tourism, these are hard to establish because of the lack of statistics and because of employers' non-declaration about the number of tourists. But a chart [8] with net incomes exists, reflecting that in the Central Region of Romania (including Harghita and Covasna) the field of food and beverage is the worst paid. Harghita district has the lowest values for the commercial, learning, health and social assistance section, and Alba district has the lowest values for food and beverage section. Overall, the hospitality sector is in an unpleasant situation regarding paying, although the services sector is considered to be a priority in the development and a chance for the local people.

The suitable forms of tourism in the area are those for weekend, spa and cultural. All these are dependent on accessibility and entertainment, because if the roads were better and the entertainment choices were more, maybe the tourists would stay more than a weekend. The tourist profile that comes here can be drawn like this: average age for 40-50 years, from urban place, medium training school, medium and low income, has a cure ticket and comes in searching the old times.

#### **4. THE MAIN SIGHTS IN THE AREA**

##### *a) Natural:*

Lake Saint Annie (Figure 4) is situated 946 m high in the Ciomatu massif, near Tuşnad. The lake appeared on the bottom of an extinct volcano vent. This area was pronounced natural reservation (both lake and swamp). The lake is considered to be the most clean from Romania, because of the water supply exclusive from rain. His pureness is close to the water distillate, it is not drinkable, it has a low mineralization (close to 0,002%) and it is not populated with animals. The name of the lake comes from a local legend: a young girl named Annie is forced to get married with a rich boy and she chooses to run in the wedding night and to throw herself in the lake.

Puturosu Cave is an old brimstone quarry used nowadays as a mofette. Its name refers to the smell: „brimstone”, „nifty cave”, because from the earth gets out gas with



therapeutic effects. Near is a place named „birds' cemetery”, where a lot of animals die because of the oxygen lack.

Mohoş Swamp (Figure 5) is situated near Lake Saint Annie (it is an advantage, because is very easy to get there), split by a large ridge, and considered to be a floristic reservation. It is four times bigger than the lake, having 80 ha, and covering a lot of rare species („dew of heaven”, „sedge”, „ cane field”, „cottons”) and over 20 species of peat moss. The swamp is covered with pine, small birch and fuzzy birch. The peat is 10 m thick and has a volume of 3 million square meters. The original comes from the unique sensation that tourists can try here, close to the sensation in a quicksand; they can also see carnivorous plants.



Figure 4. Saint Annie Lake (Taloş, January 2010) Figure 5. Mohoş Swamp (Taloş, May 2010)

*b) Anthropic:*

Tuşnad Spa resort is situated 650 m high, at the foot of Ciomatu peak. It is a permanent spa, with a national and international importance, on the higher grade of Olt River, 31 km far for Miercurea Ciuc. It has 1800 habitants, tourism is the main activity and Carpituş is in its administration. Surrounded by spruce and fir forest, the resort has moffets, mineral-water springs and fresh air [9].

Balványos Spa resort is a place gathering three old resorts. The oldest is situated in the Balványos opening, called „Brimstone from Turia” (the name suggests the smell of HS<sub>2</sub>). In this cave, the therapeutic gas is used for cure and healing. It is considered to be the biggest natural moffet from Europe, havind 14 m long [9].

Balványos Citadel Ruins are one of Tuşnad Bath' sights. We can find here the traces of an old town built by szekely people in the XI century and in XIV century becoming Apor's



family property. The ceramics found here is from XVIII century. It is 1 km far from the resort and the road is marked properly.

## **5. ELEMENTS OF DANGER**

Although the volcanic area was active one million years ago, and the chances to erupt are quite small, there are other risks like: irrational use of mofettes, unattended acid springs near Balványos, the swamp area, sulfur mines, granite quarry from Carpiuş, the old stone mine from Bixad and other human risks.

The dry gas baths, the so called mofettes, are very healthy, recommended to those who suffer from vascular system and locomotors disorders, but they can damage health if they are excessive used. That's why tourists shouldn't stay too much inside, or to cross the indicated gas line. Over time, a lot of spas were built around the sulfur dioxide gas, from simple ones (wood places, stairs etc) to modern spa. Many of them suffered degradation and abandonment, not being restore anymore. Many local people had created mofettes in their own basements and they have success because of the low prices and the primitive practice (candles for gas control, wood bench and empirically advices for therapy).

Most of them ignore the gas therapy rules: medical supervision, slowly going inside, is not allowed to talk or to be tired, the maximum period time is three minutes; the moves shouldn't be bump, no more than 8-10 people inside, no silver things or watches, and the gas control should be done with a cigarette lighter [10].

Tourists had signalized some unattended acid traces on the way to Balványos Citadel, more precisely at 22, 4 km on the road. It is a spring with bright violet water, where were found sulfuric acid traces, a world curiosity, because the phenomenon is met only in Rio Grande's Valley and on Java Island. The danger comes also from the CO<sub>2</sub> emissions (the area is called "Death Valley"), and from the authorities lack of interest in area demarcation. Until May 2010, the area was almost damaged, but the students from Cluj and the local hall have retrieved the springs, stairs and benches.

During winter, the lake freezes and become attractive for skating, but the tourists shouldn't venture even though the ice seems thick and they should remember that the lake is 7 meters deep. The swamp is the less known part of the reservation and can become dangerous if we consider the swampy accidents. On Pucioasa hill there are some places with gas emanations, like Bear Cave, Timsos Cave, Gyilkos Cave, and very known is Birds Cemetery- an old gallery of a sulfur mine which crashed and where CO<sub>2</sub> has accumulated. The birds that fly near and get under the gas level die immediately. Not only birds are victims, but also small mammals, bats, dears and mice.

Materials needed for gunpowder manufacture were extracted from the sulfur mines in the Pucioasa Hill (even during the Revolution from 1848), but today many of them become caves, attractive and dangerous in the same time. Makeshift roads can create real problems, because the rescue team cannot detect them in case of lost or accident, and an example is the access to Bixad.

Other risks are related to wild animals' presence in the area, more precisely the Bodoc-Ciomatu mountain area is populated with bears and in the Balvanyos ruins area are snakes. Some tree debris and deforested areas were reported near the main cities.

## **6. GEOLOGICAL, GEOMORPHOLOGIC AND HYDRO PROCESSES**

The swamp appearance, as a geological process, started 3000 years ago. As Schreiber [6] highlighted, Mohoş is a moor in a vent which has formed by peat filling over years. The first vent that had erupted was the one with the moor (the explosion was strong and had destroyed a part of the vent), he get quiet and a lake has formed. After that, the vent was grinded by external agents (wind, rain, snow etc.). Later, the volcano had erupted through the other vent and a great part of the ash reached in the lake and encouraged peat moss evolution. This time the eruption wasn't so violent and the vent was preserved. Nowadays, Mohoş is a lake with moss and mesh water. The pear layer is 20 meters thick and in the past people tried to exploit it. Interesting is that the local ecosystem is composed by poisonous, hallucinogen and carnivore plants, unique in Romania.

The torrent process, defined by Grecu [2], is a irregular drainage system of the torrents and mountain under water having rocky valley floor; all processes of bank erosion, transport and storage that happen on a slope during concentrated leak. There are some small torrential bodies in the study area that include microforms like channel and ravines along creeks like Pig Creek, Fish Creek, Small Hill Creek etc.

The slumps are sudden displacements in form of individual rock or stores falls on a slope with high declivity (about 90 degrees). There are individual falls (when are involved rocks of different sizes) similar to free falls, mass fall and slope fall. The slumps' causes are high inclination of layers, high degree of cracking, river deepening, river lateral erosion or slope base erosion. Falls are related to strong cohesive rocks that were cracked and disaggregated. There are also vertical collapses of rocks situated above caves or mines, because of underground activity. An example can be found at Bixad and Carpiuş mine, as a result of human activity (rock and granite excavation).

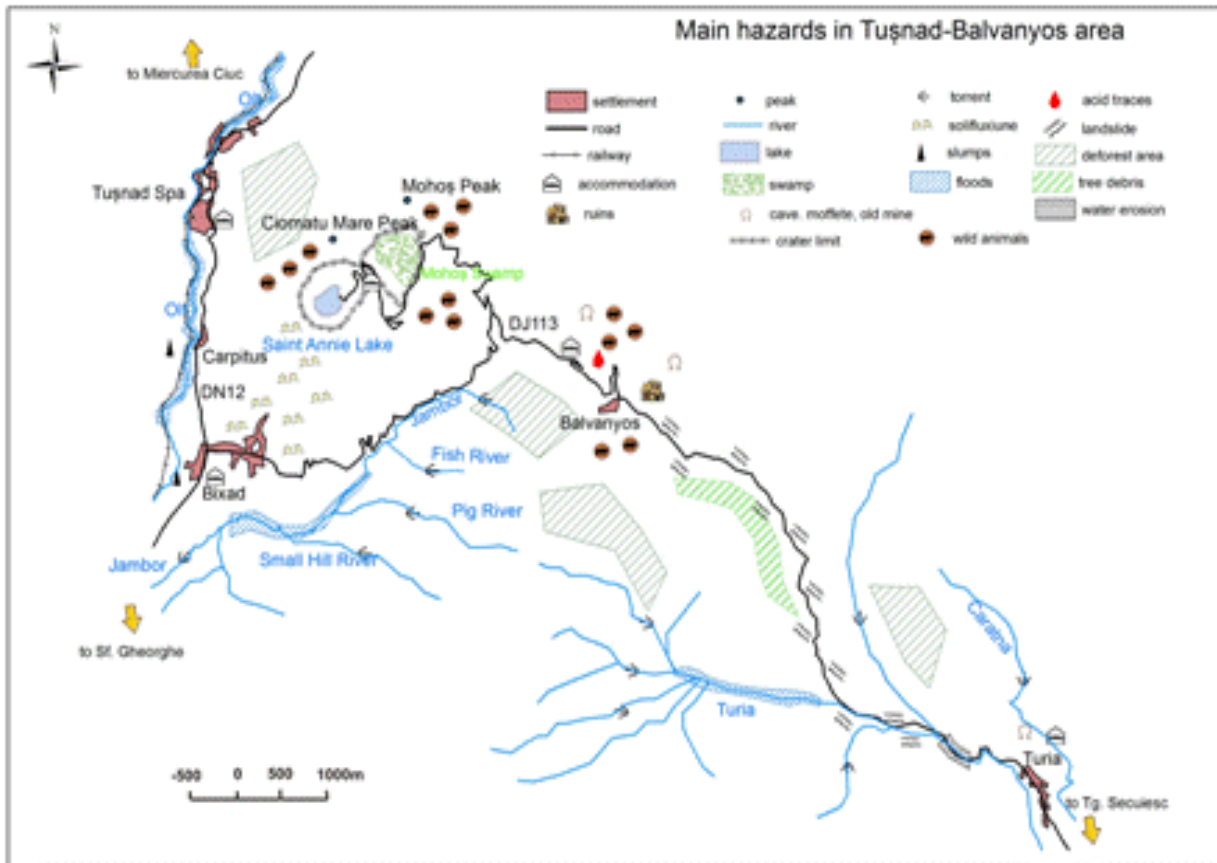
The floods are sudden and strong increase of water level, in which the river gets out from the riverbed and spills into the meadow. Simple floods can be caused by the break

down of a natural dam, by rain, by snow melting, and the complex ones have more causes that interfere in the same basin, being specific to streams. This can be found on Turia River, next to lateral erosion, which stops touristy design in the area.

„Solifluxione” is a process appeared on the unwooded slopes (for example, in southwestern part of Ciomatu mountain), having the appearance of wane or small furrows formed by breaking grassy forest. They are superficial slips arise in the soil blanket; the term assign also periglacial processes (caused by freeze-thaw activity) and the dirt movings of slope as a result of water activity. They appear in the clay area, sensitive to become mud.

Small landslides were detected along the Balvanyos-Turia road, caused by human transformations on the lands with alternating layers (clay, marl, volcanic rocks). The ”landslide” notion defines the rock dislocation process, but also the resulted landform. They are part of the slope process category that change the slope’s aspect and the changes can be major (causing imbalances) or they just move the materials from a place to another. The causes can be natural (water erosion, earthquake, groundwater erosion, slope erosion) or human (deforestation, constructions, slope excavation, vibrations etc.).

All these risks are revealed and placed in Figure 6.



↑ Figure 6. Main hazards in the area (after topographic map of Romania, 1:25000 scale, 1980)

## 7. THE IMPACT ON TOURISTY ACTIVITY

All the observed hazards have a small or big impact on the touristy activity in the area, from damages to investment losses, workplaces and small accidents. There are no statistics for the area, but a great number of discontents do exist. There are displeasures related to roads (especially between Bixad and Lake Saint Annie), facilities, directional pavement markings, demarcation etc. [7]. Some cases of fainting, accidents, intoxications were signaled through forums and personal notifications. Also, there are some suicide cases [7] which local people know about, but fortunately no accidents with wild animals detected.

In the 20th century, the beech forests were useful in the glassmaking, fact that caused in short time the forest thinning. Instead of glassmaking appeared the quarries from the right bank of Olt River, because people needed incomes. After 1989, the woodworking has been reopened and causing the reduction of the recreational potential and number of tourists.

It is hard to evaluate the real impact on touristy activity as there are no official figures. We can find an excuse if we consider that the region has no major risks, but the local interest should be customary. Although, estimation can be done: for example, if in the summer, in one week were 5000 tourists who spend 1000 Ron/holiday/person, losses would be around 5 millions Ron, not considering the human accidents and second damages.

## 8. SOLUTIONS AND METHODS FOR PREVENTION AND PLANNING

There are several projects implemented in Tuşnad-Balványos area for control improvement and reducing the risks of bad accidents. First of all, there is a natural reservation and, secondly, partnerships with different goals.

Lake Saint Annie-Mohoş Swamp Reservation is in the S.C. ECOS CLUB S.R.L. administration, that's why the control is easy. For example, at the entrance is a security and control cabin with authorized employees, where a fee is taken (5 Ron/person or 10 Ron if the tourists enter with the car). The fee for swamp visiting is 25 Ron/person, fee that includes a guide and a flyer with details and restrictions applied in the reservation. All the tourists should be informed and respect those restrictions in order to avoid fines. All the local activities will have the reservation administrator agreement.

The community partnership for nature protection and ecotourism promotion in Ciomatu-Balványos region was started by GeoEcological Accent Organization, and the goals

are: ensuring the conservation status of the local habitats, improving communication between parts, planning a management system for involving authorities, NGOs and research institutions. It is desired to realize an informal campaign for the people regarding natural values and the habitat role, but also the benefits that can be achieved by the local people [11].

Beside these existing projects, there are also other things to be solved:

- improving accessibility (main roads, paths and forest roads);
- complete and correct touristy information regarding rules, effects and consequences of a mofette therapy;
- prohibition of improvised pits in local homes;
- restricted access near the acid springs;
- setup a billboard with the existing risks, named in the study;
- closing the sulphur mines and remove from the travel circuit;
- limiting the access on improvised roads;
- reestablishing water springs places: bench, stairs, hallmarks, paths etc.;
- foundation of info centers with qualified employees;
- layout of billboards announcing wild animals (bears and snakes);
- setup of billboards announcing secondary roads;
- creating promotional campaigns for different tourist categories etc.

## **9. CONCLUSIONS**

We can admit that every region that has more or less sights, has also dangerous elements, some of them natural, other related to human ignorance, both authorities and tourists. Sometimes, the number of sights is proportional to the risks number, and that happens in case no local organization and settlements about touristy activity exist.

Normally, the quantification of damages should be done to every touristy regions, no matter risk importance, but the reality proves that only the areas in which the risks are major and the hazards have a constantly impact receive official reports and statistics, but fortunately the other areas have planning projects, organization and maintenance, meaning that they are sustainable.

As we could see in the map, Tuşnad-Balványos area has no major hazards, but for preventing future displeasures it is needed a good management and further administration and preservation. We can say that the existing hazards can become human risks in case that sustainable development is no longer followed and an uncontrolled, intensive tourism will

be adopted. The tourist and authority's ignorance would mean a risk for the area, in terms of damage and spoilage of the sights.

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