

**Babes-Bolyai University, Cluj-Napoca**

**Faculty of Geography**

**ADAPTING TO THE GEOGRAPHICAL RISK OF THE TOURISM  
RESORTS IN HARGHITA COUNTY**

**Ph.D. THESIS**

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**- 2014 September –**

# **Adapting to the Geographical Risk of the Tourism Resorts in Harghita County**

## **Abstract**

**Key words:** adaptation, geographical risk factors, hazards, vulnerability, resilience, natural risk factors, anthropic risk factors, technogenic risk, ecological risk, impact, tolerance.

## **Introduction**

The main target of this thesis: “Adapting to the geographical risk of the tourism resorts in Harghita County” is to find answers concerning some phenomena that affect the tourism resorts in Harghita County and the way these try to adapt to these risks. The targets of the research were chosen due to their distance from the place of work of the author. Following the economical evolution of Harghita County we have to note, that tourism is one of the most constant branch, that produces revenue, jobs and career opportunities for many locals. The theme of this thesis handles a couple of areas that are relatively new and recent, like the study of hazards, the vulnerability of a settlement, geographical risks, and the forms in which the units of a settlement react to different forms of threats that they present vulnerability to. Tourism of one of the most dynamic branches of the economy, and in this area attracts local or foreign investors and entrepreneurs, outing to good use the natural potential of the land combined with the unique inventiveness and implication of the local population.

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I would like to enumerate some of the most significant bibliographic sources that provided the scientific foundation of this research:

- Benedek J. (2002), *Riscurile umane*, în ”Riscuri și catastrofe” (volumul I.), Edit. Casa Cărții de Știință, Cluj-Napoca, pp. 43-54.
- Bogdan, Octavia, Niculescu, Elena (1999), *Riscurile climatice din România*, Academia Română, Institutul de Geografie, București
- Octavia Bogdan, I. Marinică, N. Rusan, Simona Rusu, (2007), *Riscul iernilor calde în România (cu aplicație la iarna 2006-2007)* în ”Riscuri și catastrofe” (Anul VI, vol. 5), Edit. Casa Cărții de Știință, Cluj-Napoca
- Goțiu Dana, Surdeanu V., (2007), *Noțiuni fundamentale în studiul hazardelor naturale*, Edit. Presa Universitară Clujeană, Cluj-Napoca
- Goțiu Dana, Surdeanu V., (2007), *Evaluarea vulnerabilității și a rezilienței comunităților umane din Țara Hațegului* în ”Riscuri și catastrofe” (Anul VI, vol. 5), Edit. Casa Cărții de Știință, Cluj-Napoca, pp. 201-211
- Goțiu Dana, Surdeanu V., (2008), *Hazardele naturale și riscurile asociate din Țara Hațegului*, Presa Universitară Clujeană, Cluj-Napoca
- Grecu, Florina (2006), *Hazarde și riscuri naturale*, Editura Universitară, București
- Irimuș I. A., (2006), *Hazarde și riscuri asociate proceselor geomorfologice din aria cutelor diapire din Depresiunea Transilvaniei*, Edit. Casa Cărții de Știință, Cluj-Napoca
- Irimuș I. A., (2006), *Vulnerabilitatea și riscurile asociate proceselor geomorfologice în planingul teritorial* în ”Riscuri și catastrofe”, Casa Cărții de Știință, an V, nr.3, pp. 21-32.
- Mac I., Petrea D., (2003), *Sisteme geografice de risc*, în ”Riscuri și catastrofe”, vol II., Casa Cărții de Știință, Cluj-Napoca
- Moldovan F., (2003), *Fenomene climatice de risc*, Edit. Exhinox, Cluj-Napoca.
- Mândrescu ., (2000), *Cutremurul, Hazard natural major pentru România*, Editura Tehnica, București.
- Ozunu A., (2000), *Elemente de hazard și risc în industrii poluante*, Edit. Accent, Cluj-Napoca.
- Puiu, V., (2006), *Riscurile geografice și organizarea spațiului din cadrul Culoarului Mijlociu al Mureșului (Sectorul Deda-Alba Iulia)*, Teza de Doctorat, Cluj-Napoca
- Sorocovschi, V., (2002), *Riscuri hidrice*, Riscuri și catastrofe (volumul I.) Edit. Casa Cărții de Știință, Cluj-Napoca.
- Surd V., Puiu V., Zotic V., Moldovan C., (2007), *Riscul demografic în Munții Apuseni*, Edit. Presa Universitară Clujeană, Cluj-Napoca

- Surd, V., Zotic, V., Puiu, V., (2003), *Hărțile de risc și importanța acestora în gestionarea teritoriului*, în Petrescu, I., ed. *Mediul – Cercetare, protecție și gestiune*, Editura Presa Universitară Clujană, Cluj-Napoca.
- Surdeanu V., Basarab V. D., colaboratori, (2007), *Riscurile naturale din Județul Satu Mare*, Editura Arvin Press, București

Some important works that provided important scientific support regarding the geography of tourism:

- Ciangă, N., (1979), *Rolul stațiunilor din Carpați în dezvoltarea turismului*, în *Studia Universitatis Babeș-Bolyai*, Cluj-Napoca
- Ciangă, N. (2001), *România. Geografia Turismului (Partea întâia)*, Editura Presa Universitară Clujeană, Cluj-Napoca
- Ciangă, N., (1985), *Turismul în Munții Apuseni*, în *Studia Universitatis Babeș-Bolyai*, Cluj-Napoca
- Ciangă, N., (1995), *Evoluția și tendințele cercetării în Geografia Turismului în România*, *Studia Universitatis Babeș-Bolyai* 1-2, Cluj-Napoca
- Ciangă, N. (1998), *Turismul din Carpații Orientali. Studiu de Geografie umană*, Ediția a doua, Edit. Presa Universitară Clujeană, Cluj-Napoca.
- Cocean, P., (1992), *Modele de amenajare turistică a unor regiuni muntoase din România*, *Studia Universitatis Babeș-Bolyai* 1-2, Cluj-Napoca
- Cocean, P., (1980), *Valorificarea turistică a carstului din Munții Apuseni*, *Terra*, Nr.2
- Cocean Pompei (1997), *Geografia Turismului Românesc*, Editura Focul Viu, Cluj-Napoca,
- Cocean, P. (1999), *Geografia turismului*, Edit. Focul Viu, Cluj-Napoca
- Cocean P. (2005), *Geografia generală a turismului*, Edit. Meteor Press, București.
- Mara, V. (2006), *Potențialul turistic natural al Munților Harghita*, *Studia Universitatis Babeș-Bolyai, Geographia*, LI, nr. 1, Cluj-Napoca.

All the above mentioned sources are mentioned in the bibliography section of the thesis.

## Chapter 1. Introduction

### **Harghita county, the tourism resorts in Harghita County**

Harghita county is situated in the central-east region of Romania, in the eastern part of the Transilvanian Basin and is included mostly into the central group of the Eastern Carpathians. It is surrounded by Neamț and Bacău Counties in the east, Covasna and Brașov in the south, Mureș in the west and Suceava in the north. The relief is dominated by the mountainous areas, which make up 60% of the landscape, the rest is occupied by interclosed basins, high hills. The county is divided in the middle by the two depressions: Giurgeu and Ciuc, which from north to south separate the mountain ranges. These two are drained by the Mureș and Olt rivers and their tributaries. In the east we have the volcanic ranges of the Călimani Mountains, followed southwards by the crystalline ranges of the Giurgeu, Hășmaș, Ciuc and Bodoc Mountains, and the western compartment of the volcanic chains of Gurghiu – Harghita Mountains. These last two are drained on their western slopes by the Târnava Mare and Târnava Mică rivers and their tributaries. The climate of the county is influenced by the configuration of the landscape. Thus the winters are colder than in the neighbouring counties, with long winters, and the summers are cooler.

The last classification of the tourism resorts were made according to the Government order nr. 852/13 appeared in August 2008, published in the Monitorul Oficial 613/20 August 2008. According to this document we can call tourism resorts settlements or parts of a settlement which have the natural and anthropic resources and comply to the following requirements: have natural elements with curative powers, are accessible, and have an adequate infrastructure to provide accommodation, catering, transportation, entertainment and services for the arriving tourists, are fitted with sanitation units, commercial units, cultural homes, parks, spas, wellness centers, recreational, sporting and information facilities, etc.

According to these standards in Harghita County there were nominated seven resorts: one of national importance: Băile Tușnad; and six of local importance: Băile Homorod, Harghita-Băi, Borsec, Izvoru-Mureșului, Lacu Roșu and Praid resorts.

**Terminology: Hazard** The Multilingual International Dictionary for Terms Regarding Disaster Management (I.D.N.D.R.) (1992), quoted by I. Zăvoianu and Ș. Dragomirescu (1994), defines hazards as a threatening event or the probability of occurrence of it in an area at a given time of a natural phenomenon with potentially destructive powers. According to Octavia Bogdan and Elena Niculescu (1999) hazards are random phenomena, which are unpredictable and produce a quantitative and qualitative leap in the evolution of a system, which discards massive amounts of energy and causes chaos and disorder leading to a new state of the system. If intersected with

populated areas depending on the degree of vulnerability of the system, can cause disastrous effects (quoted by Surd V, Zotic V. 2007)

**Vulnerability** is the ability to react and manage of a system to specific threats. Represents the degree and sensitivity of a system and how it coops with sudden changes within it. Vulnerability can be volunteer or non-volunteer. Is conditioned by the quality of the infrastructure and the socio-economic conditions of the system; reducing the exposition to the effects of a hazard draws the reduction of the vulnerability (Downing and Bakker, 2000) quoted by Scrădeanu D. (2014).

**Risk, according to the I.D.N.D.R.**, quoted by Zăvoianu I. (1994), is defined as the number of possible casualties, injured individuals, material losses combined with temporary interruption of the economic activities and services within a region. Thus the risk represents the quantifiable value in damage and losses after a natural or antropic phenomenon. The risk thus is the combined result of hazards and vulnerability, thus expresses the losses that a system suffers within a tear expressed in monetary value and human lives (Surd V.,Zotic V, 2007).

**Adaptability** represents the capacity of a system to react and take measures to prevent or to reduce losses and the number of casualties that result from the vulnerability of the system and the degree of the risks that had happened before.

In this chapter there is also introduced the impact of risks upon tourism activities. There are three levels of tourism risks: the level of potential attractiveness (resources); the level of infrastructure and of economic finality. We can conclude that these risks affect the quality and quantity of the resources regardless in which type of tourism they are included. These factors can be natural or of human origin or combined (Ryan, 1994, cited by. Cocean, 1999).

### **Research methodology**

This chapter deals with the ways and steps that were taken in the elaboration of this thesis. For the scientific base of the work a series of works have been studied, which is falloed by establishing the problems and question we would like to find answers for. The theme of the thesis was set, the hypothesis were formulated referring to the possible risk factors, and the ways in which these can influence a resort or settlement. After the data gatherirng we investigated how these systems developed ways to adapt to different kinds of threats, depending on their geographical position. We used the historical method, direct observation, taking interviews, completing questioners, data analysis, digital representation, the comparative method, inducing the deducing methods and finally quantifying the results in the conclusion section.



## Chapter 2. Analyzing the categories of risk factors representative to the resorts in Harghita County

**Geographical risk:** natural risk, anthropic risk, technogene risk, ecological risk

The term has French origin: *risque*, according to Octavia Bogdan (1999), who explains that the risk is the possibility to end up in a dangerous situation, to experience a trauma or lifethreatening event, with losses or victims. There is no risk without a phenomenon, that causes losses or has casualties and a society or system which to suffer all these. Thus the risks is unpredictable concerning the time or the intensity, when it is going to happen, towards which humanity has a passive attitude. According to genesis the risk has four categories: of natural origin, anthropic, technogene and ecologic (Goțiu Dana, Surdeanu V, 2007).

**a) natural risks can be:**

- **geological:** for example earthquakes, volcanic activity, tsunamis;;
- **climatic:** typhoons, hurricanes, heat or cold waves, droughts, extreme temperatures, sudden temperature changes, torrential downpours, blizzards, hailstorms etc.
- **hydrological**, according to origin there are differentiated into (*Sorocovschi, 2003*):
  - *extreme hydrological phenomenon* (floods, hydrological droughts etc.);
  - *thermodynamic processes and phenomena* (waves, tides, ocean level oscillations etc.)
  - *stationary hydrological processes or phenomena* (excess of humidity, landslides due to torrential downpours etc.);
  - *processes and phenomena connected to hydrologic interferences* (mixing of seawaters and sweet waters in densely populated areas).
- **geomorphological:** gravitational land processes;

**b) Anthropic risks** are included into categories defines as (Benedek, Schultz, 2003):

- **Social risks:** poverty, unemployment, urbanizing, way of life;
- **Medical risks:** contagious diseases, viruses, chronic illnesses (malaria, yellow fever);
- **Demographical risks:** immigration, aging population, population growth, urbanizing;
- **Political risks:** disputes for positions, territorial and functional disputes

**c) For the *technogene risks*** there were given different causes. These are included into three categories:

- Cultural deficiencies
- Organizational deficiencies
- Management deficiencies

The lack of a well-coordinated crisis management – can lead to a small degree of resilience.

*d) Ecological risks* are influences by natural and anthropic factors. The diversity of species or even their extinction within an area is the issue to take into consideration. Examples can be: desertification, deforestation, forest wildfires, mining activities, etc (Goțiu Dana, Surdeanu V, 2007, pp.100).

**Evaluation of the impact of different risk factors** representative for each resort in Harghita County. We differentiate between exposure to low risk factors, moderate unilateral risks, moderate multifunctional risks, multilevel excessive risks, unique differentiated risk and associative differentiated risks. In the following we will investigate each type of risk groups that affect the resorts in the studies areas. The degree of vulnerability and the main risk factors and their level of influence is expressed in figures 15 and 16.

#### - **Băile Tușnad**

We will analyze all aspects of the system which can be exposed to a risk factor.

**Natural risk factors.** The resort mostly is exposed to the wild animal attacks. Here we need to mention the brown bear (*Ursus arctos arctos*). This species causes a lot of stress, discomfort and damage within the resort. Since 2006 it moved in from the garbage storage units located on the outskirts of the city, to the inner areas, into the yards and even houses of the locals. On its diet we can enumerate chained dogs, chicken, pigs, sheep, cows, horses and this year cooked food from the houses. Encounters with the bears, which visit the resort (10 are identified daily) are of daily occurrence. This represents a unique excessive risk to the resort. Beside the animal attacks we can mention the hailstorms which affect the cultures and the fruit trees, torrential downpours which cause mudslides and slope washes or even smaller floods on the tributaries of the Olt Rives. Powerful winds knock down several trees in the resort, which cause traffic jams on E578 or on main streets. Landslides are rare and have no significant effects on the resort.

**Social risks** are expressed by the evolution of the population, through the wellbeing and living standards, healthcare, diseases, violence and vandalism. We can notice a slight decrease in the number of inhabitants, but this tendency is slowed down due to the economic growth of the resort. By the increased number of tourism units, more workplaces mean more revenue and motivation to stay. Attractiveness is grown and extended.

**Technogene risks** that have an affect on the resort are the accidents. The main reason is that after the modernization of E578, the speed of the traffic increased, and the railroad that passes through the resort has a wavy route. Due to high traffic, the risk to pollution increased, firstly to phonic then to chemical pollution. The risk of fires is low, houses are built far apart.

**Ecological risks** are mainly caused by the human activities, deforesting, bushfires, and there are several protected areas in the surrounding areas that can be affected due to the high number of tourists and lack of attending personnel.

All the main risk factors can be seen in figure 1.

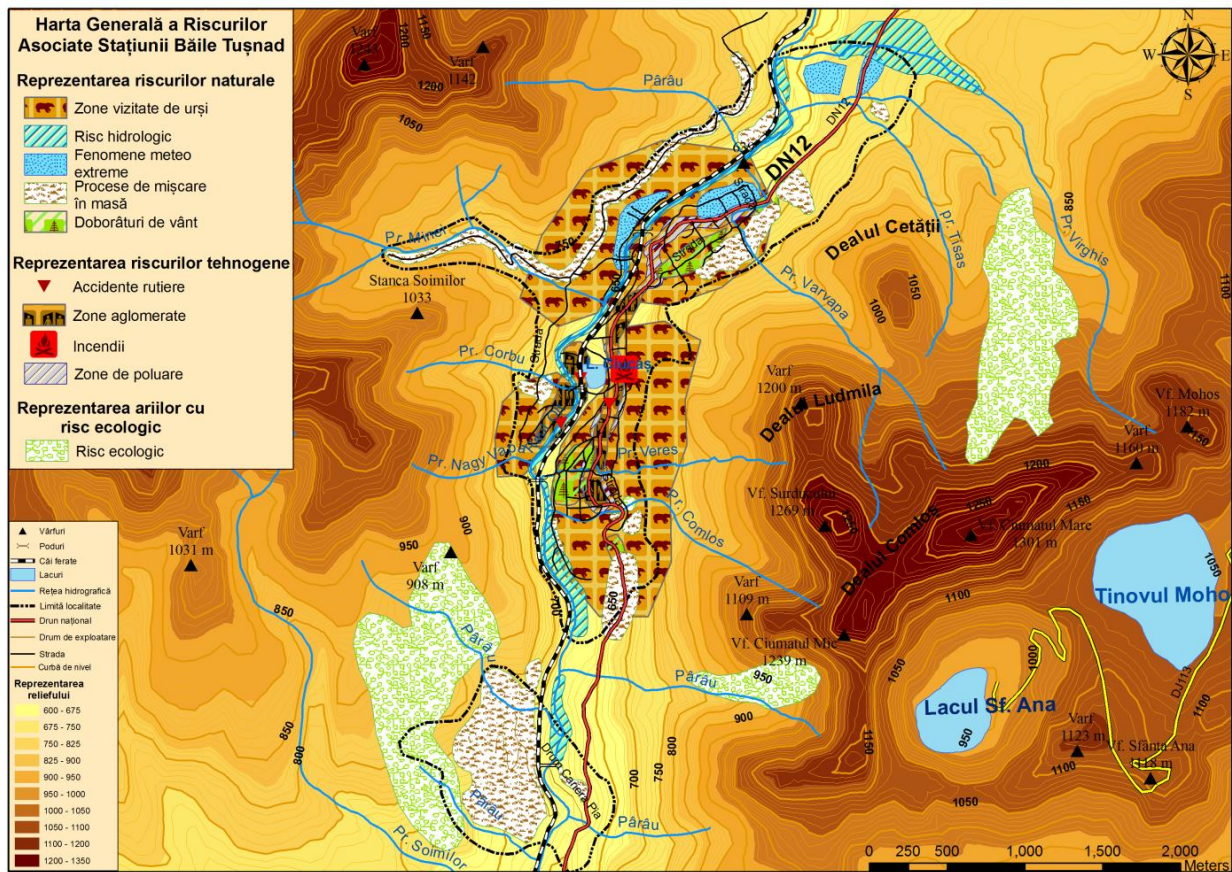


Figure 1. Representation of all risk factors that affect Băile Tușnad resort (source: author)

### - Izvorul Mureșului

Is situated between the Mures and Olt river basins, at 800 meters altitude, on a mountain pass, along the E578, at the foot of Negru Mountain.

**Natural risks:** has a unique differentiated risk factor that dominates all others starting from this year, and that is of the wild animal attacks. Here the brown bear attacks mostly the poultry houses and feeds exclusively on chicken meat. There are 4 bears that have caused over 2000 chicken kills this year. All other animal attacks are normal and produce little losses. Other natural phenomena that affect the region are the torrential downpours, the bushfires due to droughts, early frost and heavy snowfalls. The other risks are insignificant.

Among **social risks** the most significant one should be the risk of depopulation, expressed in the decrease in the number of residents. The reason was poverty and lack of workplaces. Since 2010 several new units have been built, creating new jobs and locals started renting rooms to gain more revenue.



In the technogene risk category we can include the lack of drinking water supply system, and waste water collecting system and management. In case of fires, that have been quite a few, there are only four hydrant location within the resort, which can be used in case of emergency. Accidents occur, mainly because of the high speeds on E578, and due to meteorological phenomena, that can influence the road conditions. Sound and chemical pollution due to traffic is small to medium.

**Ecological Risks** are small, without major disturbances to the flora and fauna of the resort and to the surroundings. The main risks that affect the resort can be followed on figure 2.

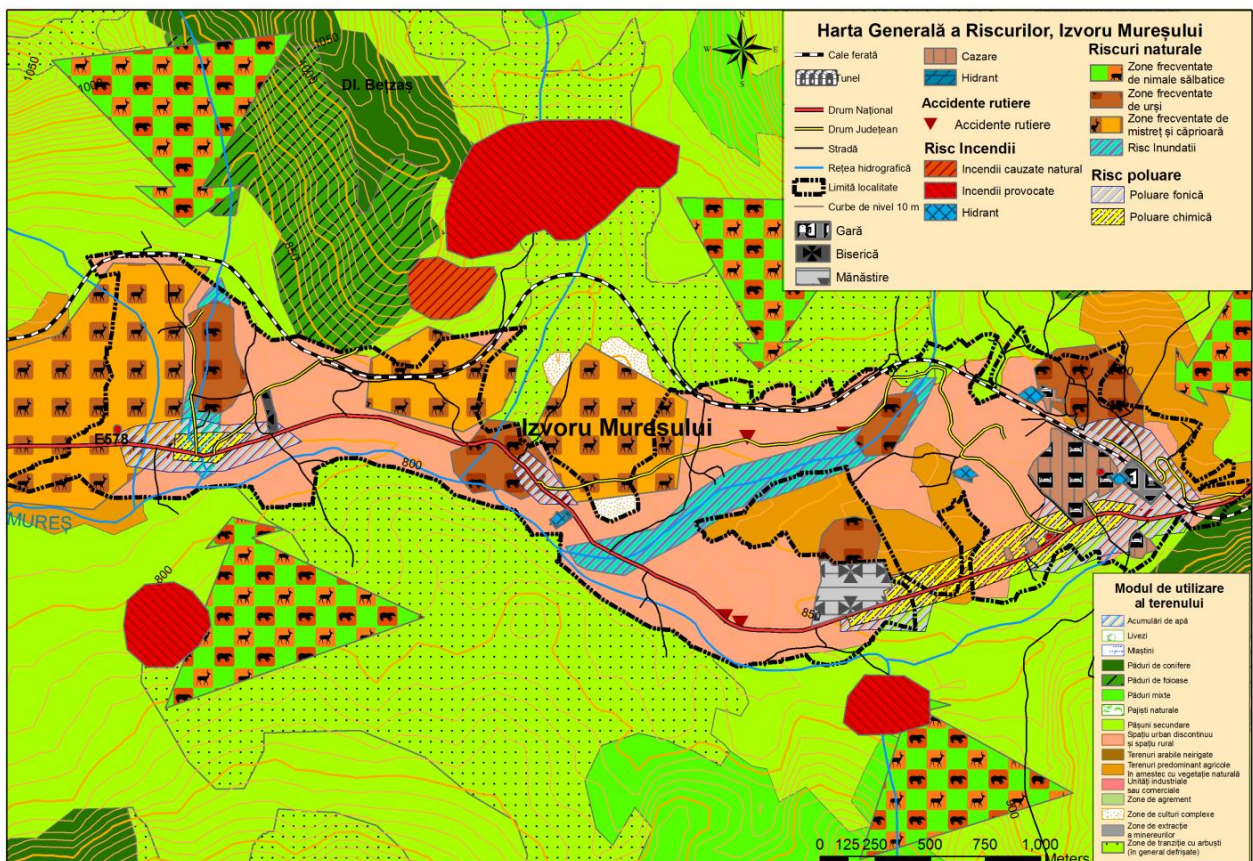


Figure 2. Representation of all risk factors that affect Izvoru Mureșului resort (source: author).

## - Borsec

It is located in the basin with the same name, surrounded by the Călimani, Giurgeu and Bistriței Mountains, at 900 meters above sea level. Its natural resources and clean air makes it one of the quietest resorts of the county. All risks are of low level of influence, and the local population shows reduced vulnerability to most of them.

Among the main **natural risk factors** we can mention the torrential downpours which can produce small floods and mud deposits, around bridges and flatter areas. The sensitive areas are at the juncture of Vinișor and Hanzcher brooks and the bridge that follows over the main road that leads up into the resort. The portion under the bridge is filled up with deposits and in case of heavy rains

can not cope with the amount of water that comes down. Other risk factors are frosts, fog, droughts which lead to wildfires. Several rainy days can affect the cutting, collection, drying and storage of hay.

There are no major **social risk factors**, the risk of depopulation has been reduced, but vandalism and thefts were made, mainly food has been stolen. This indicates poverty and desperation, indicating the lack of income, and the level of living standards.

**Technogene risk factors** are small to medium due to the high traffic on DN15, the road is narrow and with curves with reduced visibility, increasing the chance of accidents. Phonic and chemical pollution is due to the traffic and due to the modernizing works that are done in the resort (road construction and the new spa is being built – heavy machines work on the roads). These can disturb the relaxation, mood and peace of the tourists.

**Ecological risks** are more significant though, there are two natural reservations in the resort: one in the middle of it the Botanical Reservation Borsec, of only half a hectare and the Scaunul Rotund Geological Reservation which has 75 ha, with attractions like the Bears Cave, the Ice Cave and the Ancient Fountain. The anthropic pressure on these is significant, their value and state has been diminished due to lack of supervision and controlled visits.

All the threats that have been mentioned can be followed on figure 3.

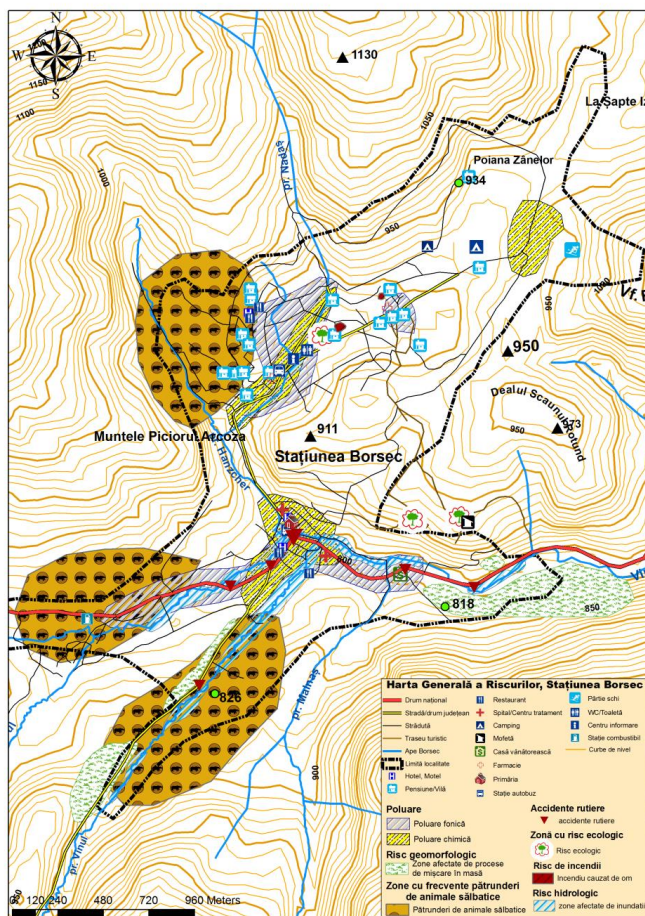


Figure 3. Representation of all risk factors that affect Borsec resort (source: author).

## - Praid

Is one of the most dynamic resorts in the county. Is located along DN13A with DN13B, within a unique natural environment. Is located on a salt mountain, which is part of an axes of settlements: the tourism axe of Corund – Praid – Sovata – Câmpul Cetății. Here salt mining was the major occupation of the residents for many years to come. But in 2006, according to the Government Order nr. 867/28 July from 2006, appeared in the Monitorul Oficial 609/17 July 2006, the settlement was given the title of resort. It is located at 520m altitude where the Târnava Mică is joined by the Corund brook.

Among the **natural risk factors** we can nominate extreme weather conditions to which the resorts has vulnerability. The Praid and Tiganilor brooks yearly produce one – two flashfloods, with some damages, the water infiltrates the houses and the yards which are lower then the street level. Other extreme weather conditions are the strong winds which affected the forestry areas, knocking down several trees, droughts, 2012, a year with a summer with lack of precipitation of two and a half months lead to the drying out of 2 ha of forest, several wildfires. Hailstorms affect the cultures just like the wild animals. Here the deer, the wild-boars, the bears look for natural food, rarely they come for honey or sources of meat. Land slides and mass processes are active in the region, which represents a medium risk factor for the houses on the Salt Mountain, due to water washouts, and landslides in the eastern compartments of the resort.

Considering the **social risk factors** these are relatively low, here as well we notice a slight decrease in the number of population, but after 2005 there is a slight improvement on the demographic side. The salt mine is still operational and provides jobs for the locals, and the tourism sector is in development. The newly opened salt water spa and pools represent a further attraction along with the increased number of accommodation units and recreational units.

The **technogene risks** to which the resort shows vulnerability are caused by overcoudings in the central area of the resort, which is intersected by the DN13A and DN13B, with all types of traffic, pollution and high risk of accidents. Another important risk factor are the fires, mostly provoked by human error.

The **ecological risk** involves mostly the surroundings of the Salt Mountain, which is a protected area, with several endemig plant species and rare animals as well. By the high number of visitors and the amount of garbage left behind, these sensitive ecosystems are exposed to degradation.

All forms of risks affecting this resort can be fallowd of figure 4.



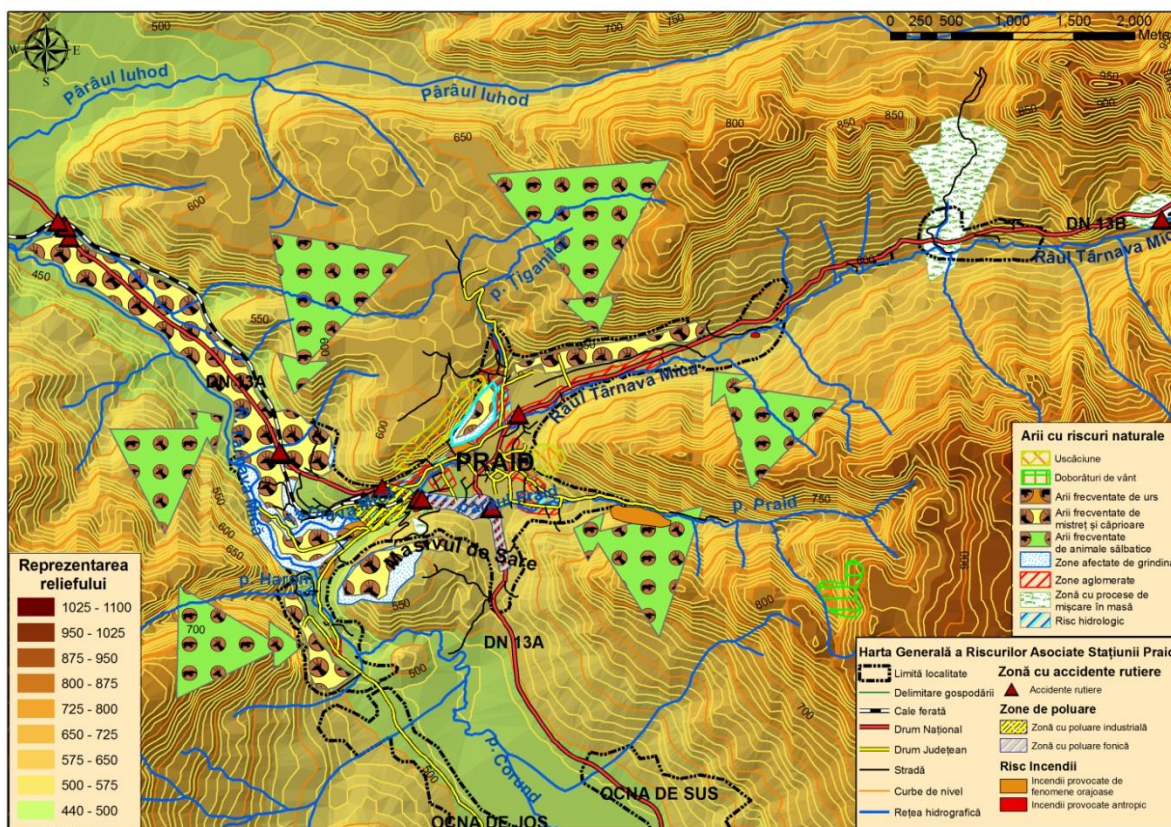


Figure 4. Representation of all risk factors that affect Praid resort (source: author).

#### - Lacu Roșu

Is located in the most spectacular surrounding, in the heart of one of the first national parks of the country. Represents the most well known destination in the county and country as well. Is part of the Cheile Bicazului – Hășmașul Mare National Park, and got its name after the lake on which shores it is formed Red Lake.

There are several **natural risk factors** which have to be mentioned here. The natural elements change rapidly here, and the resort is vulnerable to these rapid changes. Dangerous meteorological phenomena are on the top of the list: freezing-defreezing daily, torrential downpours and low temperatures, black ice, powerful winds, floods, droughts, landslides. Wildfires affected more than 2 ha of forests on the Ghilcos Mountain in 2012. Floods on the Oii brook are yearly occurrences. All protector dams that were built on the tributaries of the lake are colmated, thus the risk of the disappearance of the lake is a valid risk. Early frost can occur here even in August or as late as May. All these factors cumulating mean a medium-high risk to the resort.

The **social risks** are non significant in case of this resort. Depopulation is not an issue here due to the very small number of permanent residents. All revenues come from tourism activities. With the growth of the tourism circulation, the number of accommodation units developed, along with catering as well. Thus created new jobs and attracted not just tourists but entrepreneurs and workforce as well. The resort operates mainly in three seasons.



Intense traffic, congestions and high crowds in the center of the resort, pollution and lack of waist water management represent the most significant **techonege risks** which affect the resort. Due to the width of the road and the number of tourists, accidents can happen easily, not just on the roads but on the tourism trails as well. Fires represent a threat, due to the distance from the nearest town, and the lack of the drinking water supply system.

Being located in the National Park, attracts a great deal of responsibility. There are over 500 rare plant and animal species that are protected or are on the endangered species list. The increased number of visitors, their lack of supervision, and the great amount of residue represents a serious preasure over the ecosystem. A case study was conducted about the invadind ichthyological species in the Red lake and their ecological risk.

For all the risks that affect the resort please consult figure 5.

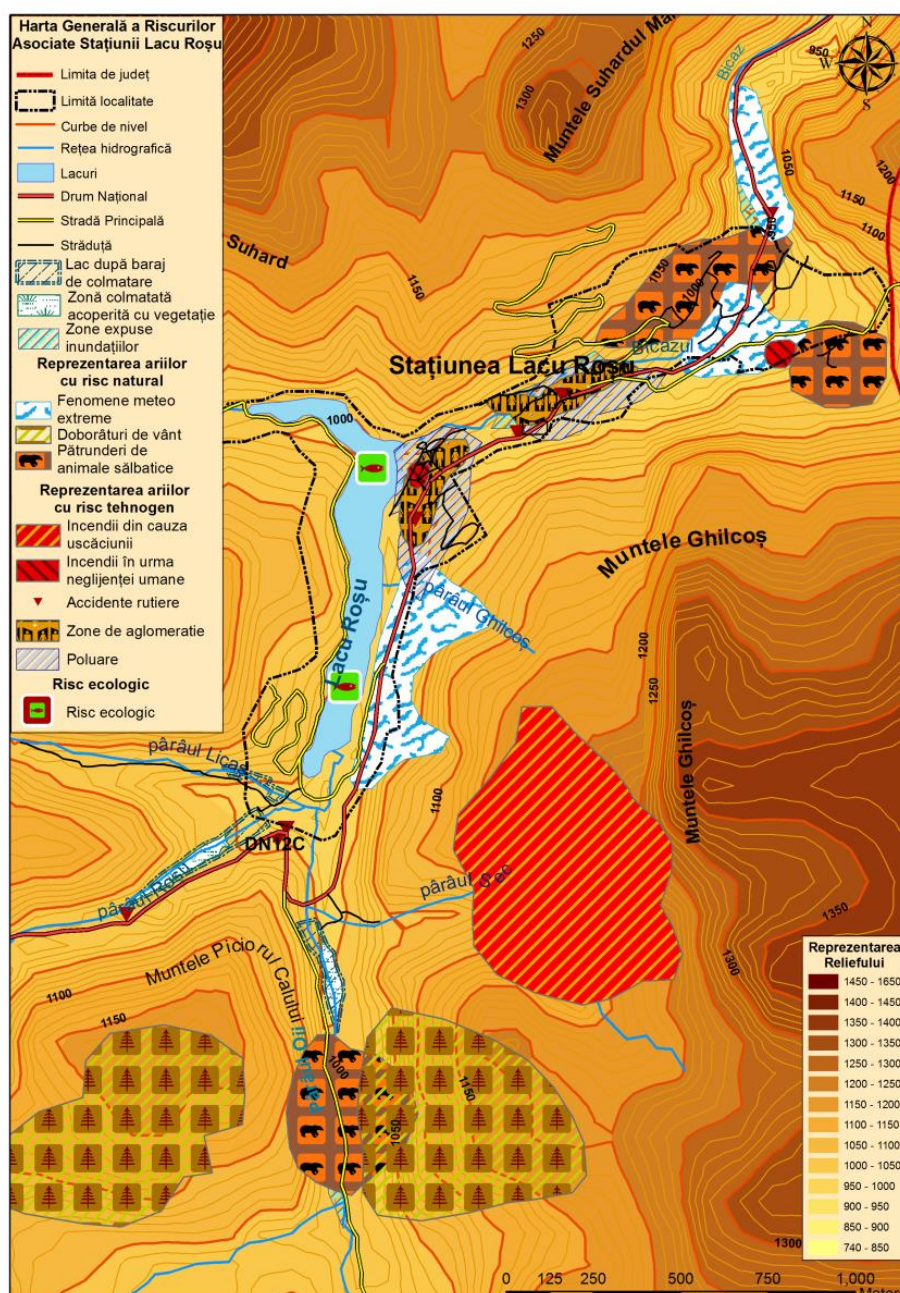


Figure 5. Representation of all risk factors that affect Lacu Roșu resort (source: author).



## - Harghita Băi

It is located at the highest altitude at 1250m above sea level, on the southern slope of Harghita Ciceului Peak (1761), in the middle of the Harghita volcanic mountain range, at the end of DJ138A 7 km from DN13A. Being so remote and well sheltered, and since the coal extraction was stopped in 2003 is the quietest and cleanest resort of the county. It is well known due to the many ski slopes and amenities for winter sports.

Considering the **natural risks** which produce discomfort and to which the settlement presents a certain degree of vulnerability are the extreme meteorological phenomena. Here we can talk about torrential downpours, massive snowstorms, strong winds, blizzards, fog, early frost, black ice. Landslides are scarce due to the geological structure of the volcanic mountain, and are the results of caving ins, because under the resort are the several shafts and galleries of the coal mine. Some processes can occur on the tailings deposited in the mining period. All these will not alter the air quality or the quietness of the resort.

The **social risks** are low, most of the population employed by the mining company has left, the total population now is 123 permanent residents who live in the first 3 blocks of flats near the mining site. All the rest are temporary accommodation types. Most of the tourists visit the resort in the winter or in the summer.

The **technogenic risks** are the only ones that represent a certain degree of vulnerability, and are mostly linked to accidents and injuries during leisure or sporting events, in about 85% occurring in the winter season. Road accidents are rare and are due to meteorological conditions, there were very few fires and acts of vandalism and thefts, due to being so remote. The mining site represents a high risk of accidents, because the security of the place is not that strict.

The **ecological risks** are reduced. The Balu Adventure Park, located next to the Csipike ski run on the tree trunks is the only one that could have a certain degree of risk to the environment.

All the risks that are representative for the resort can be seen in figure 6.

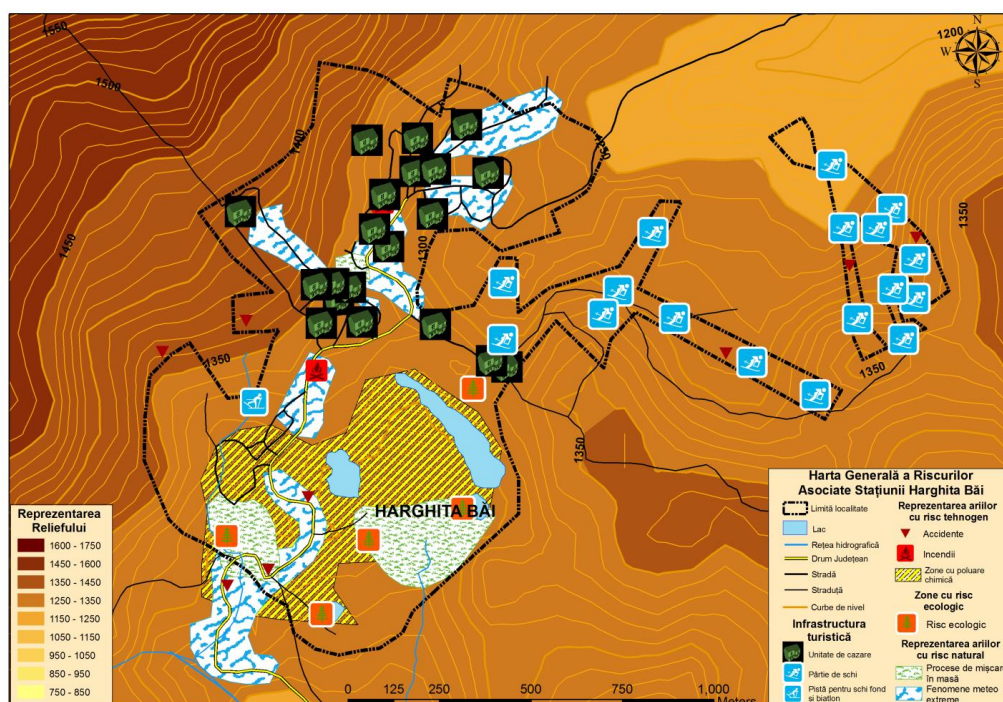


Figure 6. Representation of all risk factors that affect Harghita Băi resort (source: author).

## - Băile Homorod

One of the most well known resorts of the county for its mineral water springs is located along the DN13A between Odorheiu Secuiesc and Miercurea Ciuc on the southwestern slopes of the volcanic plateau of the Harghita Mountains. This resort has a medium degree of vulnerability to risk factors.

There are just a few **natural risk factors** that present a certain degree of risk, and among these the most significant risk factor is the torrential downpours which can cause flashfloods, 2,3 times a year with considerable damage to the tourism infrastructure mainly around the Lobogo Pension. The other risk factors with less damage are the hailstorms which affect the potatoe, corn and wheat fields, the forming of black ice combined with early frost, wild animal attacks or strong winds that can knock down trees. Here the wild animals mainly bears, deer, wildboars visit the croplands, as the bears the beehives. Their impact on the local economy is tolerable.

Considering the **social risks**, these are very low, with no significant fluctuation considering the demography of the resort. There was a risk for poverty, and aging of the population after 1990, due to the degradation of the tourism infrastructure, but since 2010 there is an improvement. Several housing units have been built, and one of the mineral water pools has been modernized, along with the springs near the DN13A. Higher number of visitors mean more job-opportunities and improved living standards.

The **technogenic risks** are the ones that confer a medium level of risk to the resort. With an excessive unilateral level of combined risk factors the occurrence of serious road accidents is high. The configuration of the DN13A between Băile Homorod and Vlăhița, one portion just in the eastern part of the resort, near the ski run and the other less than one km away caused over 13 deaths since 2006. Excessive speeds due to straight lines and sudden turns with high angles lead to several road accidents in all seasons, many casualties and several lost lives. The road and the meteorological conditions, not adapting to these represents a high risk factor here. In the resort, due to the high flow of the traffic, and the parking spaces can become overcrowded near the mineral water springs and Lobogo Restaurant, accidents can occur here as well. This portion is exposed to pollution as well (phonic and chemical). Fires haven't been reported recently.

The **ecological risks** are low, the biotic elements in the region are not affected by the anthropic activities, and territorial planning is well documented and takes into consideration the natural attraction factors of the region. All significant risks that affect the resort can be seen on figure 7.

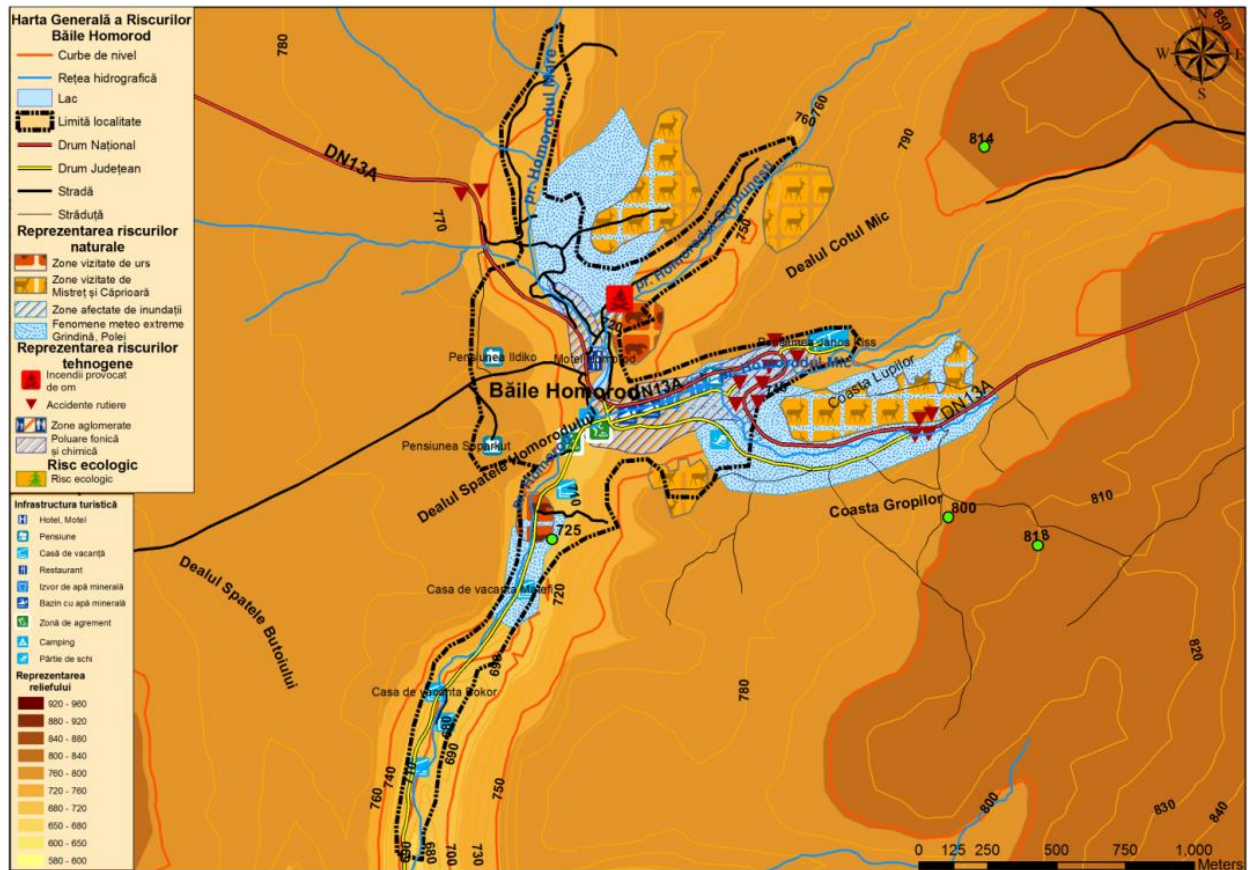


Figure 7. Representation of all risk factors that affect Băile Homorod resort (source: author).

### Chapter 3. Types and forms of adapting to the geographic risks

**Ways of adapting:** individual, collective and managed.

Adaptability represents the readiness, reaction and the power of resilience to come to a stable balanced state and to reduce to a bearable level the sustained damages in case of a risk. Adaptability depends on many factors: the memory of past events, the acquired experience, the power to regenerate (which depends on the resources at hand, revenues, the level of knowledge, the promptness of the local population, the level of insurances, the legislation and the cooperation level between government offices and local branches).

Adaptability we can discuss on three levels: individual – when all measures are taken individually, according to the budget of the household; collective – when two or more neighbours join in to create a common joint effort to reduce the effects of possible risks; managed – when organizations like the S.V.S.U. (The Volunteer Service for Emergency Situations) or other organizations manage, educate, take measures and guide people in case of risks.

The first form of adapting is the household and the way all its components are arranged around the house and yard. We can identify two types of households: the monobloc household, and the detached household. The monobloc is the one where all components are closely built together for better protection and easy reach, all being under one big roof. The detached one has all its components separate, well placed around the yard, behind which there is the garden.

### **Types of adaptability:**

- *anticipative* adaptability - presumes the occurrence of a risk and takes measures to prevent any damage from happening. For example river course management, consolidating the banks, (Praid), making concrete walls to prevent slope erosion or landslides (Băile Tuşnad, Băile Homorod, Praid, Borsec), preventing colmating (LAcu Roşu).

- *passive* adaptability - refers to measurements taken which act passively, only by being there to prevent or reduce the effect of risks. For example roadbumps to reduce speed in agglomerated areas, or police cars presence on the road even without any officers inside will passively make drivers to be cautious.

- *progressive* adaptability - refers to complementary and successive measures that are ment to gradually discourage, reduce or eliminate the risk factors. This could be best exemplified with successive fencing, first wood, then wire then electric for example (Izvoru Mureşului).

- *indifferent* adaptability - refers to the ability of not considering any measurements, because there is a higher power, whose will is stronger than any defence one can put up, or the risk factors are so low, that the losses can be tolerated. This is the case of putting up low beam fences, to delimitate the property, but only this is its function.

- *technogene* adaptability - means the upgrading, the technical improvement of some equipments, that assure the security or protection in case of a risk, these can be exemplified through insulating works, when different houses are thermically rehabilitated, or security and lockdown system upgrades, from traditional locks to electronic lockdown systems with alarms, door changes from single lockdown system to multipoint lockdown system, from traditional wooden fence to modernized wired fence with combined with electric fence.

- *elastic* adaptability - refer to measures that react in a flexible, more elastic way to different types of threats, meaning that some measures can cope with multiple risk factors. For example the enclosure of dumpsters into metal and concrete constructions, with strong roofs and lockdown systems, which discourage for one bears and large animals that are used to look for sources of food around garbage disposals and keeping these closed for night times discourages and eventually makes bears to abandon these sites.

- *unilateral* adaptability - means that the measures taken are only ment to be a form of adaptation for a single form of threat. An example would be chicken yards enclosed with wire fence that has a wire net above to prevent praying birds from getting to the chickens, or making barns from wood to assure the air passage to be able to dry and keep hay dry.

- *collective* adaptability - refers to the fact that several individuals within a given territory adopt a series of measures together to reduce the impact of risks that they are all facing. For example in case they

have a brook or river in the back of their yards and all decide to raise a continuous concrete wall, for protection in case of flashfloods, that constitutes the foundation of the fence they have facing the water and raise it further with wooden structures, or these can be the foundations of some garden components (barns, stables, etc) (for example in Praid along the Târnavă Mică riverbed).

- *multiple form* adaptability – means taking some measurements that reduce the effects of multiple risks at once. Here we could exemplify with the monobloc structured household, where all annexes are under the same roof, being compact, they offer better shelter, better protection against the cold, the hailstorms, fires, theft or animal attacks, are easily reachable and better supervisable reducing the effects of several risks.

- *intuitive* adaptability – refers to the way that exposures to risks can be reduced or eliminated by preparing the tourists or locals to a possible encounter. For example warning signs and panels that inform you of some threats, like in Băile Tuşnad there are several warnings around the resort concerning bearsitings within or in the vicinity of the resort, or the roads signs that should warn participants in traffic about the dangers that can lie ahead (in Harghita Băi, Borsec or Izvoru Mureşului).

- *deductive* adaptability – this means that the effects of a possible risks are deduced, even if they haven't occurred yet. This could be exemplified through deforestations in areas where a lot of trees were knocked down by winds, and replanting these areas to prevent slope washdowns, or another example would be the thoughtful construction of the houses on the Salt Mountain at Praid, to prevent water from going under the house that will lead to a cave in eventually.

**The forms of adaptability represent the implementation of these measurement in the field.**

- **In Băile Tuşnad**

Within the resort we can identify multiple types and forms of adaptability. To the natural risks we can start from mentioning the different ways of building fences. Simple fences, double fences (wired fence or wooden fence with barbed wire overhead) but these proved inefficient against most bear attacks. A unilateral form of adaptability, making the dumpsters from steel, and placing them into concrete and steel enclosures, with metal roof is a more effective way against the bears (see figure 8 a.). Placing animal cages in dangerous areas to capture and relocate bears that become a serious threat to humans as well is another unilateral form (figure 8 b.). Placing scented sponges with pepperspray in places frequented by bears is proven to be effective in driving them away. Placing warning signs in major spots in the resort proves somewhat thoughtful. Within the households having more dogs, unchained, motion activated lights, and alarms proves to be effective. Most of the houses and pensions are well isolated against the harsh winters. Against high floods on the Olt, the banks between the railway bridge and the Ciucas Lakes, has been reinforced with concrete walls.

As a form of adaptability to the social risks, creating new employment opportunities by modernizing the tourism infrastructure, building new ones, diversifying the offers and services motivates the locals and the inhabitants from the neighboring settlements to seasonally look for work within the resort.

To reduce the technogenic risk factors the police adopted active measures by having a car with speed detection, thus monitors the resort constantly. There is an active and well trained S.V.S.U. unit, equipped with a firetruck and fast response team. For the ecological risks warning and informing signs are placed in the interested areas which have the goal of informing, educating and warning the tourists or visitors.



Exemples for forms of adaptability can be seen in figures 8 a,b,c,d,e,f.



a. Enclosed and reinforced dumpster. B. Cage to capture bears near the railway station. c. slope consolidating works.



d. Double fence and terraces for slope consolidation. e. Simple fence. f. Reinforced river bank along the Olt River.

Figure 8.a,b,c,d,e,f. Forms of adapting to risks in Băile Tuşnad (source: author).

#### - Izvorul Mureşului

The unilateral excessive risk to which the resort present vulnerability are the bear attacks, which especially intensified this year. There is no matter how high or sophisticated a fence is, the bears still get in kill a lot of chicken and get out, even with cubs. Because the risk is too recent, the waus of adapting to it are still in progress, there are individual and collective iniciatives and managed ways but proven ineffective. The birdhouses are very simple wooden structures, which are easy targets for bears (see figure 9 f.). But for example against praying birds there are better forms of adaptation (see figure 9 b.). Making the barns from concrete or bricks, is expensive but effective (see figures 9 d and e). Thermal isolation for the houses is a must considering the winter temperatures (see figure 9 c). By the increase of the tourism circulation and the new employment opportunities that came with the new accommodation units lead to a slight improvement demographically and employmentwise, but powerty is still a risk that needs to be delt with. Violence and criminal activity is very low, so these are well controlled. For reducing the impact and vulnerability in case of technogene risks there were 4 hydrants placed in the resort. The resort does not have neither drinking water supply network nor waist water collecting network, this being a big disadvantage. As a form of deductive adaptability, the houses are placed far from the accessibility road, and in the yard there are densely trees planted to reduce phonic and chemical pollution (see figure 9 e).



Figura 9.a. Reinforced and multi fencing.

b. Chicken yard with wire-net above.

c. Thermoisolated house.



d. Barn made of concrete and bricks with reinforced doors and upgraded locking system



e. Simple wooden made fence and yard



f. Birdcage made of wood without reinforcement showing signs of bear attack (surse: autorul).

Figure 9 a,b,c,d,e,f. Forms of adapting to risks in Izvoru Mureşului (source: author).

#### - Borsec

Is the resort with the level level of exposure to risks. There are complex forms of adapting. The lack of major risk factors occurring in the last 10 years show signs of relaxation on the residents. Most of the bridges are colmated, and the waterlevels have risen due to deposits. Here the fences have mostly delimiting purposes for animal attacks being rare. The brooks' courses are well maintained and reinforced (see figures 10 a and c). Most of them are thermally isolated (see figure 10 b).

The resort entered a new evolution phase starting from 2008, and constantly developing. Since 2012 the pace of evolution has been picked up, several projects are initiated. By the construction of the new wellness and spa complex, by modernizing the tourism infrastructure, the resort is offering new job opportunities, more services, and better conditions. The Mayor's office bought 11 villas since 2012, rebuilt 8 of these and the rest are under development and transformation (see figures 10 d,e,f). Adapting to the ecological threats there are signs indicating the attractions and the endangered species and formations that need to be protected.





Figure 10.a. Brook bank reinforced.

b. Simple fence and thermo isolated houses.

c. Renewed road and rebuilt bridge.



d. Partially demolished building bought by the Mayor's Office (source: autorul).

e. The new wellness and spa under construction

f. O-Saros spa in use since 2012.

Figure 10. Forms of adapting to risks in Borsec (source: author).

### - Praid

The most of the adaptability was inherited by the system, there are few risks which required new ways of adapting. Among the inherited forms we can enumerate the water course management that targeted all courses of waters within the resort (see figures 11 a and c). As a collective form of adaptability several households which end on the banks of the Târnavă Mică made their fences with adjoined concrete raised basement and wooden upper parts. Against animal attacks, there are simple and complex fence systems applied (see figure 11 b). there are several works applied on slopes to prevent mass movement processes (landslides see figure 11 e and f, torrent formation on salt due to delution figures 11 h and i). Another form of adapting to a series of consecutive rainy days, in the hay collecting season, there are special fences used to dry the hay, and well vented barns where the hay is stored so it can completely dry out.

Considering the technogene risk factors the resort is mainly exposed to pollution, accidents and fires. The center of the resort is the most crowded are, and because the DN13A goes right in the middle of it requires a constant police surveillance. This active form of adapting to this risk proves to be somewhat effective. The grouped construction model of the households presents a significant risk of fire spreading, but the presence of a S.V.S.U. and a well trained volunteer response team tries to keep things under control. Treating the houses with nonflammable substances is another passive way of adapting to fire threats applied in many houses. Considering the social risks, the development of the resort is the best way of adapting to reduce unemployment, to improve social life and living standards. By placing signs and boards at the entrance and throughout the Salt Defilee helps people understand the uniqueness and value of the reservation.





Figure 11. a. Water course management.

b. Monobloc construction model in Praid.

c. Tinagilor brook's banks are reinforced.



d. Double fence wire and net.

e. Land slide prevention works

f. Land slide stopping works (source: author).



g. Slope consolidation along DN13B (source: author)



h. Water drainage on the Salt Mountain top



i. Torrent formed due to dilution stopped by residue depositing from Salrom

### - Lacu Roșu

This resort is located in the most spectacular environment with the most extreme weather conditions. Among the natural risks we need to mention the hydrological risks, several dams have been built on all tributaries of the Red Lake, but all of them are clogged and filled up. Most of the riverbed downstream the lake has been consolidated (see figure 12 c). To stop slope erosion and landslides making terraces combined with brick walls is an effective way to prevent such events (see figures 12 a and b). A passive of adapting to fire spreading is the dissipated construction method, the houses are well apart. To prevent to formation of black ice, the water is evacuated from the road. Extreme temperatures like frost in August or snowfall in September are possible, so water on roads can be dangerous. Here fences are only representation of the perimeters, mostly very simple and they are ment to keep out mostly people (see figure 12 f).



To cope with the high tourist flow, the parking area has been enlarged, a nice way of adapting to the need of the tourists and reduce the pressure they had on the road in the vicinity of the lake. There is no way that pollution can be reduced significantly due to the configuration of the road and the landscape itself do not allow it. To prevent accidents the number of mountain rescue members has been increased, because there are several trails with medium and high degree of difficulty that need constant monitoring and assistance.

For reducing the anthropic impact on the environment, information boards at overlooks, or in the major areas of the resort try to inform the tourists to keep the environment clean, and to protect its endemic values, not to disturb or harm them. For this the presence of the police is welcomed.

To reduce the risk factors the joint efforts of the locals and entrepreneurs is a welcomed sign, by coworking they adopt new forms of adapting to reduce the effects of threats that are bad for the tourism business.



Figure 12. a. Constructing on terraces consolidated with concrete walls b. accommodation unit on the Oii valley c. Reinforced riverbed along the Bicaz



d. Early September frost along DN12C e. Dam that is filled up on Oii valley f. Simple fence made from branches (source: author).

### - Harghita Băi

This is the remotest and one of the quietest resorts in the county, spectacular in all seasons. One of the most evident forms of adapting was the finishing of the drinking water supply network and the waste water network in 2013. The major roads are being modernized, this resulting in easier accessibility and higher tourism flow. The accommodation units are modernized and thermally insulated because here the winters are long and cold. Another form of adaptability was applied on the mine dump slopes, to prevent landslides, washoffs and erosion. As a form of adaptation, the lakes that got formed on these mine dumps are now used for touristic purposes (figure 13 d and e).

The only major risk factor in case of this resort is the risk accidents, and these happen rarely on the roads. These happen in about 85% in the winter, on the ski runs or trails. To reduce the number of injuries or better treatment in case someone gets hurt, the permanent presence of a mountain rescue team was stationed here.

These individuals are highly trained and are very efficient in their field of expertise. As an intuitive form of adaptability we can mention again the water supply system, with several hydrants to recude the damage of fires. As a technogene form of adaptability to injuries on ski slopes, nets are installed yearly along the skiruns, and in the arriving areas of the transportation stations. To the risk of depopulation, the resort tried to answer by operating the resorts and its facilities in all seasons, although the winter seasons prove to be the most crowdred ones here. The newly built pensions and guesthouses are well equipped and modernized and are well adapted to tourist's demands (see figure 13 f).



Figure 13 a. Modernizing the infrastructure . b. consolidating slopes with concrete walls c. Simple fence and yard management.



d. Managing mine dump slopes against erosion e. Lake formed on a mine dump used as attraction. f. Modernized and well isolated new pension.  
(source: author). (f. <http://www.bellavita.marien.ro/hargita/main.php?lang=hu>)

### - Băile Homorod

This resort is exposed to certain risks that include it in the cathegory medium considering its vulnerability. Among the most impressive natural risk factors we need to mention the torrential rainfalls, which produce flashfloods. To adapt to this type of threat the Homorodul Mic brook bed vas consolidated with rock walls, and was raised and the small brook that runs along the ski slope was managed as well, but not enough. This is the one that affects the areas at the base of the skirun, by bringing deposits or washing the pavement away (see figures 12 a, b and c). Against halestorms the resort present a passive form of adapting even indifferent form of adapting, by neglecting the damages resulted on the cropfields. There are several species of animals that invade the cropfields and do certain amount of damage, the wildboars, deers and bears. The last one come to feast on honey as well. Several beekeepers put up electric fences or provide enhanced security around the hives to protect them (see figure 15 f). Others use complex fences and improved yard management. The most significant risk factor although is the risk of road accidents. Due to the high traffic on DN13A, the configuration of the road represents a major risk. Between the resort and Vlăhița there were several road accidents with over 13 victims since 2006. This includes this section of the road into the extremely dangerous cathegory. The nature of the road with long stretches of straight lines and sharp turns



can be confusing, and this is the reason why most of the drivers fail to adapt their speed. There are warning signs, but they are not enough. On the other hand in high season, when there are several vehicles stopped on both sides of the road around the two mineral water springs and the Lobogo Restaurant and Pension can endanger those who want to cross the road. Passive ways of adapting to winter conditions are carried out by wooden made accommodation units with thermal isolation, presented at international standards. All efforts for forms of adapting can be seen in fires 15 a,b,c,d,e,f.



Figure 14 Adaptation to torrential downpours. a. Water course management on Homorodul Mic b. Brook management along the skirun Lobogo



d. Simple fence and yard management (Surse: autorul) e. Modernised pension f. Electric fence just outside the resort.

( picture e. [http://www.szekelyfoldiinfo.ro/Menu/Szallashelyek/homorodfurdo-szallas-soparkut\\_panzio-homorodfurdo-hotelek-villak-panziok.html](http://www.szekelyfoldiinfo.ro/Menu/Szallashelyek/homorodfurdo-szallas-soparkut_panzio-homorodfurdo-hotelek-villak-panziok.html) ; picture f: <http://www.panoramio.com/photo/89883451>)

## Chapter 4. Conclusions

The hazards are events which occur regardless of all human activities, and the risks that result from them depend on the vulnerability of the administrative structures over which they deploy. The risk represents the material damage or loss and the quantification of probable losses in case of hazards. To be able to properly adapt to a certain risk factor there are needed: readiness, attitude, cumulative historic knowledge of similar events, a well elaborated management plan for prevention, during an event and reestablishing order and balance. For this to be effective, there is a need for information exchange, education, sensitivity and common effort. For the elaboration of this thesis several individuals provided valuable information and data, which is presented in this work.

Considering all risk factors the most vulnerable to risks (unilateral excessive risk factor) proved to be Băile Tușnad. The excessive risk factor is represented by the wild animal attacks, especially the

brown bear attacks. All domestic animals are vulnerable to bear attacks all over the resort. Beside this risk, all others do not present such magnitude. Among these we can enumerate the torrential downpours, flashfloods, tree knockdowns, gravitational processes. Among the technogene risk factors we need to mention the pollution factors and accidents induced by the high traffic flow on E578 and on the rail roads. The resorts has adapted selectively to these threats at different levels: individual, collective or managed. Modernizing or upgrading the fences did not prove effective in most cases, to prevent bears from entering the yards or gardens. But applying enhanced security by having more unchained dogs, mounting motion activated lights and phonic warning system, could be a better solution. There were applied specific methods by inscented materials places in frequented areas to discourage the bears. The resort is fitted with warning signs and panels regarding possible bear encounters. The police showed flexibility considering the technogene risks, by a dynamic presence in the resort, although more means should be applied to reduce speeds in the overcrowded central areas. The presence of a S.V.S.U. unit is well thought and trained for emergency situations.

With a considerable degree of vulnerability we awarded Izvoru Mureşului with the same risk factor as in case of Băile Tuşnad. The bear activity got intensified this year, with severe anomalies. The wooden made henhouses present great vulnerability in front of the bear attacks. Most of the adopted ways of adaptability are still unefective and singular. The deductive and anticipative ways of adapting include reinforced wooden structures (barns, henhouses) and improved security systems, (locking system upgrades). The collective way of adapting is alarming the neighbours as well in case of a bear attack and try to drive the bear away. These methods prove to be effective on short term, but better ways need to be introduced on the mid and long term. In case of the other risk factors, the vulnerability is reduced, just in case of fires could be problems with the shortage of the water supply system. Most of the inherited ways of adaptability are effective and functional.

In the medium category of risks we included Praid, Lacu Roşu and Băile Homorod and present a certain level of vulnerability to specific risks, which individually are not that high but their overlapping over certain areas raise the vulnerability of the overlapped area. In case of Băile Homorod, the most representative natural risks are the torrential downpours which produce flashfloods, hailstorms, tree knockdowns, early frost and animal attacks (bear, deer, wildboar). To these we can add the road accidents and the pollution due to the intense traffic on DN13A. All these overlapping the main route make us include the resort into the medium category.

The forms of adaptability are progressive and deductive, the Homorodul Mic brook's banks have been reinforced with stonewalls, but the problem area of the floods hasn't been solved. But the crowded areas and the speed regulations are not solved yet, and the two portions with high accident

risks are not speedregulated. The problem of the accidents is not solved and obliges the authorities to take measures, even passive methods to reduce the risks of accidents to occur.

Praid is included in the same medium level risk exposure due to the overlapping of several risks. The most exposed region is the central area of the resort, along the DN13A, where natural, technological and social risks overlap, exercising a common pressure upon the area. As a result, the forms of adaptability are dynamic, the people's attitude is flexible and the good management by the resort's S.V.S.U. and other administrative units is effective, and reduce some of the risks. Although implementing some road elements to reduce the transitory speed of the vehicles would be essential, would reduce the possibility of accidents, and if a new road would be built to go around the resort, would considerably reduce the pollution risk as well.

In case of the Lacu Roșu resort, the risk level indicator is medium as well due to all the extreme natural risks that occur here overlapped by the technological and ecological risks. Here the human impact is significant and leaves every year unreversible changes in the system. The natural risks are represented by the torrential downpours, tree knockdowns, flashfloods, landslides, black ice, early frost, fog and snowfalls. Among the technogene risks we need to mention the overcrowding effect caused by the presence at once of a great number of tourists, more than the parking space can accommodate, leading to overcrowded roads, roadblocks, traffic jams, high pollution risks and great pressure on the balance of the system. The ecological risk factors are great, not just in case of the Red Lake, but within the National Park as well. The adaptability measures are considerable, more staff, police force got detached here, the number of mountain rescue members was increased, the parking space got enlarged, but still not enough. Waste and garbage management, the lack of drinking water and waste water management represent still a disadvantage that needs to be considered in the future. The human pressure over the system is increasing with the increase of the tourism flow.

Haghita Băi resort being so remote shows only small to medium exposure to risks. Here the most significant natural risks are the torrential rainfalls and blizzards, early frost and fog, and sudden changes in the weather. Among the technogene risks the most significant one is represented by the accidents, mainly in the winter season. The means of adapting to these risks by the local administration are flexible, the Administration of the National Roads and the full time presence of the Salvamont Haghita reduce somewhat the degree of vulnerability of the visitors through prevention, informing and intervention.

The only resort with low level of exposure to risks is Borsec, here most of the risks produce reduced levels of discomfort and damage. Here the most significant risk would be considered the human factor. Here we mean the lack of will for collaboration between many villa owners and the local authorities in rehabilitating and rebuilding many of the damages, aged or dysfunctional villas. There

are several forms of adapting to all kinds of risk factors, but the most significant one should be that of the ecological risk. Since 2008 the local authorities try to restart the resorts tourism flow, and changes turned up in speed starting from 2012, with a greater involvement of the Mayor's Office. This is already visible in the tourism circulation, in the overnight stays and the values of the investment projects that were initiated.

The level of risks and the most representative risk factors can be seen on figures 15 and 16.

In conclusion the adaptability to risk factors of the resorts in Harghita County is average, and is majorly influenced by the local budget, by the incomes of the population and tourism infrastructure owners, by the living standards of the resident population and the level of the infrastructure. In case of individual ways or collective ways of adapting, everything comes down to the incomes and level of collaboration of the families exposed to the same risks within an area. On the managed level, all depends by the financial capacity of the local administration, the number of people employed in the S.V.S.U. and the mountain rescue teams. In many areas, speed regulations, road works and more warning signs would reduce significantly the possibility of accidents, the level of pollution and stress over an area. In all, a better informing, education, readiness, professionalism, and well coordinated management prove to be effective on many levels of adapting, and the vulnerability of the population is reduced greatly by their level of absorbing the changes that can occur within the system at any given time.

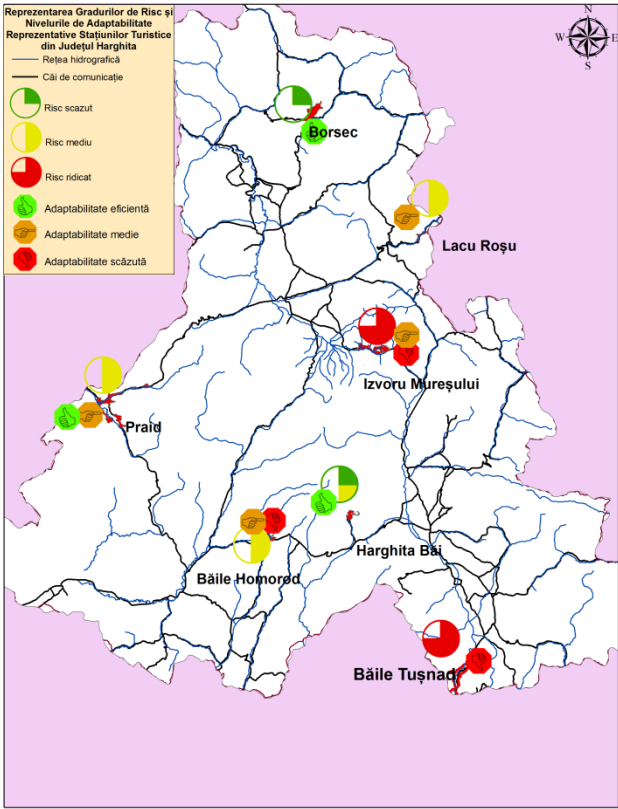


Figure 15. Representation of the levels of risks and the levels of adapting of the resorts in Harghita County(source: author)

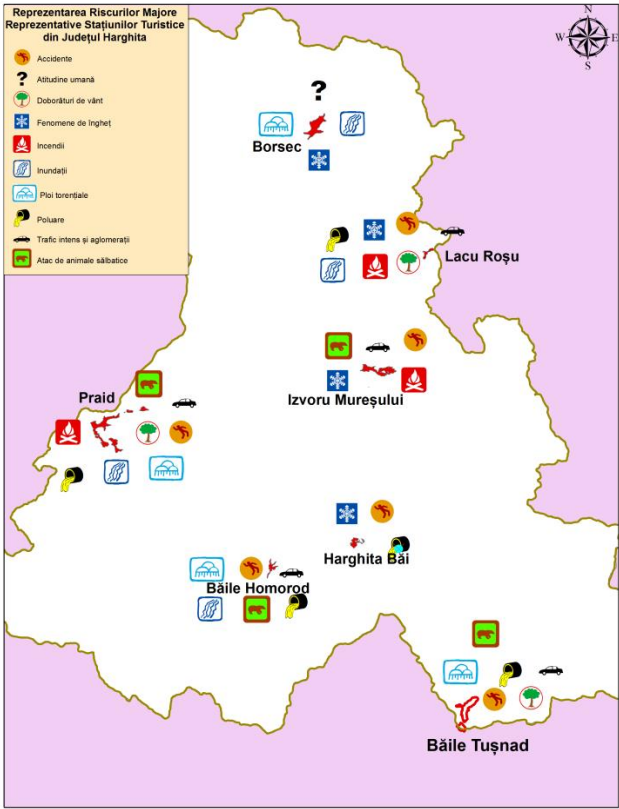


Figure 16. Representation of the major risk factors within the resorts of Harghita county (source: author).