THE REGIONALISATION OF NATURAL RISKS IN THE SOMEŞUL MARE HILLS

BARTA ANDRAS-ISTVAN*

ABSTRACT - The significance of studying natural risks derives from the human society's necessity to live safely. This approach is at its best if the analysis is undertaken at a micro-scale, i.e. through regionalisation, which supposes the complex treatment of all its environmental components and the study of all the phenomena taking place in it. Most of the risk phenomena result from the interaction of many factors, each of them with different and specific laws, and evolution trends. The regionalisation of risks is necessary as it leads to highlighting the phenomena on certain risk-friendly areas. Because of the complexity of the natural and the anthropic factors, the Someşul Mare Hills are a favourable environment for the evolution of the geographic risk phenomena; hence the necessity of the regional analysis of those phenomena.

Key words: natural risks, genetic factors, regionalisation.

INTRODUCTION

The region is an entity where almost all the phenomena of the geographic cover may be identified. The analysis of its components should be in relationship with the region itself. The detailed study of its components and of the connections between them is absolutely necessary in order to highlight the quality and the functionality of the whole (P. Cocean, 2002).

Regionalisation supposes the complex approach of all the environmental components. This approach should be an integrated study. It should not rely on strict and narrow directions because most of the risk phenomena result from the interaction of many factors, each of them having different and specific laws and evolution trends within a certain variation scale. Many times, due to his modelling force, man is willingly or unwillingly a significant factor in causing extreme phenomena, as well as the main element running various risks. The regionalisation of risks is necessary as it leads to highlighting, on certain areas, the phenomena that are more or less prone to risk-s.

The Someşul Mare Hills is a component of the Someşan Tableland. They are crossed by the right-hand tributaries of the Someşul Mare River which also names this unit. In most cases, when risk genetic phenomena appear, the areas with a high vulnerability level are inhabited by many people. Such are the settlements from the corridors of some of the secondary valleys: Rebra, Salva, Coşbuc, Zagra, etc.; those in the depressionary basins: Molişet, Suplai, Parva etc.; or those from the Someşul Mare Corridor: Sângeorz-Băi, Năsăud, and Beclean.

1. THE REGIONALISATION OF THE SOMEŞUL MARE HILLS ACCORDING TO RISK CATEGORIES

After establishing the vulnerability level in certain areas, regionalisation will take into account the features of the relief (the altitude, the orientation of the slopes, and the form of the valleys), as well as the factors that have caused extreme phenomena (the risk).

According to the vulnerability level in case of hazards, the territory of the unit under scrutiny may be divided into the following zones:

- The area of depressionary basins and high hills in contact with the mountainous space which reach 800 m in the west of the unit and almost 1000 m (called muscele) in the Năsăud Hills;
- The valleys of the tributaries of the Someşul Mare and the low hills (400-500 m);

* Babeş-Bolyai" University, Department of Regional Geography, Faculty of Geography, Clinicilor Street, no. 5-7, 400006 Cluj-Napoca, Romania.
E-mail: andrasistvanbarta@yahoo.com

- The Someşul Mare Corridor from Sângeorz-Băi to Dej.

The factors that have led to the appearance of risk phenomena are geomorphic and geomorphologic (the relief, the orientation of the slopes), climatic (the temperature, the rainfall), hydrologic (the flow, the longitudinal profile of the river, the riverbed, etc.), or anthropic (the impact of human activities upon the environment).

2. THE ANALYSIS OF RISKS IN THE DELIMITED ZONES AND THEIR GENETIC FACTORS

2.1. The Risks Characteristic of the Depressionary Basins Neighbouring the Mountain Area and to High Hills

In the depressionary basins neighbouring the mountain area and in the high hills, the genetic risk phenomena have appeared under specific climatic, hydrologic, and anthropic conditions. As a whole, the relief has evolved within regional systems with a particular modelling imposed by their geographic position, their climate zoning or as an effect of altitude levels. **Rill erosion** and **torrentiality** belong to *the geomorphologic risk phenomena* (the extreme phenomena). This category includes several complex processes. Man contributes to increasing the geomorphologic risk phenomena through the local disorders that he creates.

According to Welch (1986), rill erosion or torrents are influenced by six factors that interrelate in their action:

- The rainfall varies between 650 and 800 mm/year or even more in the area under study;
- The flow;
- The morphometry of the relief;
- The type of soil: luvic brunisol, albic luvisol, brown eumesobasic;
- The use of the territory: for agriculture and grazing on the slopes;
- The slope and the riverbank stability.

The causes of these phenomena are influenced by two variables: the intrinsic variables – those from the morphologic system (the climate, the relief, the rock, and the vegetation) – and the extrinsic variables (overgrazing, deforestation, inadequate agricultural practices, roads cut perpendicularly on the level curve, etc.).

The settlements affected by rill erosion and torrentiality are Parva, Gersa II, Telciu, Coşbuc, and Şendroaia where these processes affect the very fragmented and inadequately used slopes from the anthropic point of view (overgrazing, cutting the roads perpendicularly on the level curve, etc).

The climatic risk phenomena are **the abundant rainfall** and **the inversions of temperature**. The abundant (exceptional) rainfall characteristic of the high hills in contact with the mountainous area together with the steep slopes and the degradation of the vegetal cover cause floods, sheet erosion and the destruction of the vegetal cover, which entails serious negative consequences.

The surplus of rainfall leads to humidity surplus and its negative consequences are also influenced by the features of the active surface: the characteristics of the soil cover, the depth of the phreatic layer, the features of the vegetal cover, the topography of the area, etc. (Bogdan, Niculescu, 1999).

The second category (the inversions of temperature) is characteristic of the depressionary basins and the corridor zones of this unit. The associated risk is caused by the high frequency values, duration and, especially, the intensity of the thermal phenomena. The most intense inversions have a mixed origin (advective and radiative), which may cause a much lower air temperature (Bogdan, Niculescu, 1999).

The areas affected by these climatic risk phenomena overlap the depressionary basins nearby the mountains: Molişet, Şendroaia, Suplai, Bichigiu-Telciu, Parva, and Sângeorz-Băi.

Among *the hydro risk phenomena* in this area, **floods** and **riverbanks erosion** are frequent. Besides the quantifiable economic damage, they have also an ecological impact (Sorocovschi, 2004).

The causes of floods are very diverse and, in special cases, they contribute to certain extreme, difficult to imagine phenomena. These causes may be climatic (exceptional rainfall, sudden melting of the snow cover, the formation of ice dams due to temperatures unusual for the cold period of the year), hydrologic (the flow on the slopes, the features of the riverbed), pedologic-geographic (the structure of the

soil), bio-geographic (the structure and the firmness of the vegetation), anthropic (overgrazing, inadequate agricultural practices, deforestation).

The factors involved in the genesis of lateral erosion are: the form of the riverbanks, the flow, the flow speed, the riverbed, the absence of any hydrotechnic works.

There are flood-affected areas and the areas affected by the erosion of the riverbanks in the basins of the Sălăuța, the Ilişua, and the Gersa Valleys (in the area of the following villages: Bichigiu-Telciu, Coşbuc, Gersa I, Târlişua, and Dobric).

Risks resulting from the activity of the anthropic factor. Because of his capacity to discover, invent and create, man is capable of having an ample, rapid, even explosive impact upon the environment. For a long time, man has had a limited influence upon nature, whereas today the process of resource exploitation has extended a lot and its negative effects are not taken into account. In the unit under study, the exploitation of forest resources has a huge impact because it dwindles the forested surfaces, it destroys the tree bio-diversity (deforestation), the habitat of the fauna and it disturbs the geomorphologic balance by cutting roads in the forest and by inadequate agricultural practices (ploughing down the slopes). The settlements representative from this point of view are: Parva, Rebra, Gersa I, Gersa II, Telciu, Coşbuc, Zagra, Târlişua, Poienile Dobricului, Breaza, and Leleşti.

2.2. The Risks Specific to the Secondary Valleys and the Low Hills

In these areas, the environmental components have evolved under the influence of a less imposing and less fragmented relief, under climatic and hydrologic conditions somewhat different from the above-analysed unit (lower quantities of rainfall, changes in the longitudinal profile of the river). In these areas, because of relatively favourable environmental conditions, the anthropic factor has manifested its modelling capacity more aggressively.

The geomorphologic risk phenomena are **landslides, sheet erosion** (areola erosion) and **creep.** Landslide causes are direct. We include here the causes leading to the disappearance of the balance state of the slope, therefore causes with immediate impact, under specific conditions. We mean anthropic causes (the destruction of the vegetal cover), special climatic and hydrologic conditions, brutal natural or artificial interventions upon the slopes (exploitations, excavations, storing materials), whose effect is the overload. We must also mention indirect causes, such as the characteristics of the rock and the physic and the climatic processes leading to its destruction.

Landslide affected areas are in the proximity of the following settlements: Feldru, Nepos, Rebra, Rebrişoara, Uriu, Ciceu, and Mihăeşti.

In most cases, the creep phenomena have certain natural causes (the abrupt slope, the limits of the soil strata). In many situations, creep coexists with the landslide and it is a slow continuous movement of the slope deposits or of the *in situ* rock although this does not result in a clearly sliding surface. This process is dangerous only if slopes are used as building sites, cereal fields, or orchards.

The creep-affected areas are mainly located on the slope fronts and on the inflexions caused by the bending (flexation) of the limits of the strata. The negative effects of this phenomenon are the destruction of the roots of the cultivated plants, the degradation of the grazing areas, the bending of the trees, the movement and the bending of certain structures, such as walls or fences.

As the phenomenon is relatively common in the unit under study and is also overlaps the second fruit growing zone of Romania (plum-trees and apple-trees), it needs to be identified. The affected areas are in the neighbourhood of the following settlements: Parva, Rebrişoara, Năsăud, Zagra, Coldău, Ciceu Cristeşti, Uriu, Reteag (Petru Rareş), Bața, Ciceu Mihăeşti, and Cuzdrioara.

The risks entailed by sheet erosion are: the degradation of the soil cover caused by rainfall under the circumstances of a poor vegetal cover, which favours the direct impact of rain drops and accelerates slope washing. As the area under study is mainly rural, its relief is fragmented, the population' activity is agriculture, mostly animal breeding (sheep and cattle). Because of the high number of animals and the little surface available for grazing, overgrazing is intense which brings about the poor vegetal cover and even to its degradation. Sheet erosion is facilitated under these circumstances. The phenomenon is very widespread and it is characteristic of the steep-sloped hills with southward orientation. The sheet erosion affected areas in the neighbourhood of the following settlements: Rebra, Coşbuc, Salva, Piatra, Chiuza, Căianu Mare, Dobric, Ciceu Hăşmaş, and Ciceu Corabia, where the main anthropic activity is animal breeding, especially

sheep. Erosion has a significant impact upon the economy of the area, as soil nutrients decrease, large areas are taken out of the agricultural circuit, the capacity to support vegetation diminishes, etc. All these finally lead to lower productivity in the respective areas.

The climatic risk phenomena are the **inversions of temperature** and **the sudden variations of air temperature**, as a result of the advection of the cold air masses from beyond the Eastern Carpathians towards the mountains in the western part of the volcanic chain and of the Rodnei Mountains. The inversions of temperature make the air stratum near the soil cover get very cold. The risk is influenced mainly by the intensity of the phenomenon, then by its frequency, and the season (F. Moldovan, 2003).

The negative effects are to be identified in spring. Buds, shoots, the flowers of the fruit-trees, as well as the cropping-systems from the previous year (the autumn cropping-systems) freeze. The crop is affected and the vegetation period is shortened. The damage is economic as the agricultural output decreases or the crop is completely lost when this phenomenon appears. We point out the fact that the delimited areas are intensely used for fruit growing and the damage caused by risk phenomena may be significant. The affected units are located in the uninhabited areas of the following villages: Coldău, Ciceu Cristeşti, Uriu, Ciceu Mihăeşti, and Cuzdrioara.

Within *the hydrologic risk phenomena* category we have analysed **floods** and **lateral erosion**. These phenomena are characteristic of the corridors of the secondary valleys. They have variable flows, according to the season. The season with the highest flow level is spring when the abundant rainfall and the sudden melting of the snow may cause floods. In spring, the secondary rivers become torrents. High quantities of water flow through their beds, about 45% of the total yearly flow. The high quantity of rainfall in the valley corridors is favoured by the steep slopes correlated with massive deforestation. Floods and riverbed lateral erosion are in close connection, while the amplitude of the flows intensifies the riverbank erosion. Both floods and lateral erosion cause material and human losses as they have a significant impact upon the settlements in the area: for instance, human and animal losses, the destruction of the households, the deterioration of the infrastructure (bridges and roads), or the impossibility to maintain certain land plots for agricultural use.

The affected areas are situated mostly in the corridor of the Sălăuța and the Ilişua Valleys, and the affected settlements are: Coşbuc, Salva (on the Sălăuța), and Spermezeu, Dobric, Ilişua, Uriu (on the Ilişua). But we must remember that on the Sălăuța River important regularization works have been done by consolidating the lateral dams and the banks with rocks. An accumulation dam is to be built in Telciu.

2.3. The Risks of the Someşul Mare Corridor

Because of its geographic location, the Someşul Mare Corridor is under the influences of its neighbouring units, especially under the influence of its tributaries: the Cormaia, the Rebra, the Sălăuța, and the Ilişua Valleys, etc. These influences lead to big quantities of water into the tributaries, the specific modelling of the confluence zones with the main collector, and the features of the soil and of the rocks, etc. Thus, the big quantities of rainfall in the hilly zone and the flows of the secondary valleys cause **floods**, **the appearance of highly humid areas** and, in some cases, the appearance of bogs. All these are facilitated by the low altitude of the corridor (the river meadow zone) and included into *the hydrologic risk phenomena* category.

Floods are characteristic of the confluence zone where the tributaries of the Someşul Mare, by their modelling action, caused the appearance of alluvial cones favourable to settlements. As most settlements are located in the river meadow, the anthropic activity has become more important due to the dense infrastructure which is also characterized by a high level of vulnerability to floods. Because these phenomena have been widely discussed in specialised studies and their causes have been analysed in previous paragraphs, we shall continue by identifying the location and delimiting the areas which run flood risks. As we have mentioned above, these areas are characteristic of confluence zones, such as those in the neighbourhood of the following settlements: Sângeorz-Băi, Ilva Mică, Rebrişoara, Salva, Mocod, Uriu, Reteag, and Mica. Other areas favourable to floods are the narrow segments of the corridor, such as those from Nimigea Românească and Beclean.

Humidification and bog developing are influenced by the features of rainfall in the zone under study as well as by river flow variations during certain periods and also by the features and the structure of the rocks. Some other factors that increase the phenomenon are the structure and the type of vegetation, land use characteristics, and the absence of land betterment works (e.g. drainage) or their deficient management.

Humidification and bog developing are favoured by the accumulation and the long-time stagnation of rainfall water on land. In the low altitude corridor zone, the soil consists of waterproof rocks (clay and gritstone) (N. Florea, 1963). Another cause of over-humidification is the proximity of the phreatic layer or the large water quantities stagnating after the floods. Such zones may be noticed in the uninhabited areas of the following settlements: Rebrişoara, Salva, Mogoşeni, Săsarm, Uriu, Reteag, and Ciceu Mihăeşti, where they cause the appearance of specific soil types: gleysol, pseudo-gleysol, peat gleysol, and peat soil.

Due to its composition, the hydrophilic vegetation favours the appearance of over-humidification in the corridor under study.

When humidity increases, the pedogenetic process gets certain features that may have negative effects on land use: less air in the soil, the disappearance of the oxidation and reduction chemical reactions, the increase of the organic mass, the decrease of mineral compounds in the soil. All these influence its productivity capacity (N. Florea 1963).

The climatic risk phenomena are the **hail** and the **fog**. The hail appears during the warm period of the year (in spring and at the beginning of the summer), under atmospheric conditions typical of this zone. It is a dangerous phenomenon as it appears during the vegetation period and causes partial or complete destruction of agricultural plants, such as: cereals, fruit trees, and vegetables. This shows that the corridor zone is intensely cultivated and the damage can be significant (F. Moldovan, 2003). The affected areas overlap the fruit growing zones from Cuzdrioara to Beclean and those where vegetable growing is a tradition. They are situated in the following settlements: Uriu, Săsarm, Nimigea, and Mocod. One can, therefore, notice that hail has an impact on certain spots and stripes in the lower area of the corridor (F. Moldovan, 2003).

Fog appears in the depressionary forms of relief under specific atmospheric conditions, according to the specificity of the local atmospheric circulation and it is influenced by the corridor effect. The phenomenon is visible all year long, but the periods of maximum intensity are in spring and autumn; it is specific to the whole corridor, but is obvious (more intense and longer) in the industrial centres (Beclean and Dej). It is dangerous as it drastically diminishes visibility and implicitly increases the number of car accidents. Moreover, it has negative effects on the people who suffer from cardiac, vascular and breathing diseases (F. Moldovan, 2003) .

The bio-geographic risks are typical of the whole geographic unit of the Someşul Mare Hills. They are caused by the high number of people, by their increasing needs and, implicitly, by their inadequate exploitation of the vegetation and fauna resources. This risk category includes *the destruction of the vegetation* (through deforestation and ploughing, with varied purposes), *the appearance of secondary vegetation, the decline of resources and the wood quality, the disappearance of certain fauna and vegetation species,* or *the diminishing of their area* in favour of agricultural crops, pastures, human settlements and their infrastructure.

CONCLUSIONS

According to the level of vulnerability to risk and the extant risks, we have identified three compartments in the Someşul Mare Hills: (1) the zone of depressionary basins and high hills in contact with the mountains, (2) the corridor zone belonging to the tributaries of the Someşul Mare River and the low hills (400-500 m), and (3) the zone of the Someşul Mare Corridor .

The geomorphologic risks we have identified in this unit are: landslides, erosion, torrents, and creep. Among the climatic risks we mention abundant rainfall, the inversions of temperature, the hail, and the fog – especially in the depressionary basins and the valley corridors. Floods, lateral erosion, humidification and bog developing are hydrologic risks.

The interaction of different types of natural risks leads to the appearance of an environment deficient for life and with negative effects upon human society.

REFERENCES

BĂLTEANU D. and ALEXE RĂDIŢA (2001), *Hazarde naturale şi antropogene*, Ed. Corint, Bucureşti.

BOGDAN O. and NICULESCU E. (1999), *Riscurile climatice din România*, Academia Română, Institutul de Geografie, Bucureşti.

CLAVAL P. (1993), *Initiation a la Geographie Regionale*, Nathan, Paris.
CHAPMAN G. P. (1977), *Human and Environmenatl Sistem*, Academic Press, London – New York.
COCEAN P. (2005), *Geografie regională*, Ed. Presa Universitară, Cluj – Napoca, p. 37.
FLOREA N. (1963), *Curs de Geografia Solurilor cu Noţiuni de Pedologie*, Ed. Didactică şi Pedagogică, Bucureşti, p.243-249; 268-274.
GHINEA D. (2002), *Enciclopedia geografică a României*, Ed. Educaţie Enciclopedică, Bucureşti.
LAJUGIE J., DELFAUD P. and LACOUR C. (1985), *Espace regional et amenagement du terittoire*, Dalloz, Paris.
MIHĂILESCU V. (1970), *Geografie - Ecologie, regiune geografică- ecosisitem*, SCGGG XVII.
MOLDOVAN F. (2003), *Fenomene climatice de risc*, Ed. Echinox, Cluj – Napoca, p. 59, 135, 139, 140.
NIR D. (1990), *Region as a socio – environmental System. An Introduction to a Systemic Regional Geography*, Ed. Vluwer Acad. Publ. Dordrecht, The Nederlands.
POP GR. P. (2001), *Depresiunea Transilvaniei*, Ed. Presa Universitară Clujeană, p. 161.
SOROCOVSCHI V. (2002), *Riscuri şi catastrofe*, vol I şi II, Ed. Casa Cărţii de Ştiinţă, Cluj-Napoca.
SURDEANU V. (1998), *Geografia terenurilor degradate*, Ed. Presa Universitară Clujeană.