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Critical Geographical Phenomena in the Someşului Mare Hills

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CONTENT

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INTRODUCTION

For its existence on Earth, man needs the stable, continuous presence of a favourable living environment, capable of assuring its physical existence and to offer the possibility of its intellectual, moral, social, and spiritual development. Through its capacity to discover, invent, and create, man proved itself capable to generate widespread and rapid, even explosive changes to nature, to transform the environment to its own benefit, but also to produce immeasurable damage through abusive, intentional acting, without knowing and strictly respecting the laws of nature. The impact of human activities on the environment is represented by any direct or indirect effect of a given anthropic activity in a certain territory that produces a change in the course of evolution, in the quality of the ecosystem, in the health of human population, in the integrity of the environment, the cultural heritage or the social and economical conditions.

For a long period of time, man had a limited influence over nature; nowadays, the exploitation process of natural environments has come to a large extent, with no consideration for the disturbances induced to these milieus or for the difficulty of removing these disturbances. This causes tardy interventions for stopping degradation phenomena or, sometimes, even an involuntary acceleration of that phenomena.

For a long time, man assumed that soil, water and air can absorb and recycle residual products of its activity, viewing the oceans, the atmosphere and even the soil as a sort of recuperation facilities with unlimited capacity. Unfortunately, it has been proved that some of these products, e.g. synthetics, are resistant to natural decomposition, and are even toxic, or that certain pollutants, even if dispersed in small quantities in the environment, are able, after a variable time period, to enter natural food chains, as it is the case with some heavy metals, pesticides, or radioactive substances.

Residues, organic waste and dung, discharged in rivers, consume through decomposition the oxygen needed by aquatic organisms, as well as nutrients intensify the growth of algae at the expanse of oxygen from the water, causing unwanted effects, and sometimes even the ”death” of the affected waters. Similarly, air pollution became a common feature of the environment. Another major aspect regarding environment deterioration and food shortage for a growing population is represented by the irrational utilisation of soils and the fallow-laying of extended areas.

The lack of information determined many reasonable people to persist in actions harmful to the environment, without being aware of their negative contribution. The changes to the environment were often slow-going and hard to observe; even if some of them were apparently insignificant, they caused irreversible damage, such as the large-scaled use of pesticides, mercury pollution, or the use of substances like asbestos.

All the above-mentioned, accumulated and diversified in time, reveal a new, very important and urgent problem to society – the protection of the environment, meaning both the biosphere and its interaction with other natural or man-made elements.

Creation of nature, man intervened on it, transforming it according to its interests and simultaneously becoming creator of its living environment, an activity that also determined

the development of its intelligence. Through its capacity to discover, invent, and create, man proved itself capable to generate widespread and rapid, even explosive changes to nature, to transform the environment to its own benefit, but also to produce immeasurable damage through abusive, intentional acting, without knowing and strictly respecting the laws of nature. Without biological processes that are taking place in nature for thousands of millennia, we wouldn't have neither food, nor oil or coal.

Numerous, new phenomena occurred, associated with man's interventions on nature that were not always made with a fully understanding of immediate and long-term consequences, consequences that resulted under the action of self-regulation laws in each ecosystem and in the global ecosystem – the biosphere.

A already visible phenomena is the interruption of the endless circle of life and its replacement with man-established linear processes, some of which totally independent, that are generating useless final products; these products – waste, residues, dung – accumulate in growing quantities, having increasingly negative effects on the quality of the environment.

All these actions, that causes the brake of ecological balance and that have a negative impact on human health and comfort, or on the economy (by modifying the quality of environmental or anthropical factors), represent the pollution of the environment. Actually, by pollution we understand any action through which man is degrading nature.

All quality problems derive from the natural potential of the environment to tolerate, without notable damage, some forms and intensity of human pressure. Thus, any type of environment can be characterized by a tolerance field, whose limits are given by its natural state, and a spreading field, representing various intensities of human impact.

The impact of human activities on the environment is represented by any direct or indirect effect of a given anthropic activity in a certain territory that produces a change in the course of evolution, in the quality of the ecosystem, a change that can affect the health of human population, the integrity of the environment, the cultural heritage or the social and economical conditions.

CHAPTER I

1.1. THE SOMEȘULUI MARE HILLS - PHYSICAL-GEOGRAPHICAL FEATURES

The Someș system is organized in the north of the Transylvanian Basin, being bordered by the heights of the Apuseni, Gutâi, Țibleș, Rodnei, Bârgău, and Călimani mountains.

The Someșul Mare River rises in the western extremity of the Rodnei Mts., where the Valea Zmeului creek, springing under the Coșorbii Pk. (1547 m), and the Măria creek, springing under the Omul Pk., flow together to give birth to the system. After the confluence of the two water flows, the Someșul Mare is limited to the north by the Țibleș Mts., to the east by the Rodnei Mts., to south-east by the Bârgău Mts., bordering in the south to the Bistriței, Șieului, and Ungurașului Hills, while in the west, it reaches to the Sălătrucului Hills, the Breaza Crest, and the Lăpuș Depression. The eastern limit of the Someșului Mare Hills is on the Cormaia valley, while the western one follows the valley of the Gârbăul Dejului. This area, comprised between the limits shown above, forms a regional well-structured unit, showing specific differences in relation to the surrounding units. The characteristics of this geographical unit reveal specific features: the entire area is drained by right-side affluents of the Someșul Mare River; the limit to the northern mountain area is difficult to observe, being marked by the west-east aligned small depressions of Molișet, Șendroaia, Suplai, Bichigiu-Telciu, Parva, and Sângeorz-Băi. The Someșului Mare Hills comprise three **subunits**: Ciceului Hills, between the Gârbău Dejului and Ilișua valleys, Suplaiului Hills, between the Ilișua and Sălăuța valleys, and Năsăudului Hills between the Sălăuța and Cormaia valleys (Pop, Grigor P., 2001). For the regional integrated analysis of critical geographic phenomena and the achievement of precise results, we also included the Someșului Mare Valley to this unit. This decision is motivated by the fact that the effects of most hazard phenomena accumulate and influence the valley region and by the need to observe the phenomena on their entire spatial extent. This valley is the result of the deepening action in the Neozoic sediments of the Transylvanian Basin of one of the most important rivers inside the Carpathian arch, representing a major separation line between the Someșului Mare Hills and the Transylvanian Plain.

Geologically, the Someșului Mare Hills are constituted mainly from O*ttnangian sediments* formed of conglomerates, sandstone and carbonated clay, with *Oligocene* formations on a narrow strip bordering the mountain area in the north, and *Badenian deposits* in the south, containing sandstone, volcanic tuffs (Dej tuff) and occasionally salt, such as the salt dome in the Suplaiului Hills, from Săsarm, which stretches north-west toward Căian.

The **altitude** falls gradually from the mountain area to the valley, and the relief is highly fragmented, revealing long watersheds following the north-south orientation of rivers. The **fragmentation rate** of the relief is caused by a dense hydrographical net, including clearly shaped watersheds in form of mild crests or waved erosion platforms. The fragmentation degree is influencing the location of settlements and roads, as they are positioned along valleys or at confluence points. Water erosion is conditioned by geology, climate, vegetation cover and anthropical factors. Present modelling processes are more intense in areas where vegetation removal is more advanced (deforestation, overgrazing), resulting in an intense surface erosion. Depending on causal factors, modelling processes in the Someșului Mare Hills can be divided in: river bed erosion, including rain wash, ravination, and gully erosion, having a more aggressive character and a short action period, and slow erosion processes,

including creeping, landslides, soil running, mud flow, and compaction. Even if these processes have a spatial limited action, their occurrence rate is very high in this region.

Given the imprecise delimitation to the nearby mountain area, confusions can be made in the demarcation of the unit. For this reason, we took altitude as the main criteria, without neglecting geology and vegetation, though. The hills in the proximity of the mountains reach, in some cases, heights over 900 m (e.g. the Năsăudului Hills); altitudes are dropping toward the Someșului Valley down to 400 m in the lower part of the region.

The relief influences climate, effecting local changes at the borderline to the mountains (temperature inversion). Given the geographical position of this region among the main neighbouring relief units and the effects the latter have on atmospheric circulation, we can observe a large variety of **climate manifestations** influencing the population and its activities. The region's climate reveals clear differences of all its elements as altitude increases. Temperature succession shows risings and dilatation in the warm season and decreasing and contraction in the cold season, while transition periods are very short and with many fluctuations, forcing the course of many human activities, such as agriculture, forestry, tourism and transports, but likewise it can seriously disturb these activities.

Many of the settlements have a linear-tentacular, ramified shape (esp. on confluence areas) on the main axis of the Someșul Mare River, known as the "Someș type", and including most settlements between Sângeorz-Băi and Dej (Rebrișoara, Salva, Uriu, Reteag).

Functional, these settlements revealed a strong bond with the geographical space and its economic resources as well as a partial planning of social-economic activities from the authorities. Measures taken by the authorities, mainly encouraging agriculture and the development of industry widened and enriched the functional situation of most settlements. Nowadays, most settlements have a mixed functional profile (agro-industrial, agro-forestry-industrial), with only settlements in the valleys of Sălăuța, Ideciu and Zagra keeping their traditional profile (forestry-pastoral, agro-forestry-pastoral).

The Someșul Mare Valley habitat axis holds a significant **communication** function, as it is passed by an electrified railroad linking the 4^{th} and 5^{th} main railways (Beclean – Suceava), and the route E576.

The landscape, along with a specific touristic potential, confer identity to the region; the perspective of rural tourism, associated with profound mutations in land use as a result of intensified anthropisation, create the premises of changes in rural space, which will confer distinctive typological characteristics to the habitats.

CHAPTER II

2.1 THEORETICAL CONCEPTS

Most studies offer a large number of definitions and denotations for the terms mentioned above, all of them being quite similar, respectively.

From the variety of definitions, in regional geography and particularly in the qualitative assessment and classification of geographic regions, following assertions have a higher importance: ”referring to a moment of crisis that can cause an important change”, or: ”revealing lacks or mistakes appertaining to a certain entity”, or: ”that evaluates the qualities and defects of certain conditions, situations”, or: ”that can effect an important negative change, in a decisive, crucial manner”. Their interpretation can lead us to the conclusion that the respective region comprises one or more negative elements or interrelations (of geographical risk), or that it is close to a inherent crisis that might radically change its present quality in a negative way; such a condition will classify that spatial entity as one with a high risk, being included in the category of *critical regions*.

2.1.1. Critical regions

From those presented above it is easy to see that ”critical” refers to a crisis moment that precedes a sudden, negative change. Thus, *critical geographic regions* are being defined as territories where such changes are imminent or in progress. These regions have a high risk potential. Similar terms are used: *declining region* – defined as ”a region characterised by a degradation process of economic activities, usually caused by shutting down production units and service providers, relocation of capital and workforce”.

Regarding the classification of geographical regions, P. Cocean (*Geografie Regională*, Presa Universitară Clujeană, Cluj-Napoca, 2002) shows that regions may be also classified by their *vulnerability degree*, pointing out three types of geographic regions: stable, critical, and disadvantaged ones.

Regarding strictly *critical regions*, these are subdivided in two main categories:

- Critical geographic regions with natural risk;
- Critical geographic regions with anthropic risk.

2.1.1.1. Typology of critical regions

Critical geographic regions with natural risk are divided in another two gropus:

- Critical geographic regions with non-climatic natural risk;
- Critical geographic regions with climatic natural risk.

Critical geographic regions with anthropic risk comprise following categories:

- Political critical geographic regions;
- Economical critical geographic regions.

2.1.1.2. Critical geographic environments

These are worldwide areas with various extent and functions where potential factors concur to the occurrence of predictable or unpredictable unbalances. For the time being, only several elements can be used to make a certain prediction, and only time, through modern investigations, may change this condition. Natural and anthropic factors are merging, resulting in complex forms, and in some situations, the emerged potential energy may be

caused by a generating factor that characterises the entire evolution.

2.1.2. Theoretical argumentation of notions and terms used in the analysis of natural hazard phenomena

Natural hazard phenomena are part of the geographical risks, and any analysis should include concepts like hazard, disaster, cataclysm, catastrophe, vulnerability, accident, record, risk, etc. Natural, potential risky phenomena conducted to intense research, because the failure to prevent such phenomena had, in some cases, negative outcomes, which irreversibly affected society and environment. This is why the United Nations General Assembly from 11.12.1987 adopted Resolution 42/169, declaring the decade 1990 – 1999 the *International Decade for Natural Disaster Reduction* (IDNR). In the same period, under the patronage of UNESCO and IDNR, a dictionary of technical terms was published in 1992, in three world languages (English, French, and Spanish), in order to use a special, scientific, and unitary language (Zăvoianu, Dragomirescu, 1994).

In the context of classification of used terms and notions, we will refer to this dictionary, as well as to the terminological scheme used in Romania (Bogdan, Niculescu, 1999).

2.1.2.1. Global research on natural risk phenomena

In analysing natural risk phenomena, a specific methodology has to be respected, consisting of:

- Systematization and typecast of all risk phenomena;
- Knowing risk factors;
- Finding a unitary measurement system;
- Identifying evaluation criteria and parameters;
- Choosing the acceptable risk level;
- Drawing the risk map, by cartographical means.

The complex analysis of the relations between risk and geographical systems is imposed by their variety and by the diversity of variables that defines them and assure their functionality.

2.1.2.2. The nature and dimensions of risk

Types and sources of risk

All human activities are potential risk sources, but in the context of integrated risk evaluation and management, following types and sources are more relevant:

- Continuous emissions in air, water, soil, etc., produces by industry and associated activities;
- Accidental emissions of dangerous substances from industrial plants that have negative effects on the environment and human health (explosions, fire, operation and transport of dangerous substances, storage of dangerous substances, industrial accidents, etc.);
- Transport systems (as permanent emission sources); the transport of dangerous substances can generate accidents with negative effects on human health and on the environment; in this context, transport means the transfer of goods, materials,

and persons on railways, roads, special transport systems (electricity, natural gas, etc);
- Natural accident sources (storms, floods, land degradation, etc.) that may occur in risk areas and over technological risk sources, amplifying their effects;
- Agricultural activities that can affect human health and the environment (use of fertilisers, insecticides and herbicides that contaminate soil, ground- and surface water, air, and degrade the aesthetics of territorial systems, etc.); agricultural activities consume large quantities of water and may generate desertification and soil erosion;
- Urbanisation and urban infrastructure are also risk sources for the environment and human health (disturbance and pollution of the environment, wastes, anthropic pressure, changes in land use, etc.).

The subjects of risk

Anthropic risks generated by the above-mentioned sources primarily affect human individuals and local communities, economical and social sectors, but also the buildings (historical buildings and monuments). All these subjects can be affected directly or indirectly by the effects generated by these risks, this being the reason why it is important to gain knowledge about the perception and interpretation of known risks of exposed communities.

2.1.2.3. Perceived and evaluated risk

Risk psychology is important for risk evaluation and management. The fundament of the psychology of subjective decision-taking process is that, in order to give meaning to its surroundings, man creates a mental image of reality and environment (mental map). In reality, human reaction to risk suggests a frequent change in perceived and even in subjective risk. Important, for authorities and local communities, is the problem – attention cycle, which presents characteristic features for risk-generated environmental problems report. In the USA, the problem – attention cycle is divided into five studies:

a. Pre-problem study (pre-risk);
b. Alarming discovery and euphoric enthusiasm;
c. Realising the cost of significant progress;
d. Gradually decrease of intense public interest;
e. Post-problem stage.

2.1.2.4. Functional complexity of risks

The complexity of risk usually has three causes. First, it is linked to high number of factors, components, and impacts. It is also generated by the irregular and unpredictable behaviour of a relatively simple system. Complexity is sometimes the product of an overlapping of organising levels and stages. The various forms of complexity does not exclude each other, they usually act together.

2.1.2.5. Analysis of perception and acceptability of environmental risks

Humanity tried to eliminate the risks that threaten the health or safety of population od that affect the quality and evolution of the environment, and it spared no efforts in order to keep them under control, elaborating new evaluation methods and techniques to reduce them.

Environmental problems induced by new technologies and human activities generate controversies regarding the acceptability of induced risks. In the context of sustainable

development, the analysis of complex criteria is needed, involving environmental, technical, economical, social, psychological, and ethical aspects.

CHAPTER III

3.1. NATURAL CRITICAL GEOGRAPHIC PHENOMENA

Elaborating the typology of natural risk phenomena from this region, we based on an earlier analysis by Mircea Voiculescu (2002). For this, we evaluated and analysed only those natural risk phenomena which, through spatial-temporal extent, intensity and manifestation are characteristic and are located in the Someșului Mare Hills.

Classification of natural risk phenomena in the Someșului Mare Hills:

- geomorphological risk phenomena
  - landslides
  - ravination and gully erosion
  - soil erosion
- hydrological risk phenomena
  - floods
  - wetting and swamp formation
- climatic risk phenomena
  - Hail
  - fog
  - temperature inversions
- biogeographical risk phenomena
  - risks on vegetation (deforestation, overgrazing, natural fires);
  - risks on fauna (destruction of natural habitats, their continuous shrinking).

3.1.1. Critical geomorphologic phenomena and processes

Following, we will analyse geomorphologic risk phenomena in the Someșului Mare Hills, regarding their typology and phenomenology, as risks are represented by: landslides, ravination and gully erosion, and surface erosion.

3.1.1.1. Landslides

The causal elements and factors causing the occurance of landslides are interconnected and interrelated. They are divedid in:

- potential elements;
- preliminary elements;
- releasing elements.

or

- natural;
- anthropic.

We have to remind that preliminary and releasing factors are not clearly separated, as the differences are given only by the intensity of the phenomenon. Terrain stability depends on the interaction between permanent, favouring, and temporary, aggravating, and releasing factors that do or do not influence the occurrence and evolution of landslides. Permanent factors are: geology, geomorpholgical and structural conditions; temporary factors are: hydrological, climatic, hydro-geological, seismically, forest, and anthropic conditions.

The main landslide types on the slopes of the Someșului Mare Hills are: clod slides, lenticular slides, massive slides (resulting in landslide mounds).

- *Clod and lenticular slides* are frequent on steep slopes in the main valleys (Someș, Gersa, Rebra, Ideci, Țibleș, Ilișua).

Fig. 1. Clod slide in Spermezeu

• *Deep slides* are old, stabilised landslides, and their formation period is hard to determine. In the Someșului Mare Hills, there are two known landslides of this type. The cause of their formation is the alternation of deposits with grit stone-marl and marl-clay facies that can be observed in the breaking slope.

Fig. 2. Deep landslide in Spermezeu

Landslides in the area are generally stabilised, with the exception of some mounds and breaking slopes, which are still active. The phenomenon is particularly active in intense deforestation areas, or at the timber line (if relief conditions are favourable).

3.1.1.2. Ravination and gully erosion

Pellicular flow, in certain slope conditions, concentrates in channels of different dimensions, which eventually form a specific relief. If their depth and length are small, they can be removed through simple agro-technical methods. Depending on their development stage, these channels bear different names: rill, gully, or ravine.

In our next analysis we will underline the contribution of physical-geographical and anthropic factors in the formation of ravination processes, and the associated risks in the Someșului Mare Hills.

Climate conditions, mainly rain and air temperature, contribute to the occurrence of ravination through heavy rainfall, in addition to overgrazing, deforestation, inappropriate agricultural practices, roads build on slopes, as the latter are not part of the morphological system.

The above-mentioned lead us to the conclusion that human activities, that triggers the aggressive evolution of the phenomenon, are also the most affected ones; we can observe the *cause – effect* relation, the influences and response to a certain perturbation.

Fig. 3. Ravination forms (a.- Nimigea de Sus, b.- Şendroaia)

The vast area of the hydrographical basins in the Someşului Mare Hills, correlated with relatively steep slopes, may influence the area above the ravine, mainly the wuater quantity on each ravine end. Progressively, ravines will extend toward watersheds, slopes become steeper above the origin line, and the flow becomes more erosive.

3.1.1.3. Surface soil erosion

Among natural risk phenomena accelerated by human intervention, surface erosion has a higher importance because of the negative effects and damages it generates. Surface soil erosion means the ablation of solid particles (humus) from the soil surface and, implicitly, the loss of nutrients through water flow, effecting a rapid degradation, reducing or even total loss of soil fertility.

Soil erosion processes causing the ablation of the upper part of the soil, are natural (pedological) processes of earth crust denudation. Human activities, through the introduction of unbalances, contribute to the acceleration of natural factors and denudation (that are usually slow), causing them to became extremely aggressive.

Thus, through the destruction of soil surface, as well as through down-oriented fall of particles due to splashing, pluvial erosion is occurring.

Pluvial erosion begins with the destruction of soil particles through striking, and is followed by the distension and then dispersion of the binding agent. These processes depend on the physical-chemical properties of particles, binding agent, and on the air and water quantity in the soil.

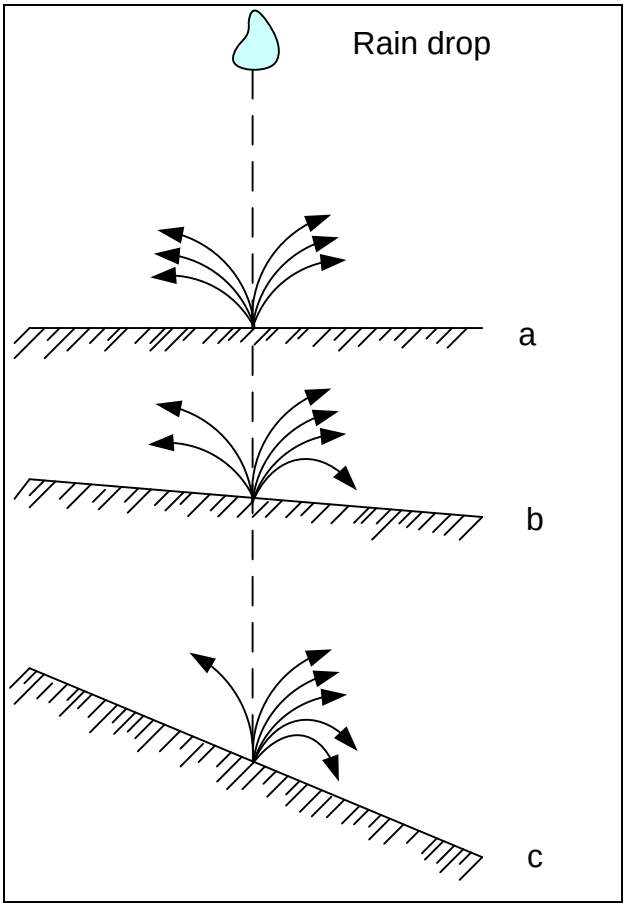

Fig. 4. Splashing caused by the impact of rain drop, where:
a – horizontal surface; b – mild slope; c – steep slope.

Fig. 5. Pellicular flow erosion (Borleasa)

The phenomenon has a wide extent, being characteristic to south-oriented hillsides. Areas where this erosion process is active lies in the vicinity of following villages: Rebra, Coşbuc, Salva, Piatra, Chiuza, Căianu Mare, Dobric, Ciceu Hăşmaş, Ciceu Corabia.

3.1.2. Climatic critical phenomena

The analysis of climatic risk phenomena is imperative, as it can offer data used for a better forecasting and for the successful fighting of such phenomena. The analysis of their formation helps us classify and forecast them, but also to determine measures of eliminate negative effects. Climatic risk phenomena are generated mostly by atmospheric conditions, excepting those being intensified by human actions through pollution ant its implications (e.g., fog).

3.1.2.1. Hail

In temperate climates, hail is common to the warm season, i.e. late spring and summer, and has climatic causes, being associated to cumulonimbus clouds and to the general atmospheric circulation, which, in turn, is influenced to some degree by the relief.

The negative effects of hail, the risk and danger factor it represents are conditioned by following situations:

- When it occurs in full vegetation cycle of various crops;
- When it is associated with strong winds;
- When the particle diameter exceeds 10 mm;
- When the phenomenon lasts more than 15 min.;
- When the hailstones form a thick icesheet which can hold for days, causing crops to freeze;
- When it occurs after long dry periods that favours the erosion of dried soil, especially in the case of inclined terrain (Bogdan, Niculescu, 1999).

Affected areas are the intensively cultivated orchards from Cuzdrioara, Ciceu Mihăeşti, Reteag, Uriu, Ciceu Cristeşti, Coldău and Beclean, or those traditionally cultivating vegetables, around Săsarm, Nimigea, Floreşti, Mocod, Cociu, Reteag.

3.1.2.2. Fog

The phenomenon has a high frequency in the Someşului Mare Valley, summing 55 days/year in Dej and having a slight decrease towards the upper part of the valley. In this region, fog occurs as a result of a hollow relief and of channelled air flow, generically known as *the valley effect*. The phenomenon is active all the year, with maximums in spring and autumn, when persistent fog seriously disturbs transportation, given the fact that this sector is traversed by the E58 road (linking Dej with Suceava, and is one of the most important connecting roads between Transylvania and Moldova) and by the 4^{th} and 5^{th} main railway tracks.

3.1.2.3. Temperature inversions and sudden variations in air temperature

Sudden temperature variations and temperature inversions are a result of the advection of cold air masses from beyond the Eastern Carpathians and the neighbouring mountain area, of hillside orientation and the air mass channelling effect. Inversions effect severe decrease in

temperature near the ground, and its risk is given primarily by the intensity of the phenomenon, followed by its frequency ant the season it occurs (Moldovan, 2003).

The negative effects are seen in spring, when buds, young sprouts, and flowers freeze and when autumn rotations are being deteriorated, as well as in autumn, through crop destruction or vegetation period shortening, resulting in insufficient ripening of crops. Moreover, the affected areas are densely covered by orchards, and the damages these phenomena can produce are considerable. These areas are located around Coldău, Ciceu Cristeşti, Uriu, Reteag, Ciceu Mihăeşti, and Cuzdrioara.

Another agricultural branch affected by sudden temperature variations is the stock breeding sector, predominant in the neighbouring mountain area, mainly in Molişet, Şendroaia, Târlişua, Suplai, Bichigiu, Telciu. The negative effects are a result of air temperature decrease, causing animals to become diseased; the feeding process loses intensity, having repercussions on products quantity and quality.

3.1.3. Hydrological critical phenomena in the Someşului Mare Hills

From the natural risk phenomena and processes, in this section we will present the hydrographical ones, focusing on floods, wetting, and swamp formation.

3.1.3.1. Flooding as natural risk phenomenon

Floods are some of the most disastrous extreme phenomena caused by the combined action of atmospheric, hydrological, geomorphologic, and anthropical factors. Through their magnitude and intensity, flooding causes not only material damages and casualties, but they also affect the environment, modifying riverbeds and the micro-relief. The region's rivers gather their water from the southern slopes of the Rodnei and Ţibleş Mts., its climatic conditions effecting high discharge.

On a general map, the rivers seem rather mild; in reality, their longitudinal profile is quite steep, as their springs lie generally over 1000 m, while the altitude on the confluence with the Someşul Mare merely reaches 300 m. This altitudinal difference influences the erosion force, suspension transport capacity and flow intensity, which can have a turbulent character.

Along quantifiable economic damages, flooding also affect social life and the environment, through social and ecological consequences. Flood occurrence is primarily caused by natural factors (climatic conditions, geography, and hydrology) that give the phenomenon certain intensity. The most affected areas are the water meadows and terraces of the Someşul Mare, where ground humidity is very high and the groundwater near the surface. In recent years, though, extreme hydrological phenomena occurred aggressively on the main tributary rivers and in depression basins at the contact with the mountains, as a result of heavy rainfall, turbulent flow, correlated with the absence of any flood-protection facilities.

3.1.3.2. Swamp formation and wetting

Wetting and swamp formation processes are influenced by the rainfall regime, the variation of liquid discharge in certain year periods, but also by the underground's characteristics and structure. Other factors augmenting the phenomenon are: structure and typology of vegetation, land use, the absence of land reclamation, or a bad management of the latter.

The effects of wetting and swamp formation are progressive and long-lasting, influencing soil and crop characteristics. The affected areas lie mostly in the Someșul Mare valley, outside following villages: Rebrișoara, Salva, Mogoșeni (where the variation in groundwater level induced soil salination), Săsarm, Uriu, Reteag, Ciceu Mihăiești. Here, specific soil types are being formed: gley, pseudogley, peatgley, and peat. Moisture excess has various manifestations and causes damages to many economic and social sectors, among which the most affected is agriculture, with all the related implications.

Fig. 6. Wetting processes (Uriu)

3.1.4. Pedological critical phenomena

3.1.4.1. Real estate

Estate represents the totality of land properties between the boundaries of a territorial unit.

The Someșului Mare Hills and the Someșului Valley sum a total area of 2235.2 km^2.

3.1.4.2. Soil erosion

Soil quality can be affected by terrain inclination. From a terrain with a high downhill gradient, soil can be easily washed out, once the initial vegetation was removed, and along with it the roots that hold soil particles together. The use of farm equipment on a steep terrain is also more difficult. Climate is a major factor for land quality. As such, natural disasters such as drought and flood, or damages caused by wind, frost, or hail may compromise crops.

Depending on the causal agent, erosion phenomena can be classified as follows:

- Water erosion;

- Wind erosion;
- Chemical erosion;
- Mechanical erosion;
- Biological erosion;
- Erosion through salination.

Erosion occurrence forma may be classified in:
- Superficial erosion;
- Deep erosion.

Soil quality can be affected by:
- Improper exploitation;
- Improper use of fertilisers and phytologic-sanitary products, including both quantitative and qualitative elements;
- Unorganised waste disposal on various types of terrains;
- Improper agricultural activities or such activities carried out in inadequate periods, the absence of soil degradation prevention activities;
- Natural disasters.

The Inspectorate for Emergency Situations of Bistrița-Năsăud County mentions weather phenomena from January – April 2008 that also affected soil. Thus, ice blockades in February affected 1.5 ha of agricultural land in Căian, while heavy rainfall in March caused active river bank erosion in Nimigea, Zagra, and Ilva Mică.

3.1.5. Biogeographical critical phenomena

In the entire region, there are plant associations and faunistic species characteristic to the Someș Plateau. Vegetation and fauna features always had a considerable impact on the social-economical component of the unit, being, in turn, influenced by temperature, winds, water supply (rainfall, rivers, and groundwater), slope orientation, and soil and biotic factors.

Vegetation is spatially spread depending on physical-geographical features, being classified in two categories, depending on vegetation mass consistence.

3.1.5.1. Biodiversity

Biodiversity describes the richness and variety of natural world, from the diversity of habitats like forests and meadows, to the plant and animal populations, and even to the genetic diversity inside these populations.

3.1.5.2. Economically exploited natural flora and wildlife species (inclusively as genetic resources)

Changes in natural habitats (extending agricultural terrain, increased use of fertilisers, and introduction of industrial technologies in agriculture) caused the shrinking or even complete disappearance of some natural biotopes.

As a result of replacing natural with artificial associations, changes in the structure and number of wildlife individuals serving as raptor food occurred.

3.1.5.3. Risks regarding vegetation and fauna

Given the impact of agricultural ecosystems, wildlife habitats suffered, with few exceptions, a severe shrinking and fragmentation. The expansion of arable land caused a dramatically retreat of fauna inside protected areas (woods, river meadows, protection strips). The shrinking of habitats is also caused by disturbance factors: deforestation, the vicinity of human settlements and roads, destruction of nests and breeding grounds, poaching, etc.

CHAPTER IV

4.1. ANTHROPICAL INFLUENCES ON NATURAL RISKS IN THE SOMEȘULUI MARE HILLS

Anthropic impact on the environment is represented by any direct or indirect effect of human activities in a given area which produces a change in the course of evolution and in the quality of the ecosystem, and that can affect human health or the integrity of the environment, of cultural heritage, or of social and economical conditions.

For the evaluation of and knowledge-acquiring about technological risks in the Someșului Mare Hills, the highlighting of the activities causing such phenomena is needed:

- Mining, building rock exploitation;
- Forest activities, wood processing;
- Agriculture and agricultural practices;
- Transportation, etc.

4.1.1. Industry-induced critical phenomena

4.1.1.1. Phenomena affecting the atmospheric environment

In respect to the stipulation of act 3/2001, an annual evaluation of greenhouse gas emissions (as contained in App. A) is to be realised. Among these gases, calculations (basing on EA/EMEP/CORINAIR methodology) were made for carbon dioxide, methane, and nitrous oxide. Total values in the emission inventory for the year 2008 are:

Situation of greenhouse gas emissions

Table 1.

Pollutant	Quantity (tons-year)	Carbon dioxide equivalents
CO_2	313297,257	313297,257
CH_4	2074,931	43573,551
N_2O	31,776	9850,56

Acidification

Situation of acidification gas emissions

Pollutants with acidification effects are sulphur oxides, nitrogen oxides, and ammonia. Emissions in 2008, according to the emission inventory, were:

Table 2.

Pollutant	Quantity (tons/year)
SO_2	676,555
NO_x	965,891
NH_3	58,222

Pollution with particulate matter

Particulate matter was observed in three points inside the unit and two in the vicinity: Beclean, Năsăud, Rodna, Sângeorz-Băi, Poiana Ilvei.

In the next table, mean annual concentration of particulate matter at the prelevation points is represented:

Table 3.

Quality indicator PARTICULATE MATTER				
Zone	Unit of measure	Probe duration	Annual MAC, t/km^2 year	Annual mean conc. t/km^2 year
Beclean	t/km^2 year	month	200	20,148
Năsăud	t/km^2 year	month	200	40,92
Poiana Ilvei	t/km^2 year	month	200	30,000
Rodna	t/km^2 year	month	200	58,332
Sângeorz-Băi	t/km^2 year	month	200	44,652

4.1.1.2. Critical phenomena affecting hydrological milieu

In order to offer vital elements for the evaluation of water quality evolution, the observation activity is carried out by territorial offices for water management subordinated to the Water Direction Someș-Tisa of the National Authority ”Apele Române”. These offices collected water probes from control sections and determined, through laboratory analysis according to in-effect regulations, the physical, chemical, and biological quality indicators.

The resulted data, correlated with temperature and pluviometric regime, revealed situations in which insufficient treated sewage was discharged by industrial facilities and local management units, as well the chaotic development of aquatic fauna.

Violation of limits stipulated in the Order 1146/2002 regarding surface waters were registered for ***pH*** indicators, ***ammonia (*** $\boldsymbol{NH_4^{\#}}$***),*** and ***nitrites (*** $\mathbf{NO_2^-}$***)***.

For the region’s surface river subsystem, slow flux information obtained monthly in 16 surveillance sections, among which 8 from rank I sections, as well as rapid flux with a daily frequency in 2 sections, and weekly from one section, are used.

4.1.1.3. Risks generated by gravel plants

Building material extraction is a highly developed industry in the region, thanks to rich resources, increasing the pressure on environmental elements and determining a high degradation rate. Extraction activities produce changes in the riverbed of the Someșul Mare, in the direction and flow speed, remove the vegetation from the water meadow, or make arable land unusable, increasing flood risk, the more so as there are non river bed ameliorations. Extraction activities in the Someșul Mare Valley have two forms:

- Organised activities;
- Unorganised activities.

Fig. 7.Excavations on arable land in the valley

Organised activities are represented by gravel plants in the region, functioning near: Năsăsud, Salva, Nimigea Românească, Nimigea, Chiuza, Florești, Cociu, Săsarm, Beclenuț, Beclean, Coldău, Cristeștii Ciceului, Măluț, Braniștea, Uriu, Reteag (2 plants), Bața, Ciceu-Mihăiești, and Mica.

Unorganised activities are realised by small private entrepreneurs or locals, and consist in discharging gravel or clay used for brick manufacturing in the river bed, thus creating holes in which, by negligence or lack of information, domestic or industrial waste is disposed of.

4.1.1.4. Forestry

According to data from the Territorial Direction for Forest Regime and Hunting Cluj, forest area covers a total of 190 866 ha, from which 187 127 ha of woodland.

Wood mass harvest in 2008 from state-owned public forests was 47 000 m^3. 32% of the entire forest area lies in the hilly part of the region. According to data from the Forest Direction Bistrița, state-owned public property woodland in the Someșului Mare Hills was 19 072 ha at the end of 2008. Wood processing produces resins, sawdust, splint, dust. Their disposal should concern town halls and interested institutions. The Cellulose and Paper Factory in Dej polluted the Someșul Mare in 2002 with such substances, first time with chlorine compounds, and second with residues from cellulose boiling and wood past production. The result was the destruction of aquatic fauna down the river. Such pollution cases occur where there is negligence or where modern sewage technologies are missing.

4.1.1.5. Energy consumption and its effects on the environment

In the region, natural gas and wood are used as energy source. In 2008, the natural gas distribution network was extended with 48,5 km.

The influence of thermal energy production on the environment is realised through:

- Pollutants produced through fuel burning and emitted into atmosphere;
- Fuel leak, affecting water, air, and soil, depending on fuel type;
- Thermal energy loss through transport and distribution networks.

Because this region is a typical rural one, without centralised heating systems, the heating of houses is done with ovens, using wood and sometimes sawdust as energy source.

4.1.2. Agricultural critical phenomena

A source of agricultural risks is the improper use of arable land and production technologies. This is done by improper ploughing along the slope, or transforming pastures and hey meadows in arable land. These processes accelerate soil erosion, increase suspensions in rivers and facilitate the transport of chemicals used as fertilisers and crop protection agents.

4.1.2.1. The effects of the use of chemicals and groundwater and rivers

The increase of agricultural productivity and demand force a proper protection of crops and fruit trees against pest, diseases, and weed. This protection is done with pesticides (against animals, fungicides, herbicides, growth regulators, etc.).

4.1.2.2. Risks occurring from stock breeding

This agricultural branch offers the region's population food resources, transport power, raw materials for domestic activities, and natural fertilisers for poor soils.

Along with this resources and facilities resulted from stock breeding activities, unwanted negative effects to the environment also occur. This activity represents a real danger for water consumers, as heavy rainfall can drain organic and inorganic substances, nitrates and pathogens into groundwater, contaminating it.

4.1.3. Critical phenomena resulted from waste and dangerous chemicals management

4.1.3.1. Domestic and assimilable waste

Domestic and assimilable waste is represented by mixed garbage collected from the population, mixed assimilable refuse from retailers, industry, institutions, refuse from gardens, parks, markets and streets.

4.1.3.2. Hazardous waste

The main types of hazardous waste in the region are used batteries and recheargable batteries, used oils, metal parts used for the manipulation of dangerous substances, and medical waste.

4.1.3.3. Domestic waste

This type of waste contains a large amount of organic matter, exceeding 60%, the rest of 40% consisting mostly of hard degradable materials (plastic bags, bottles and cups, paper, metal, textiles, various toxic substances). Their disposal is done without respect for security and waste disposal regulations, usually along country lanes and rivers, as well as in holes resulted after gravel excavation for building purposes.

4.1.3.4. Areas of improper waste disposal, their location

One such area that represents an important risk factor is the waste disposal facility for domestic and industrial waste of Năsăud, located in the vicinity of the Someșul Mare River. Another location is the domestic waste disposal facility of Beclean, situated in the water meadow of the Someșul Mare (at 70 m from the water), near the railway bridge.

4.1.3.5. The impact of waste on the quality of environment

Through disposal and incineration of waste, negative effects are inflicted to environmental factors (air, water, soil), as well as humans.

Domestic waste deposits are found near or inside settlements and houses, and surface or underground water sources.

4.1.3.6. Initiatives taken for the reduction of waste impact on the environment

Initiatives taken for the reduction of waste impact on the environment are represented by changing the behaviour of economic entities regarding their responsibilities in waste management, awareness-raising and education actions regarding the environment.

4.1.4. Touristical critical phenomena and their impact on the environment

The study of touristic risks is a new domain among geographic approaches and is a must-be as a result of human pressure, through touristic activities, on natural or artificial resources and, implicitly, on the environment. The proper development of touristic activities depends on the potential offered by the environment and on its quality and functionality parameters.

4.1.4.1. Evaluation and inventory of touristic objectives in the region

Regarding their origin (natural or artificial), as well as their spatial extent and their importance, we have:

Natural touristic objectives

Anthropic touristic potential (cultural and historical)

4.1.4.2. The causes of touristic risk phenomena

- Deterioration and overuse of access infrastructure to touristic objectives, caused by long utilisation and the absence of rehabilitation activities (this being the cause of the decreasing number of international tourists);
- The absence of rehabilitation work and re-entering of some sites in touristic circuits;
- The absence of touristic accommodation facilities or their improper location, the same for access roads;
- Another risk factor is represented by the capacity of accommodation facilities which, depending on specific situations, can be insufficient or too large;
- The degradation of touristic objectives by the behaviour of ”tourists” which alter the touristic usage potential of some objectives through vandalism, improper (random) waste disposal, pollution and the destruction of natural landscape aesthetics;

4.1.4.3. Necessary actions for diminishing and removal of touristic risks

These actions include urgent measures for the consolidation, rehabilitation and regaining of the original characteristics of touristic objectives, in order to eliminate the risk of imminent degradation by natural causes or through intense visiting; rethinking the road net and the construction of new access ways, preserving the landscape aesthetics of the region.

4.1.4.4. The negative impact of tourism on the environment

Although the Someșului Mare Hills possess a remarkable natural landscape beauty and interesting natural resources (mineral water, saltwater, mofette), these potential is not properly exploited by touristic operators in the region.

CHAPTER V

5.1. SOCIAL-ECONOMIC CRITICAL PHENOMENA

5.1.1. Social risks

In the category of risks we can include: the increase and decrease of the population, unemployment, urbanisation, and falling living standards. What puts its mark on the studied area is the urbanisation process with its influence, human risks.

5.1.1.1. The migration of the young population and of the work force

The population's mobility makes the object of study for demographers, geographers, economists and sociologists. The covered distance leads to the differentiation of three types of movements such as: short distance travelling (under 100 km), medium distance travelling (100 – 500 km) and long distance travelling (over 500 km).

5.1.1.2. Immigration rate

In order to attract civilians for permanent settlement a region has to ensure a better life or at least has to give the impression that this is possible. The fact that in Someşul Mare Hills has not existed and does not exist a well defined industrial activity, the absence of income possibilities, especially after 1990, caused the migration of the population toward other regions.

5.1.1.3. Migration growth

This indicator is represented by the difference between people who settle in a place and those who leave that place.

The migration phenomenon can be divided into two distinct phases:

- Internal migration
- External migration, which increased after 1989

5.1.1.4. The feminization of the population

The organization of genders represents the expression of the proportion men-women in the total of the population and it is identified reporting , either the total number of men to the total number of women (male reporting), or the total number of women to the total number of men (female reporting).

The factors that determine balances and imbalances between the two sexes are:

- The migratory movements explain the observed differences between the two genders, be it temporary or long term
- The male over-death rate which in the past was due to military conflict nowadays is due to alcohol consumption, tobacco, having jobs with high risk of danger, accidents.

5.1.1.5. The ageing of the population

The organisation tin age groups is the expression of dividing the total population of a region in three major categories corresponding to the young , adult and elder population.

The organization in age groups is influenced by fertility, mortality and migrations and it has important variations at a regional scale. From a demographic, but also economic point of view the analysis of the share of the elder and young population within the total population represents a major importance, the proportion between these two revealing the ageing tendencies and sometimes the rejuvenation of the population.

5.1.2. Economic risks

The economic risks contain:

- The disappearance of some branches;
- The inadequate exploitation of resources.

From this category of economic risks a great impact in the unit represents the disappearing of certain branches, in our case from industry.

5.1.2.1. The economic condition of the unit

At the end of December 2008, the total of employees was 51466, representing 1,1% of the number of the employees on economy. Out of these 48,0% were employed in industry and constructions (24699 individuals), and 49,3% in the services domain (25369 individuals).

The economic risks in Somesul Mare Hills are represented by:

- The disappearance of certain industrial and agricultural branches
- High degree of unemployment and the migration of the work force towards other regions or countries
- The lack of specialists in certain fields (constructions, utilities, agriculture)
- Political dysfunctions and poor political involvement in economic activities
- Deficiency in structural funds management which could relaunch economically this unit
- Poor communicational infrastructure
- Lack of investment in industry and agriculture, because of this the industrial equipments lost rentability, and products could not meet international standards.

CHAPTER VI

6.1. URBAN CRITICAL PHENOMENA IN THE SOMEȘULUI MARE HILLS

The urban milieu of the region consists of three towns, as follows:

1. Năsăud, an old cultural centre, with plastic products and textile industry, presently in restructuration and re-launching process;
2. Beclean, an important railway junction, with metallurgical and food industry;
3. Sângeorz-Băi, a touristic spa with therapeutically mineral water springs.

6.1.1. Air and water quality in the urban milieu

6.1.1.1. Air quality in urban areas

Air quality in urban areas is evaluated for the entire region and is monitored as follows:

- in Năsăud, Beclean and Sângeorz-Băi, the monitoring is done as follows:
  - Through short-term probing (30 min.), done monthly in a single takeoff point, indicating SO_2, NO_2 and NH_3
  - Through monthly takeoff, in a single takeoff point, for particulate matter.

6.1.2. Fresh water quality distributed through public supply system in urban areas

According to current legislation, the Public Health Direction realises the audit for sewage plants.

Thus, in 2008 there were taken 1424 water probes from central facilities, where evaluations were made according to act 458/2002. From these probes, 52 did not physical-chemically correspond, representing 3,65% (while 5% is maximum).

6.1.2.1. Water quality in wells

There have been 156 probes from public wells analysed, esp. from those used for newborns, on which contaminated well water may cause acute methemoglobinemia. From all analysed wells, 45 (28,85%) did not met potable criteria. In 2008, one case of acute methemoglobinemia was observed.

6.1.3. Comfort and health condition of the population vs. environment quality condition in populated areas

6.1.3.1. The effects of air pollution on human health

The quantification of air pollution on human health can be done by:

- Monitoring direct effects on human health of various pollutants (irritating, systemic toxic, fibrillating, cancerous) or
- Monitoring indirect effects – causing discomfort, followed by population reactions to discomfort.

6.1.3.2. Air pollution in urban areas (including electromagnetic sources)

In Beclean, Năsăud, and Sângeorz-Băi, SO_2, NO_2 and NH_3 were monthly monitored in 2008 (through 30-minutes probing), along with particulate matter.

6.1.3.3. Noise and vibrations in urban areas

Given population density in towns, esp. in Beclean, these towns were monitored on noise level.

According to analysis results, accepted noise level was exceeded both at day and night.

CHAPTER VII

7.1. PROTECTION, PREDICTION, AND COMBAT OF ENVIRONMENTAL RISKS IN THE SOMEŞULUI MARE HILLS

Strategic environmental evaluation developed as a precaution measure at high-level decision-makers, because impact evaluation at project level proved to be a rather limitative and week measure, and, consequentially, insufficient.

As a component of sustainable development, it includes the control of social-economic activities' impact on the environment. This implies a detailed knowledge on the phenomenon, including identification, estimation, evaluation, etc.

7.1.1. Evaluation of ecological impact (EEI)

7.1.1.1. The need for ecological impact evaluation

It is well known that any human activity has a wide range of implications that can affect the most diverse domains. Generally, the entire spectrum of implication must be taken into account, as indirect effects may override direct ones. Along environment protection experts, engineers, economists, sociologists, and jurists have to be part of the problem-solving process, thus highlighting the interdisciplinary character of the EEI.

7.1.1.2. EEI indicators

An important role in the estimation process is taken by the defining of indicators, directly observable, countable or measurable parameters, which have the capacity to accurately reflect the effects. Indicators will be specific to their respective domain: economical, social, ecological, etc.

In ecological impact evaluations, following indicators are most usual:

- Description of the geographic – climatic – meteorological milieu;
- Characteristics of environmental components' quality (water, air, soil, etc.);
- Social indicators (population numbers, population groups, unemployed);
- Economic indicators (mean income, production, environment funding);
- Description of analysed activity (technological, operational).

7.1.1.3. Impact matrix

Presently, the most used method is the EEI. It implies comparisons between different factors in a crossed matrix. At the intersection of activities with the ecological factors, the intensity and importance of the impact is being quantified. One of the most important matrixes, the so-called Leopold Matrix, covers 100 types of operations which produce impacts on 88 ecological factors and conditions. The use of this method allows the analysis of all possible relations, making the total evaluation more objective.

7.1.1.4. Environmental balance

Companies with activities affecting the environment must realise one or more balances (EB), in order to obtain franchise. The EB has several approach levels, and the evolution of presented steps is done basing on a „cascade" interaction (Stugren, 1994).

7.1.2. Environmental policies, risk management and monitoring

The most important environmental policy domains are those regarding sectorial stress types, such as: air pollution, water pollution, soil pollution, etc., or sometimes even more narrowed, like air pollution with certain substances.

7.1.2.1. Environmental policy instruments

The first step in environmental policy and strategy is the priority setting. Once done, implementation instruments have to be chosen. The selection must consider two types: "impose and control", basing on regulatory methods, and "market mechanisms", basing on economic instruments, such as assessments and taxes over pollution, or selling and buying pollution rights (Rojanschi, Bran, 2002).

7.1.2.2. Environment management strategies

Environment management must guide activities towards environment protection, and includes elements of the environment management system according to ISO 14000 standards, elements that should be entirely included in Romania's environment management systems.

The development of environment management system and its instruments must follow the harmonization of the relation between economic entities and the environment.

7.1.2.3. Environment monitoring

Environment protection activities, as coherent and efficient action, are done by organising and assuring the functionality of environment monitoring system.

Monitoring environmental quality represents a complex system of data gained through long-term, systematic observation, organised in a system of parameters and indicators covering a wide spatial and temporal range, capable to assure the possibility of pollution control.

7.1.3. Protection, prediction, and combat measures of natural risks

7.1.3.1. Protection, prediction, and combat measures of geomorphologic risks

One of the highly disputed problems regarding landslide processes is that concerning their prevention, or, if the disaster already happened, their combat. The solutions underline the experience specialists gathered throughout the years.

Thus, two solutions for solving this problem were elaborated:

1. A naturalistic solution to the problem, highlighting slope evolution factors and seeking the elimination of triggering causes;

2. A technical solution, seeking to eliminate the effect through "artworks", which moves the complex conditions under which the process evolves on a second level.

Landslides are natural risk phenomena with the highest rate regarding material damages and even casualties. In order to diminish the risk represented by landslides, the means by which causal factors can be controlled have to be known.

7.1.3.2. Protection, prediction, and combat measures of hydrological risks

Among hydrological risk phenomena and processes, the highest rate is registered by floods, which produce the most material and human damages. In the last century, human communities living or working in flood-endangered regions worked together, basing on experience and information gained, in order to protect their goods and lives against the aggression of these phenomena.

From the protection measures against flooding, we point out:

- Dams, that protect appreciable areas of agricultural land against flood, along with settlements and other goods situated in exposed areas. Consequentially, along the Someşul Mare River dams have been built near settlements located in the water meadow (Feldru, Nepos, Rebrişoara);
- Interventions in the river bed in order to increase their transport capacity, by river bank regulation (meander cutting, channel cutting for high water off-drawing), or by digging polders that should draw a part of the flood.

7.1.3.3. Protection, prediction, and combat measures of anthropical risks

Pollution is a consequence of human activities, while its elimination is problem of causal error correction. The control decision occurs at the same moment at which the damage is recognised, and present-day technical and scientific means can resolve all pollution problems. The avoidance of pollution must begin at the source, intervening in the process of pollutant creation (Ozunu, 2000).

7.1.4. Matrix evaluation of risks in the Someşului Mare Hills

7.1.4.1. Quantitative risk evaluation in order to set territorial management priorities

Risk evaluation in the context of territorial management has following goals:

- Identification of environmental risk sources, of transmitting ways and of risk subjects;
- Characterisation of risks in order to set intervention priorities;
- Quantitative evaluation of environmental risks;
- Determination of risk management measures in order to improve environmental quality;
- Control and elimination of risk generating anthropic activities;
- Implementation of territorial management strategies.

Territorial management priorities must be determined considering quantitatively and qualitatively evaluated risk components. By presenting territorially determined homogenous risk sectors, decision takers can promote a territorial management efficiently oriented towards main problem solving. The advantages of using evaluation matrixes rest in the fact that they offer quantitative data to decision takers and that, through the interpretation of results, they

permit the evaluation of impact and risk separated by environmental components and pressure factors.

The Someşului Mare Hills represent a distinct geographic unit inside the Someș Plateau and are known by the presence of several degraded areas, regarding environmental quality.

The hills and the valley stretches between Dej and Sângeorz-Băi, presenting following territorial features:

- It is a region of converging territorial flows coming from neighbouring geographical units and a major informational and infrastructural corridor;
- It is a intense humanised axis, representing accordingly numerous sources of environmental dysfunctions where society – environment relations had a pronounced conflict attribute;
- It has a high human population rate, which projects a high anthropic pressure on the territory;
- A synthetic evaluation of human impact on environmental components in the Someșului Mare Hills was realised by using rapid evaluation matrixes elaborated by Pastakia and Jensen in 1998;
- The adjustment of the matrix method and matrix components was realised considering the environmental characteristics of the studied unit and their anthropic significance. Furthermore, the evaluation based on information (official data and terrain observation), which permitted a higher objectivity of the actual evaluation.

Results and conclusions

The Someșului Mare Hills are part of an occurrence ground of natural, demographic, economic, social, and environmental critical aspects. The research carried out upon the environmental factors is focused on the relations between men and geographical components which sustain it also upon current or potential problems which appear in such relations. We refer to environmental problems when the geographical components or the interventions of the anthropic factors generate a conflict that harms society.

The quality and the thoroughness of the functional processes define the system's condition, while the problem diagnosis of unbalanced environmental systems with heterogenic manifestations faces a series of difficulties, such as:

- The hidden characteristics of the processes which maintain the relations with the structure of the environmental system;
- The complexity of environment degradation manifestation forms;
- Chosing the most proper scale for cartographic representations.

The complex analysis of the relations between risk and geographic systems is determined by their variety, the multitude of variables defining and assuring their functionality. The frequent occurrence of natural risk phenomena is partially induced by human intervention in environmental systems, so that unilateral classifications, without considering all variables, are not eloquent.

Considering their natural origin, each phenomenon was included to a certain genetic type and subtype which affects certain areas. We considered the characteristics of the phenomenon: simple, if its action is spatially limited, does not affect other environmental components and does not cause other processes, and complex, in the case of extended spatial occurrence and with implications upon other components and causing future influences.

Anthropic influences on the environment and degrading life quality have a direct impact on demographic processes, mainly birth rate, mortality, migration. Human intervention manifests through agricultural and industrial activities, communications (the first being the most intense), with deep implications in creating natural unbalances. The most important implications are observed in the dynamics of actual geomorphologic processes, pedogenesis, and generally in the region's landscape changes.

Methods for pollution fighting and pollutant removal were elaborated, but the effects of pollution are far from being negligible, as it has a long-term impact, and repercussions on human life and the environment.

The matrix elaborated by Pastakia and Jensen (1998) is an environmental analysis and evaluation instrument that allows a coherent presentation of the evaluation of human impact on environmental components.

The advantages of the method are: the possibility of comparisons between different types of impact and risks; the transparency and stability of the analysis and evaluation process; the flexibility of the method, corroborated with the graphic representation of the results; it is easy to realise and apply; it supports the environmental planning process and the territorial development process.

The matrix has several deficiencies that have to be mentioned:

- It involves (partial or total) judgement subjectivism of the evaluator or of the evaluation team;
- The evaluation is a qualitative one, even if the results have quantitative nuances;
- The transparency and objectivity of the evaluation may be influenced by conjuncture or permanent factors.

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