

Abstract

In the past years, the majority of the catchments of the Barladului Plateau benefited of deep physical geography studies, the catchment of Stemnic (Buda) remaining defective under this aspect. The chosen subject is a pertinent one, as the studied catchment confronts with real problems due to the intensity of the pedo-geomorphological processes and the appreciated extension of the intensely degraded land surfaces.

The present paper wants to be a modern and systemic approach of the problem of land degradation by the analysis of the control factors, establishing the intensity, spreading, dynamics and impact on these processes upon the quality of the environment, but also of the modality to prevent and control in order to conserve the soil resources, that are very important for a region with agricultural vocation.

The Ph.D. thesis “**The Catchment of the Stemnic (Buda) River. A Pedo-geomorphological Study**” is structured into seven chapters and contains 102 figures (photographs, graphics and maps) and 14 tables.

The first chapter is ensured by an introductory part where the stress is on the geographical position and the history of the scientific research. We hereby mention the fact that the hydrographic catchment of the Stemnic river is situated in the South – West of the Central Moldavian Plateau and has a total surface of 15.662,5 ha, which represents 2.2% of the surface of Barladului Plateau.

The second chapter refers to the working methods and stages. A very important success in spatial modeling of the degradation processes consisted of realizing the numerical model of the land, obtained by scanning, importing, geo-referencing and digitalization of the level curves of 55 topographical plans in the scale 1:5.000. The election of a very detailed MNT, in scale 1:5.000 in the detriment of that in scale 1:25.000, started from obtaining a very increased accuracy degree of the assessments of various nuances.

The third chapter, named “*General Considerations Regarding the Natural Environment*” is dedicated to the analysis of the factors that determine the general evolution of the relief and soils, also contributing to the degradation of the lands in the catchment of the Stemnic.

Under geological aspect, the studied catchment is entirely overlapped over the Moldavian Platform, being remarked the generalized presence of friable sedimentary rocks, of Basarabian, Kersonian, Meotian and Quaternary age. The weak resistance of the sublayer is responsible for the intensity and appreciable extension of the degradation processes, while

the external shaping of the deposits with monocline general structure influenced the present configuration of the relief.

The temperate continental climate with excessiveness nuances has also an important role in directioning the present geomorphological processes and imposes through the thermal regime (8 - 10°C) and also through the pluviometric one (500 – 600 mm). The excessiveness nuances are evidenced by increased thermal amplitudes, as well as by the great frequency of torrenatial rains.

The hydrologic factor plays an essential role as the researched area is the result of the action of the rivers, a fact demonstrated by the appreciable percentage of the sculptural relief shapes (77.4%). By its characteristics related to the regime of the liquid and solid flow, the hydrographic network influences the transportation and accumulation of the solid materials in the main river beds and the cuvettes of the accumulation lakes.

The natural vegetation corresponds to forest steppe and forest floors, but during the last two decades it has been radically changed by taking to culture of the agricultural lands, which determined the intensification of the degradation processes. The South and middle parts correspond to forest steppe area, with intercalation of xero thermophile forests, brushwood and steppe xero-phile grass lands. The forest area, with xero-phile and xero-mesophile forests occupies the higher part of the interfluves of the Northern half as well as the interfluve Fâstâca-Racova.

In the fourth chapter, “*The Relief*”, there are treated a series of morphographic and morphometric features of the relief of the catchment of the Stemnic, respectively the exposure of the versants, hypsometry, the slope and depth of the fragmentation of the relief.

Within the context of the general monocline structure of the geological sublayer in the Central Moldavian Plateau, the external shaping factors, especially the fluvial erosion and the land slides, lead to the development of a typical hilly relief. As it has been observed by David M. (1921, 1922), the structural platforms (plateaus) and the flanks relief give “the true plateau character” of this hilly area.

Normally, with the subsequent valleys, the versant with cuesta reverse is widely extended and holds the main percentage, usually over two thirds. Within the studies catchment basin 42% develops on the left of the Stemnic and 58% on its right. The apparently surprising anomaly in the valley of the Stemnic, with the main percentage of the right versant (cuesta front with Northern exposure), is generated by the evolution of some subsequent valleys, situated at North, respectively the most developed valley of the upper Barlad and the younger valley of Buhaesti. The homoclinal evolution (depth and dislocation

towards South) of the above mentioned valleys provoked the appreciable limitation of the percentage of the left side of the catchment of the Stemnic (almost integrally under the shape of a versant with cuesta reverse role, with Southern exposure) reported to the right side (cuesta front).

On the other hand, the right versant of the Stemnic Valley, especially downstream the confluence with Fâstâca, is presented as an ample cuesta front, fragmented by a series of confluent valleys that sculpted obsequent valleys under the shape of some well shaped slipping amphitheatres. This observation represents an argument in order to sustain the idea that the valley of the Stemnic is a pretty developed one even if its left versant (cuesta reverse) is more narrow and has a subordinated percentage reported to the right versant (cuesta front).

In exchange, in the subsequent Fâstâca valley the cuesta front (right versant) is much less fragmented by small subsequent confluent valleys which underline the fact that we deal with a much younger valley.

The absolute altitude of the region decreases progressively from West – North-West towards East - South-East, according to the slope of the surface layers. The presence of some harder rock horizons in North and West. The maximum altitude is met in Răzeși Hill of about 466.1 m, the minimum being of 88 m situated at the confluence of the Stemnic (Buda) with Barlad. The medium altitude is of 229 m. The altitudinal plane, between 200 and 350 m, holds a percentage of 78.9% of the entire territory, which reasons once again the amplitude and intensity of some present geomorphologic processes in a hydrographic basin constituted predominantly of some unconsolidated deposits.

The lands with a slope higher than 5%, with erosion potential, represent 77% of the total. According to the slope class there are observed areas of production of pedo-geomorphologic processes, as well as the presence of relief asymmetries.

The geomorphologic analysis of the catchment of the Stemnic shows the main characteristics of the structural – lithologic relief, the sculpted relief (fluvial - denudational) in generally monocline structure and the fluvial accumulation relief.

The structural – lithologic relief occupies a secondary place, subordinated to the sculptural relief (fluvial - denudational) in generally monocline structure. The geological sublayer, made up predominantly of friable rocks, easy to eliminate by erosion, imposed locally in morphology, under the shape of the plateaus, only where, close to the surface, there appeared more resistant to erosion rocks.

The sculptural relief has a remarkable spreading holding a percentage of over 77% of the surface of the catchment of the Stemnic. Although predominant, we have to mention also

the fact that this developed under the direct influence of the monocline support and suffers transformations under the action of the present geomorphologic processes.

The fluvial accumulation relief occupies 18.7% of the surface of the basin, of which the alluvial depressions and glacises are more extended comparing to the fluvial terraces. The most ample development is represented by the alluvial depression of the Stemnic which reaches the maximum width of 1.5 km at the confluence with Barlad.

Because of the predominance of the friable, sandy – clayey layer, there are kept few terraces, occupying a surface of 73.5 ha, being better shaped the terrace of 100 m relative altitude.

The range of the geomorphologic processes with a role in the land degradation is the one characteristic to the entire Moldavian Plateau, the local specific being influenced by the structural – lithologic particularities, morpho-climatic and the way of using the lands.

Of the analysis of the pedologic studies afferent to the communes of the studied catchment it comes out that on 877.2 ha is present the excessive erosion, on 702.4 ha a very strong erosion, on 337.9 ha strong erosion, on 305.8 ha moderate erosion, on 1367.3 ha weak erosion and on 6733.6 ha a very reduced erosion (unappreciated).

The upper catchment is less exposed to erosion because the timbering degree is quite significant. The recently taking into culture of the land and the texture is predominantly middle- fine. As an argument we hereby mention the fact that the areas with weak and moderated erosion are situated on the lands close to some localities (Rafaila and Buda).

In the middle catchment it obviously grows the percentage of the areas affected by erosion I surface, on one hand as an effect of the growth of the agricultural surfaces and the anthropic pressure of the territory, to which there are added also a series of morphometric particularities (increased declinations, increased relief energy, relatively intense fragmentation)

In the lower catchment there is met a great percentage of the surfaces affected by the erosion in surface, under the conditions where the catchment is obviously narrowing, the timbering is considerably reduced and the relief energy and the declivity are maintained at increased parameters, especially on the right of the river where there are observed the largest surfaces affected by erosion.

The versants gaps occupy 37 ha, are generally discontinuous and have reduced dimensions and depths, while the bottom of the valley gaps have greater dimensions and a continuous character, but occupy a more reduced surface, of 25 ha. The communication ways

(roads) may be affected by the appearance and development of the gaps, along with taking out of agricultural circulation of these surfaces (62 ha).

The landslides have been identified on the topographic and orthophotoplans. Their presence is connected to the cuesta relief, especially on their fronts. They have a large range of shapes and dimensions. Though, the total surface affected by landslides exceeds 8744.5 ha (55.8% of the entire territory), which offers a concluding image on the land degradation. These are characteristic to the entire hydrographic catchment, having a special frequency in the upper catchment as well as in the entire catchment of the Fâstâca river.

The fifth chapter treats the particularities of the soil layer. The data and information regarding the taxonomic framing and the characterization of the soil layer come from O.J.S.P.A. Vaslui, the data being updated and interpreted according to S.R.T.S., 2012. For the validation of the results there have been realized a series of soil profiles in “key” points and for representative soil types, including the silvan field. Within the catchment of the Stemnic there have been identified 10 genetic types of soil that form part of 6 soil classes and have been divided into 65 inferior taxonomic units.

The soil class with the most spread surface is the one of the cernisols with 3.127,3 ha (20% of the entire surface), followed by luvisols that occupy 2.936,3 ha (18.8%) and the protisols with 2.813,3 ha (18%). The last three places are occupied by anthrosols, with 956 ha (6.1%), hydrosols, with 390.6 ha (2.5%) and vertisols, with 100.7 ha (0.6%).

At the level type, the greatest surface is held by preluvosols with 2.933,9 ha, respectively 18.7% of the entire catchment, on the second position is placed the chernozems with 1.850,4 ha, respectively 11.8%, on the third position we find regosols with 1.581,4 ha (10.1%). There is surprisingly the much extended surface occupied by regosols, which correlates with the amplitude and intensity of the present geomorphologic processes, the named soils occupying extended perimeters in the areas with stabilized landslides. The following soil types are the faeoziums that count 1.276,9 ha (8.2%), followed by alluvisols with 1.231,9 ha (7.9%) and anthrosols with 956 ha (6.1%). On much reduced surfaces are found the stagnosols with 196.9 ha (1.3%), then gleiosols with 193.6 ha (1.2%), followed by vertisols with only 100.7 ha (0.6%), and on the final position, with only 2.4 ha (0.02%) are situated the luvisols.

In the case of the subtypes, the field researches and laboratory analysis imposed the separation of simple subtypes, but also of the double ones (especially with chernozems and faeoziums), but also with the triple ones (especially at gleiosols, alluvisols and anthrosols),

where there are frequent the processes of carbonation (proxy and epicalcaric soils), gleization, but also of salinization and alkalization.

The main pedogenetic processes are: clay formation, bioaccumulation, eluviation – illuviation, gleization and stagnogleization, salinization and alkalization, carbonation, cracking. Under the conditions of a warmer and drier climate and the forest steppe vegetation, specific for the middle and low catchment, the humidification is intense and the specific soils for this area (chernozems and faeoziums) that held important humus reserves (over 150 t/ha), the average value of the humus content in the first 20 cm is around 2.3%. In the case of the lands occupied by silvan vegetation, under conditions of more abundant precipitations that lead to a much intense levigation, the humification is less intense, the specific process being the one of litter formation, hence a layer of undecomposed and semidecomposed organic rests.

Of the carted surface of 10.324,1 ha, 4.502,3 ha (44%) presents Am(molic) horizon, rich in humus on at least 25 cm, with alkalis saturation degree at least equal or higher than 55%, and 5.821,8 ha (56% of the carted surface) have Ao(ocric) horizon with a low content of organic matter.

The reliability notes for arable land were calculated as average of eight cultures (wheat, barley, corn, sunflower, potato, sugar beet, soya, peas - beans), according MESP, vol. II.

The arable lands of the catchment of the Stemnic are comprised mostly in quality class III (40.9%), followed by class II, with a percentage of 30%, while the average for arable is of only 43 points (class III) indicates a moderate productive potential. This fact constitutes a discriminating element for a territory with an economic development based almost exclusively on the agricultural field. This finding is confirmed by the significant percentage (almost 30%) of the lands in favorability classes IV and V.

The main factors that limit the capacity of agricultural production of the lands of the studies catchment are: erosion in surface, landslides, humidity excess, fine textures, humus reserve and the reduced content of nutritive elements.

The sixth chapter is dedicated to the *way of using the land*. A special attention is given to the dynamic of using the lands during the period 1894 – 2009.

The percentage of the major categories of using the land reflect the rural character and the predominantly agricultural profile of the area. Of the 15.662,5 ha, that is the entire surface of the catchment of the Stemnic, 69% of the total come to the agricultural lands and only 31% to the unagricultural ones, a thing due to the intense transformation of the initial vegetal

carpet and its replacing with intense cultivated surfaces, in the disadvantage of the natural and forest steppe grass lands.

During the period 1970 – 1990 there s observed a general tendency of decreasing the rhythm of the land degradation because of the initiation of an ample project of anti erosion project in Barlad Plateau.

We can affirm that between 1984 and 2009 in the catchment of the Stemnic (Buda) there were not registered substantial transformations in the way of using the lands. The thing that truly modified was the agriculture system.

The Ph.D. thesis encloses with a last chapter designated to the *conclusions*. Thus, the physical – geographic and social – human conditions in the catchment of the Stemnic impose the enactment of some corresponding measures in order to prevent and control the soils erosion, by introducing the works of anti erosion organization and arrangement of the agricultural lands and the settlement of some silvan plantations on the lands affected by landslides.

The information in this paper may be of a real benefit for public state institutions (prefectures, mayoralities, environment agencies, development agencies, agricultural directions, land registry offices, etc.) in order to manage the natural resources for the perspective of a durable development of these rural communities.