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MORPHOCLIMATIC FEATURES OF THE ROMANIAN TERRITORY

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The importance of climate in gradating the earth's crust has directly or indirectly been approached worldwide ever since the end of the 19th century, a special attention being given to the ideas referring to the genesis of peneplaned surfaces or to the specific landforms in the desert, glacial and periglacial regions. These ideas have further been developed into theories concerning specific erosion cycles (M. Gee, W. Davis, Emm. De Martonne, A. Penck, W. Penck and others.). Thorough studies and detailed morphoclimatic analyses became more and more numerous in the sixties (J. Tricart, A. Cailleux, J. Budell etc.).

The main issues of concern in the Romanian geomorphological literature follow three directions of research: a) the description of Pleistocene glacial and Pleistocene-Holocene periglacial relief forms in the Carpathians (either locally, on small relief sub-units, or regionally, on various mountain ranges); b) the direct analysis of climate's role in landform development and gradation (with special focus on planation surfaces); c) the integration of separate works and findings in a synthetic morphodynamic system applicable to the country's whole territory (special emphasis being, however, laid on the climatic variations that largely diversified present-day morphodynamic structures). In this respect, important contributions were made by Emm. de Martonne (1907), G. Vâlsan (1915,1917), C. Brătescu (1928), Gr. Posea (1962, 1974), P. Coteţ (1957), Gh. Niculescu (1965) and others.

The analysis of present-day geomorphic landscape reveals two important generations of morphoclimatic relief forms.

The old climatic relief forms. This morphoclimatic generation of relief forms includes erosional and accumulation landforms that have developed in different past climates. Some of them are very old (of Paleozoic-Mesozoic age) but others have just recently been built (in the Pleistocene epoch). Their differing age makes it difficult to restore their initial geomorphological features since subsequent climatic conditions have created ever new morphoclimatic systems, thus covering any evidence of former landscape characteristics. That's why, the older the morphoclimatic systems are, the more difficult to discover key-features it becomes, the best preserved relief forms probably having been gradated by policyclic morphoclimatic processes. Paleomorphology includes erosional, as well as accumulation landforms.

The erosional paleorelief forms are represented by various peneplanation surfaces (pediplains, pediments, glacis slopes and terraces) and Carpathian glacial and periglacial landforms.

The pediplains fall into two different cathegories. The first type is observable in Central Dobrudja, where most of the tableland area is, in fact, a peneplaned surface formed in the Paleozoic era, by peneplanation of a former Proterozoic-Cambrian mountain range mainly consisting of green schists (*Casimcea pediplain*). It has evolved in a hot, tropical climate which, on conditions of scarce vegetation cover, has determined a continuous and active pedimentation. Transgressive Jurassic limestone formations have been deposited in the erosional area of nearly level land that has resulted, but they have later been outwashed by the end of the Neozoic era. The low elevation of the respective erosional plain has ultimately prevented against intense fragmentation, because the relief energy has constantly kept below 100 m. The second pediplain type is represented by the *Carpathian pediplain*, out of which only sparse fragments have been preserved as small-sized plateaus lying at different altitudes due to uneven Neogene and Quaternary neo-tectonic uplifts. This pediplain cuts into crystalline bedrock of Proterozoic-Paleozoic age and has been gradated mostly in a warm Upper Cretaceous-Paleogene climate with alternating humid and dry seasons, which determined landscape shifts from savanna to mediterranean subtropical conditions (Gh. Pop, 1962-1972). The height of the massifs being gradated has clearly determined not only the vertical zoning of climatic conditions and vegetation species, with mangroves sticking to foothills, savanna grasses growing on most highland areas and heat-loving beech and fir-trees covering the tops, but also the vertical differentiation of gradation levels.

The morphodynamics in these areas has also been different. For instance, the Carpathian pediplain evolved by unification of sparse pediments, while the clay deposits resulting by outwashing the silt alteration crust, accumulated into the surrounding sea basins (Gh. Pop, 1972). Such level highland areas are still being preserved in the Apuseni Mts. and in more mountain ranges (Godeanu, Parâng) of the Southern Carpathians.

Although intensely-fossilized, genetically similar surfaces are also traceable at different depths in the Vorland platform areas of the Romanian Plain and the Moldavian Plateau, as well as on certain massive crystalline bedrocks of Carpathian origin covered by the Transylvanian Basin deposits.

Other peneplaned surfaces refer to 1-3 level areas located in the Carpathian Mts. or encircling hills and tablelands, either as first or second-order interfluves resulting from long gradation processes under mediterranean climatic conditions that favoured intense Neogene pedimentation. But these surfaces have consequently evolved after neotectonic movements had fragmented the underlying bedrock during successive phases, so that the resulting peneplaned surfaces are only partial, mainly developing in marginal areas or along valley-floors. The main consequences of such a climate-tectonics coupling are the concentric zoning of peneplaned surfaces (either outwardly from masiff cores or downwardly from main interfluves to valley thalwegs) and their particular extention and degree of conservation, depending on lithology. The most important surfaces in this cathegory are the *middle Carpathian planation surface* (miocene) (Gr. Posea *et alii*, 1974), the *upper level of complex morphogenesis*, consisting either of more or less developed pediments and glacis slopes in the hilly and tableland areas, that have been preserved as structural or lithological plateaus of Dacian-romanian age, or of *local glacis slopes and pediments* on structural and lithological border fringes gradated under alternating mediterranean (Villafranchian-St. Prestien) or periglacial (Pleistocene) climatic conditions.

The terraces, whose number varies according to numerous factors (especially relating to valley generations and neotectonic influences), clearly reflect, mostly for upper Pleistocene-Holocene epoch, the importance of climatic variations (due to alternating periglacial and humid or arid mid-latitude climates) in the development of some extensive terraces and in the accumulation of large alluvial deposits that may sometimes appear as 15-30 m-thick coarse gravel and pebble layers (on the Trotuş, Buzău and Bistriţa river-valleys). Most studies referring to terraces (Gr. Posea *et alii*, 1974) focus on the role of climatic variations in terrace formation at mean (55-60 m) or lower (below 30 m) altitudes, the leading author applying the Trevisan morphoclimatic cyclic theory to the Western and Romanian Plains terraces.

The glacial and periglacial relief forms. The the upper-Pleistocene general cooling of climate in successive stages, out of which two had a major impact on Romania's relief forms, has favoured the rapid development of a large number of valley and cirque glaciers on top of highest mountains, on one side, and the intense periglacial gradation of high ridges and lower mountainsides. The present-day landscape still preserves glacial forms that have only partially been gradated afterwards, namely glacial cirques, valleys and troughs (in the Bucegi, Făgăraş, Parâng, Retezat, Godeanu, Ţarcu, Rodna Mts.) or residual periglacial morphologies (arête, columnar joinings, steep slopes).

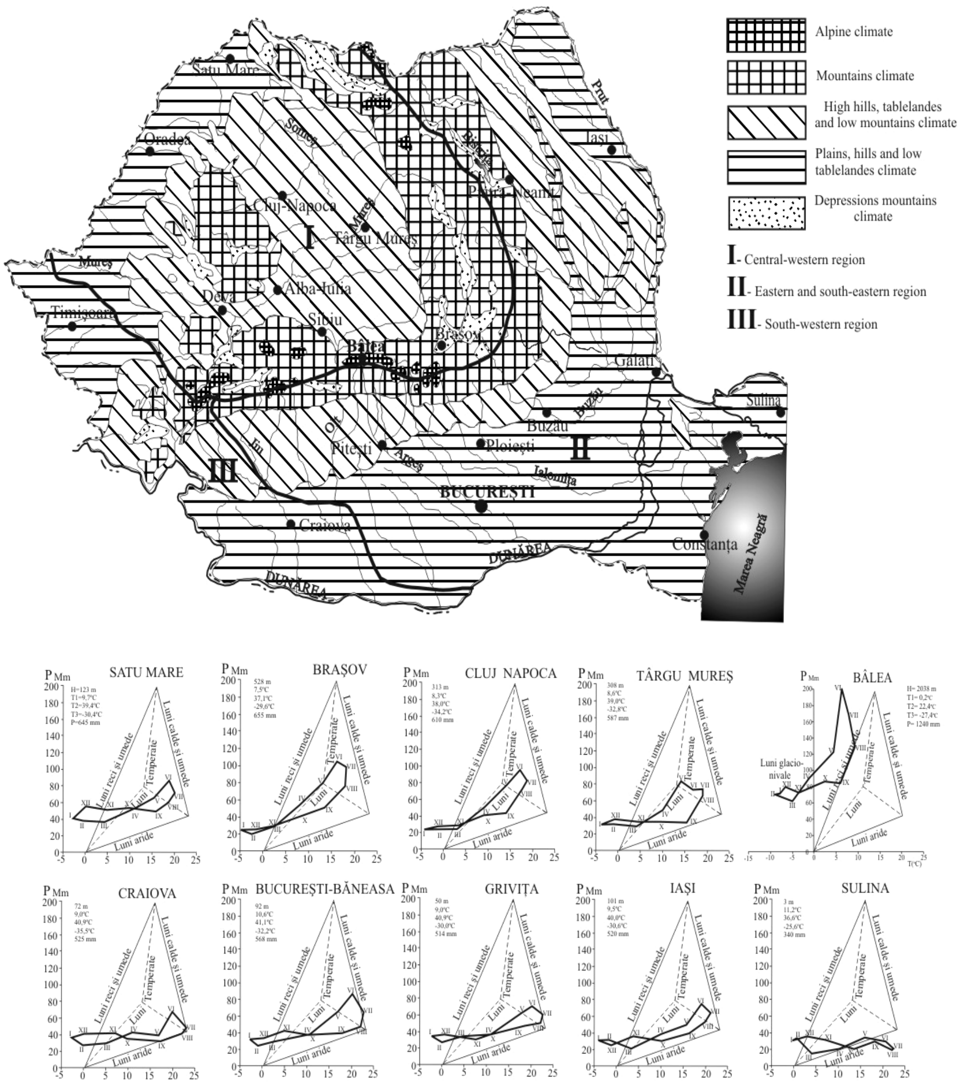
The accumulation paleorelief forms are connected to the piedmonts and piedmont plains reflecting the relationships between various units of contact and specific climatic conditions. The huge gravel and sand amounts that have been carried away from highlands and accumulated in some lowlands as result of active stream erosion had an important contribution in the formation of these relief forms, under the specific conditions of subtropical climate at the end of the Pliocene and the beginning of Pleistocene epochs. A large piedmont alluvial plain has consequently been created southwards from the Carpathians, which will later be uplifted by some hundred meters, intensely fragmented and turned into plateau and hilly areas (the Getic plateau, the piedmont hills fringing the outer border of the Curvature Subcarpathians). Hills that have genetically and structurally evolved from former piedmont areas may also be found in other geographical units having similar subtropical climates (on the inner border of contact between the Carpathian Mts. and the Transylvanian Depression, in the Lăpuş Land, on the Călimani and Gurghiu piedmonts fringing the volcanic mountains in the Eastern Carpathians, on the outer border of the Western and Eastern Carpathians, northwards from the Moldavia river-valley etc.).

Under specific periglacial climatic conditions, further piedmont alluvial fans and plains have been built towards the end of the Pleistocene and partly in the Holocene epochs (as in case of the Ploieşti and Buzău Plains or of the Braşov Depression fringing border).

The intense periglacial gradation in the Carpathian Mts. has created large talus slopes on steeper foothills. In fact, these are large debris cones and glacis slopes being heavily forested with coniferous species.

The recent climatic relief-forms. This morphoclimatic generation of relief forms has recently evolved by weather and climate gradation; their formation, frequence and spatial distribution is more or less influenced by various combining factors.

The extremely varied landforms as regards lithological composition, structural



Peguy climograme. H-Height absolute; T1- The average annual temperature; T2- The maxim absolute temperature; T3- The minim absolute temperature; P- Quantity annuale the precipitation.

Fig. 1 Morphoclimatic regions of the Romanian Territory

configuration, fragmentation and declivity degree, soil and vegetation cover, have unevenly been gradated by varying climatic conditions that played the major part in selecting the morphodynamic agents and influencing their frequency of action in time, by ultimately determining the intensity of gradation processes and the spatial distribution of the resulting relief forms. Although all climatic components have directly or indirectly contributed, to a greater or lesser degree, to the gradation of various relief forms, the most important morphodynamic factors are:

- The daily air-temperature ranges in spring and autumn;
- The duration and frequency of dry and drought periods;
- The early fall or late spring frosts;
- The seasonal rainfall amounts, rainfall showers, drizzles;
- The snow-layer duration;
- The wind speed and frequency.

The spatial extention of the Carpathian Mts. on the country's territory lying on most than 5^0 of latitude, between the main European air-pressure centres, has determined the spatial compartmentalization of climatic elements influencing the geomorphological agents and processes, as well as the resulting relief forms. Therefore, three distinct morphoclimatic regions can be identified:

- ***The central-western region*** (with oceanic mid-latitude climate) in which all climatic elements having moderate values have determined *moderate morphodynamic processes*;
- ***The eastern and south-eastern region*** (with continental mid-latitude climate) in which the main climatic elements (air-temperature, rainfalls) go to extremes and the resulting *morphoclimatic landforms have unevenly and discontinuously been gradated;*
- ***The south-western region*** (with mid-latitude climate under frequent mediterranean air-mass influences) in which the seasonal variations of climatic elements, that may sometimes go to extremes, have determined moderate morphogenetic processes.

The regional morphoclimatic differences mainly owe to relief altitudes (fig.1). Although Romania's relief forms have heights ranging from 0 m to 2,544 m, the role of the vertical morphodynamic zoning becomes evident only in the Carpathian Mts., at altitudes higher than 1,800 m, where the alpine region that has developed above the tree-line, due to colder climatic conditions, heavier rainfalls and stronger winds, intensified the seasonal cryonival and stream-erosional processes. However, an intervening zone has subsequently been gradated between the alpine region and the rest of the areas below 1,800-800 m.

The role of these important factors in regional differentiation of recent morphodynamic processes and morphoclimatic characteristics is largely supplemented by other factors relating to landform exposition, depression and valley-floor extent or anthropic intervention that disrupt natural balances, thus accelerating the land degradation processes. Therefore, it finally comes out that the moderate climatic conditions have determined numerous and various geomorphological processes that gradated specific morphoclimatic landforms, on one side, and that the climatic compartmentalization of the Romanian territory has eventually determined a corresponding regioning of morphodynamic processes. Despite the fact that the morphodynamic agents and processes equally act on all the country's territory, there appear regional or local differences due to their specific intensity, duration and mode of association, so that the resulting deposits and relief-forms differ highly from one place to another (Tables 1-3).

Various authors have tried to assess the mean denudation rates in the country's different geomorphological regions and the following guidelines have resulted:

- strong denudation rates are characteristic of Alpine regions, in which Pleistocene glaciation has produced important periglacial depositions;
- intense soil creep is active in high mountains and chemical weathering, in deforested areas;
- moderate denudation rates are maintained in forested areas overlying flysch formations, mainly due to intense stream-erosional processes;
- intense stream-erosional processes gradate the eastern plateaus with steppe and sylvo-steppe vegetation;
- landslides, earthflows and mudflows are extremely active on the deforested slopes of the Curvature Subcarpathian hills affected by strong neotectonic and seismic movements.

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Table 1

CENTRAL WESTERN MORPHOCLIMATIC REGIONS				
Carpathian Region			**Hills and Plains Region**	
Processes 1	**Landforms** 2	**Average denudation rate (mm/year)** 3	**Processes** 4	**Landforms** 5
Weathering: Moderate gelifraction on bare steep slopes; Relatively intense chemical weathering; Intense solution on limestones.	talus cones and glacis; syallitic weathering deposits; karst landforms.	Frost heaving 135 (Urdea,2000) 47.44 in Retezat. Mts. (Urdea,2000) 0.05-0.07 in Rarau Mts. (Rusu, 2002)	**Weathering:** Local gelifraction on bare slopes; Intense weathering with moderate argillization in hills area; clay/depositions in plain area; solution on salt, gypsum and limestone formations.	Talus glacis; argillo-syallitic and carbonatic-syallitic weathering crusts; karst relief forms.
Raindrop impact Moderate on deforested lands, related to rainfall frequency and slope-declivity.	upper soil outwash.	1-2 in Baraolt Mts. (Bacaintan,1999)	**Raindrop impact** Moderate (locally) to excessive (hills area); weak in plain areas.	severe rill flow or sheet wash.
Gravitational Processes Active mass movements on sedimentary rocks.	landslides and mudflows of varying volumes.	Talus creep 90-170 (Urdea,2000) Creep 30-50 in, forests, Rarau Mts. (Rusu, 2002)	**Gravitational Processes** Active landslides on hill slopes; rockfalls in salt dome areas (mines).	frequent land slides and erosion hollows.
Gully and stream erosion Intense processes on deforested slopes due to heavy rainfalls.	middle-sized ravines and streams.	22-55 in Retezat Mts. (Urdea,2000)	**Gully and stream erosion**: intense on steep, deforested hill-slopes.	deep ravines and streams; outspread alluvial fans; badlands.
Fluvial erosion: Permanent, but occasionally intensifying in March-December.	liniar erosion; bulk transport, lateral dispersal of flood deposits.		**Fluvial erosion:** permanent, but with seasonal variations; lateral erosion; suspension transport; rich alluvial depositions in lowland valley-floors.	wide valley-floors; natural levees; meander scrolls; river-channel divide.
Nival and wind erosion: rare avalanches; weak land-subsides.	nival depressions (locally: Reci)		**Nival and wind erosion:** second-order agents in depression’s gradation.	sand-dunes (Carei)

Table 2

EASTERN MORPHOCLIMATIC REGION		
Processes	**Landforms**	**Average denudation rate (mm/year)**
Weathering Solution in limestone rocks (Dobrudja)	Carbonatic-syallitic and clay-syallitic weathering deposits (in regions with more 450 mm rainfalls/year)	0.05-0.07 in Stanisoara and Gosmanu Mts. (Radoane, 2002)
Raindrop impact Active on hillslopes (with no vegetal cover) because of heavy rainfalls and rock's weak resistance.	Large soil-eroded areas (especially on the upper slopes), long colluvial glacis slopes	0.05-0.32 in Covurlui basin, Moldavian Plateau (Bacauanu et.alii, 1980) 0.5-0.8 in Dobrudja Plateau (Popovici et alii, 1984)
Gully and stream erosion very intense on hillslopes, because of heavy rainfalls; local occurrence on high river banks.	Ravines, gullies, torrential streams disrupting slope balance processes; alluvial fans	900 for ravine upstream development in Barladului Plateau (Ionita, 1998-1999)
Fluvial erosion Important seasonally flowing variations; Suspension transport; important accumulation and lateral erosion during high-flows.	Large floodplains, intense alluvial processes.	
Nival processes weak subsides in erosion hollows ("crovuri") or between the levees of the landslide bodies.	Microdepressions (lakes, swamps; bogs).	
Wind-erosional processes Deflation-accumulation in sandy areas	Active and semiactive dune landscapes (partially stabilized in the southern and eastern parts of the Romanian Plain)	

Table 3

SOUTHWESTERN MORPHOCLIMATIC REGION					
Carpathian Region			**Hills and Plains Region**		
Processes	**Landforms**	**Average denudation rate (mm/year)**	**Processes**	**Landforms**	**Average denudation rate (mm/year)**
Weathering: low intensity gelifraction; relatively intense chemical weathering; solution on limestones	Debris cones, Weathering syallitic and clay-syallitic Deposits, karst forms.		**Weathering:** Low to moderate chemical weathering; solution on limestones (Mehedinti Plateau).	clay-syallitic deposits, karst forms.	
Raindrop impact: Low to moderate on deforested slopes.	shallow soil-cover.		**Raindrop impact:** Moderate in hill areas, especially in March, April, October, December.	partial soil erosion.	0.33 in Jiu basin (Ujvari, 1972)
Gully and stream erosion: Moderate on deforested slopes.	Gullies and ravines.		**Gully and stream erosion:** moderate to excessive on deforested slopes in the Getic Piedmont	ravines and deep stream-valleys, large alluvial fans.	500-700 for for ravine upstream development in Buzau Subcarpathians Hills. (Balteanu, 1983)
Gravitational Processes: Shallow landslides, in weathering deposits.	Shallow landslides and rockslides.		**Gravitational Processes:** Deep landslides on steeper slopes.	landslides and mudflows.	0.5-10 for landslides in Buzau Subcarpathian Hills. (Balteanu, 1983) 20-70 for mudflows in Buzau Subcarpathian Hills. (Balteanu, 1983)
Fluvial erosion: Important river-flows (March-May, Nov.-Dec.)	Linear erosion, intense transport, low accumulation.		**Fluvial erosion:** Important river-flows during intervals with heavy rainfalls.	Moderate intensity erosion; intense transport, alluvial accumulation.	
Low intensity **nivation processes**.					

MAIN TYPES OF CLIMATE IN ROMANIA

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In the European context, Romania is a medium-sized country, like Ukraine, Poland, Germany and Great Britain; in this respect, the territories of all the last-mentioned countries slightly exceeding Romania's territory. However, Romania features a far greater spatial diversity of climatic characteristics and a much greater time-variation of atmospheric processes and phenomena. This is mainly due to its geographical position on the continent, on one hand, and to its various and complex relief forms, on the other hand.

Unlike Romania, there are countries with highly-diversified relief-forms, but with less varied and distinct types of climate, mainly because of their location (as Switzerland and Austria), and, furthermore, there are also countries lying in the same geographical area, with little or no climatic variations, because of their relatively homogenous landforms (as Hungary).

As far as the geographical position is concerned, we must mention that both latitude and longitude are important for the Romanian territorry, because latitude plays the key-role in determining the intensity of incoming global radiation on the ground area and longitude, together with latitude, constitutes one of the main factors influencing the frequency, intensity and main characteristics of the different types of atmospheric circulation over a given area.

Obviously, both global radiation intensity (including the values of the radiation budget) and the characteristics of the atmosphere circulation patterns are largely modified by the structure and specific properties of the active surface, namely the major relief-forms, that changes climate either by means of its height, exposure to solar radiation, inclination and form, in the first case, and by altitude, orientation of main hill and mountain ranges, exposure towards prevalent winds and landforms, in the latter case.

Resulting from ample thermo-baric differences of air in the troposphere, due to the combined action of solar radiation and ground characteristics, the general circulation of air over Romania is charactersied by distinct features that ultimately influence the climatic conditions. Therefore, the way the three main categories of climatic factors (radiative, dynamic and physical-geographical factors) combine and interact between themselves, determines the compartmentalisation of the Romanian territory into three distinct types of mid-latitude climate, the last one further comprising a fourth type, which still doesn't meet most necessary climatic requirements to be considered a distinct, individual type.

Romania's territory is stretching from N to S over less than 5^0 of latitude (namely between 43^0 37' 07'' and 48^0 15' 06'' northern latitude) and from W to E, over less than 10^0 longitude (namely between 20^0 15'44'' and 29^0 41'24'' eastern longitude); its latitudinal extent being lower than 500 km and its longitudinal extent not exceeding 700 km. The 45^0 N parallel approximately represents the northern limit of the southern third part of the country's territory. Consequently, the mean annual sums of global radiation differ slightly on latitude (over 15 kcal/cm^2 between the southern and the northern parts of the country), but greatly on altitude (over 25 kcal/cm^2 between the lowest and the highest parts of the country). Their absolute values range from 125.8 kcal/cm^2 at Bucharest, in the southern part of the country, to 107.0 kcal/cm^2 at Botoşani, in the northern part of the country. The greatest mean annual sums are specific of the south-eastern parts of the country, namely along the Black Sea shore (127.3 kcal/cm^2 at Constanţa) and the southern peripheries, that is on the floodplain of the Danube river (129.7 kcal/cm^2 at Giurgiu). Such values are the result of both higher solar latitudes (steadily increasing as latitude decreases) and longer sunshine durations (increasing as cloudiness decreases). On the contrary, the lowest mean annual sums of global radiation reach about 100 kcal/cm^2 on the highest summits of the Carpathians, where cloudiness gets higher during summer, when incoming solar radiation reaches peak values.

Annually, the lowest monthly mean values of global radiation are usually specific to December (when solar altitude is lower and cloudiness gets higher), and the highest values occur in July (when solar altitude is still high enough and cloudiness substantially decreases from the previous highest values in June).

The physical-geographical factors influencing climate play an essential role in diversifying the climatic conditions of the Romanian territory and, consequently, in creating distinct climatic types. Thus, the Carpathian Mountains and, secondly, the Black Sea, have a major contribution in this respect.

In fact, the Romanian Carpathians appear as a V-shaped chain of mountains largely opened to W-NW, under the form of a great arc encircled by a complex system of hills, tablelands and plains, that divide the country's territory into two major compartments: the inner one, lying inside the great Carpathian arc, and the outer one, comprising the gradually-descending concentric steps of encircling landforms. The different orientation of the two major mountain divisions (NW-SE for the Eastern Carpathians and E-W for the Southern Carpathians) towards the main components of general circulation, together with their altitude and inner landforms, generate sizable differences between the values and conditions of various meteorological elements in Romania.

The Carpathian obstacle frequently modifies the trajectory of mobile cyclones and the direction of winds blowing at lower altitudes than the mountain summits; intensifies the frontal activity on the ascending slopes of air-masses and declines it on the descending slopes etc. When passing over the orographic obstacle, important thermodynamic processes take place in the air-masses ascending on the windward sides, thus producing adiabatic expansions that decrease air-temperature, substantially increase relative humidity, generate clouds of dynamic (orographic and frontal) convection and increase rainfalls. However, it is important to know that such processes don't occur at the same upper-air altitudes above the surrounding plains. On the contrary, the processes of adiabatic compression taking place on the leeward sides make the temperature of descending air increase, the relative humidity decrease and cloudiness diminish to total clearing.

The large opening of the angle between the two sides of the V-shaped chain of mountains favours the guidance of the air penetrating into Transylvania from W and NW, towards the top of mountains, frequently passing over the Curvature Carpathians and, consequently, flowing down to the NE sector of the Romanian Plain. That is mainly why the foehn-like effects in the Curvature Subcarpathians and the nearby field areas are detectable not only in the values of different meteorological elements, but also in the distribution and types of soils and vegetation. Also resulting from frequent climbing of air over the mountains, the foehn effects are also visible in the Oltenian Subcarpathian Passage-Way and the western parts of the Oltenian Plain, as well as in the Turda-Alba-Iulia-Deva passage. The foehn effects in the Făgăraş Depression, where air-masses, coming from south, pass over the orographic obstacle of the Southern Carpathians, are less frequent, but more intense, due to greater heights and steeper slopes.

Sometimes, when horizontal pressure gradients are not high enough and the thickness of moving air-masses doesn't exceed the height of the orographic obstacles, they are trapped inside the Carpathian arch if they come from W, or are kept outside the mountainous area, if they come from E or NE. Under the circumstances, the air-temperature, humidity, cloudiness, rainfall and wind contrasts between the regions lying inside and outside the Carpathian arch may be relatively high (e.g. 12-15^{0}C between northern Moldavia and the north of the Western Plain).

In winter, when anticyclones stimulate the occurrence and persistence of air-temperature inversions on the bottom of Carpathian depressions and valleys, the mountain summits and peaks rise up from the "sea of clouds" below, as if they were some archipelagoes.

The invasions of polar-continental air from NE, being blocked by the Eastern Carpathians, extend all over the Moldavian Tableland, penetrating, through the southern outlet of the Curvature Carpathians, deep into the Romanian Plain, which acts as a vast, (largely opened to E) depression between the Southern Carpathians and the Balkan Mountains. On such occasions, the Romanian Plain is characterized by intense frosts getting even more intense because of nocturnal radiative cooling, on one side, and of relatively stable fogs of inversion, on the other side. As a result, the air-temperature in the plain areas (Bucharest, for instance) may be significantly lower than in the Subcarpathian (Câmpina) or Carpathian areas (Sinaia).

A climatic role less important than it would have been expected, is, nevertheless, played by the basin of the Black Sea, lying over an area of 462,000 km^2, that is almost twice Romania's territory. As everywhere else in mid-latitude areas, the sea-waters keep cooler at day and in summer, and warmer at night and in winter, in comparison to the nearby continental areas. Despite this general rule, the influence of the Black Sea on the climatic conditions in the peripherical eastern areas of the country is largely limited both in space, to a narrow, 15-25 km-wide strip of shoreland, and in terms of weather parameters that have been changed, since many of them don't have specific values for maritime mid-latitude climate. This is mainly due to the fact that, on the Romanian territory, the western components of general air-circulation predominate all through the year. Irrespective of season, the air-masses carried by the western currents reach the Romanian shore of the Black Sea after they had been submitted to intense processes of continentalization for days on end, as their initial humidity gets visibly lower and air-temperatures often go to extremes (highly decreasing in winter and increasing in summer).

The specific heat capacity, the heat conductibility, the turbulent exchange and especially the intense evaporation from the sea-surface, make sea-temperatures keep 20-25^{0}C lower than the land areas in the hot summer days. On this account, the air above sea-waters is constantly moving downwards, thus opposing to the formation of thermoconvective cloud and determining the total clearance of allochtonous clouds once they had reached the sea. Consequently, clear skies are more frequent here than everywhere else in the country.

On the contrary, on the nearby land areas, the excessive warming of the active surface determines intense upward thermoconvective air-movements, so that local pressure of air decreases. As air-pressure over the sea keeps higher at day, the horizontal pressure gradients directed from the sea to the land areas generate the sea-breezes, pushing the relatively cool and humid maritime air towards the narrow seashore strip.

In winter, the Black Sea waters often have pretty high positive temperatures, thus releasing important amounts of heat to the air above, by means of radiative and turbulent exchange processes. Consequently, the air-temperature on the seashore is higher than anywhere else in the country. The warming process is more efficient on the southern parts of the Romanian shore on the Black Sea, so that, at Mangalia, for instance, the mean air-temperature in January has kept positive all through the interval 1896-2000. The great amounts of heat being consumed by sea-waters during the warm season and those being released during the cold season largely attenuate the annual air-temperature ranges, by decreasing the maximum values in summer and increasing the minimum values in winter. On its turn, the greater inertia of sea-waters that delays both the warming and the cooling of the sea-surface, makes the seashore area colder than the inner land areas in April, and warmer in October.

All the year round, the wind-speed on the seashore areas is sensibly higher than in continental Dobrudja because of the insignificant drag coefficient at sea.

Due to the constantly higher values of relative air-humidity, fog, dew and hoarfrost are more frequent on the shore areas in comparison to the land areas.

In winter, the mobile cyclones coming from the Mediterranean Sea get deeper under the influence of the heat being released into air by the Black Sea waters, so that they sometimes even move backwards (from E to W), turning into retrograde cyclones. This process usually intensifies winds and generate blizzards in the SE parts of the country.

The dynamic factors of climate generally refer to the general circulation of air over Romania’s territory. This is mainly determined by the mean pressure field over the European Natural Synoptic Region, characterized by the development of two quasipermanent (the Azores High and the Iceland Low) and other two semipermanent centres of action (the Euro-Siberian High and the Mediterranean Low). These four atmospheric centres of action largely influence the circulation of air over much of Europe and, consequently, over Romania. Due to the dynamic and advective processes taking place both in the lower and in the upper troposphere, the pressure field is permanently changing according to a somewhat periodical variation from one season to another.

In winter, more precisely in January, most of the north-western parts of the continent are under the influence of the Iceland Low, while the western and the eastern parts are dominated by a field of high atmospheric pressure due to the joining of the Azores High (extending far reaches to France) and the Euro-Siberian High (extending a ridge deep into the Panonian Plain). A shallow pressure low is formed between the two highs, over the Italian peninsula, in the Mediterranean Sea. Under these circumstances, the Romanian territory lies under the direct influence of the Euro-Siberian High and, indirectly, under the influence of the Mediterranean Low, that is, air flows from NE to SW in the lower troposphere and inversely, in the upper troposphere. The 400-600 m-thick arctic and polar-continental air-masses cover the eastern and southern regions of the country, where air-temperatures are low and rainfall scarce. A thin layer of clouds forms above the cold air-mass, sometimes persisting for days on end, until one of the two air-masses changes its movement direction. The mountain summits rise up above the clouds, so that the mean annual number of days with clear sky is sensibly higher than in the eastern plain areas.

When air-pressure in the centre of the Mediterranean Low decreases and the respective air-mass moves towards NE, as well as when the Euro-Siberian High gets more intense and extends SW reaches, the air-temperature and pressure contrasts greatly increase over the SE of Europe, so that the warm, humid air from the Mediterranean is pushed towards N, determining abundant snowfalls and violent snowstorms in south-eastern Romania.

In summer, more precisely in July, the general circulation of air is mainly determined by three centres of atmospheric action; the Azores High being the most important since its extentions grow larger than in winter because one of its ridges covers most of western, central and southern Europe. On its turn, the Iceland Low gets deeper, but less extended than in winter. The eastern parts of the continent are influenced by a thermal low centred over the territory of Iran. Resulting from this pattern of air-pressure distribution, Romania lies between the Azores High and the SW-Asian Low, and because of lower pressure gradients, the advections of humid air from the Atlantic are slowlier. There are, however, situations in which local thermal lows develop over Transylvania and the Romanian Plain, thus stimulating the western air-flows and activating the fronts moving from the Atlantic Ocean. As upper air flows from the W, as the ground air does, the air-masses are more vertically homogenous and, consequently, cloudiness is lower than in winter.

Besides the two main patterns of mean atmospheric pressure distribution, characteristic of winter and summer months, there are also intermediary and particularly distributions that are, nevertheless, less frequent, but determine noticeable weather changes in Romania.

The climatic conditions resulting from the specific combination of all the three main factors influencing climate in Romania, determine the identification of three main types of climate, with three corresponding climatic regions.

A climatic compartmentalisation of a certain territory (continent, country etc.) may be really useful only if it is integrated into a global classification of climates, meaning that they must use common language and criteria, at least when establishing and contouring the major taxonomic units.

In Romania, the studies meant to establish the climatic regions at national scale have led to the (so far unanimously accepted by specialists) identification of four main types of climate.

In 1960, Ştefan Stoenescu publishes, both in *Romania's Geographical Monography* and in his lectures on *The Climate of the Popular Republic of Romania*, a climatic regioning that identifies: *a province sector with moderate-continental climate* (inside the Carpathian arch); *a province sector with continental climate* (outside the

Carpathian arch); *a sector with mountain climate* (in the Carpathian mountains) and *a sector with maritime climate* (on the Black Sea coast and the Danube Delta). The only, not to be neglected, difference between the two climatic regionings is that the lecture notes simply call the *province sectors* as *sectors,* without mentioning whether they fall into a distinct higher taxonomic unit, as their name as *province sector* is suggested by *Romania's Geographical Monography*.

There are also older paper-works in which the climatic regions outside the Carpathian arch are included in the so-called *sector with excessive-continental climate*.

But none of the world's main climatic classifications identifies provinces or regions with moderate-continental or excessive-continental climate that might include the corresponding climatic sectors in Romania. Moreover, since most of Romania's territory lies in the mid-latitude zone, one may infer that the *sector with moderate-continental mid-latitude climate* wholly lies inside the Carpathian arch, meaning that a tautological expression is used to denote the respective taxonomic unit. Neither the name of *sector with excessive-continental mid-latitude climate*, which has often been used by some specialists to describe the climate of the regions lying outside the Carpathian arch, is more inspired, since it is difficult to admit that the particular characteristics of this type of climate may be both *moderate* and *excessive*. On its turn, the characteristics of the *sector with maritime climate* are farther from those of the maritime mid-latitude climate than from those of the semiarid mid-latitude climate.

The climatic compartmentalization published by Octavia Bogdan in *Romania's Treatise on Geography*, volume I — "Physical Geography" (1985) tries to make one step further, especially by detailing the causative classifications. She consequently identifies six main sectors of climatic province in Romania, namely: *I-with oceanic influences; II-with sub-mediterranean influences; III-with influences of transition from oceanic and sub-mediterranean climate to arid climate; IV-with arid influences; V-with Baltic influences; VI-with seaside influences*. Therefore, the lady-author starts from the premises that, in Romania, *more climatic influences interfere because of the moving air-masses that are blocked on one or the other side of the Carpathian chain, consequently delimiting east-continental, west-oceanic, south-mediterranean and sub-mediterranean, northern-Baltic and south-eastern seaside climatic provinces extending farther beyond the country's borders.* All these provinces (and their Romanian sectors included) identified on account of the general circulation of air, are integrated into the continental mid-latitude climatic zone, *as being determined by the world distribution of incoming solar radiation.*

The first objection to this cclasification of climatic regions is that the respective *climatic provinces* can't be found in any significant climatic classifications; they merely representing only physical-geographical provinces. One may also object to the *sub-mediterranean influences* that actually represent Mediterranean influences, because the air-masses carrying the respective influences are formed in the basin of the Mediterranean Sea and not in its peripherical regions with sub-mediterranean climate. On their turn, *the influences of transition from oceanic and sub-mediterranean climate to arid climate* don't fully justify the separation of a province sector as the entire Romanian teritorry is characterised by a mid-latitude climate of transition. Neither the name of the *sector with arid influences* is suitable in the context, both because it disturbs the homogenous taxonomic criteria (by indicating the quality of the influences instead of their origin) and because it is the semiarid (not arid) type of climate that results from the respective influences, its spatial extent being restricted to a much smaller area than that of the sector under debate. Moreover, the greater dryness of the *sector with arid influences* can't merely and decisively be explained on account of the continental air-advections from NE, E and SE, because their frequency is much lower than those from NW, W and SW. And the fact that the north-eastern winds, being more prevalent in the respective sector, don't blow from arid or semiarid regions, simply fails to substantiate the name of the sector under debate. The inclusion of all *the province sectors* in the *continental mid-latitude climatic zone* (instead of the mid-latitude climatic zone) is really misfortunate because it opposes to the separation, on the Romanian territory, of a sector falling into *the west-oceanic province* (which should simply be called solely as western or oceanic province since it refers to the entire northern basin of the Atlantic Ocean and not only to its western part) as, in this case, it is supposed that *a west-oceanic province* is also included in the taxonomic subdivisions of *the continental mid-latitude climatic zone.* And this makes no sense.

The problem is similar for the sector falling into the *south and sub-mediterranean climatic province*. If, on the contrary, the six sectors are not integrated into the previously-mentioned climatic provinces, being only influenced by them (as the expression *with ...influences* might suggest), then they shouldn't be called as *sectors of climatic province*, but simply as climatic sectors, although they should have been integrated into some taxonomic units of higher rank. Finally, the identification of a *continental mid-latitude climatic zone* implies that *the oceanic mid-latitude climatic zone* lies to different latitudes and not to the extention at similar latitudes of the former zone, as it really happens in reality.

By doing a climatic compartmentalization of the Romanian territory (lying on a definite area), the lady-author fails to identify a sector with mountainous mid-latitude climate (probably because she couldn't integrate it into one of the provinces *extending farther beyond the country's borders*?). Furthermore, it is quite inexplicable how two of the country's areas (one being located in the northern grouping of the Eastern Carpathians and the other one, in the Western Carpathians) have totally been omitted by the respective classification, as if they weren't included in the Romanian territory.

The climatic compartmentalization under debate is accompanied by an altitudinal climatic classification which doesn't wholly fit into the context. The latter classification divides the Romanian territory into three climatic regions (although the notion of *climatic region* implies some continuity and, yet, the regions identified by the author are divided into separate fragments): the plain, hills and tablelands and mountain regions subdividing into further 13 climatic sub-districts, 24 climatic districts and 78 complex topoclimates that are described as if the horizontal regioning (with its six climatic province sectors) were totally unimportant. Moreover, the urban topoclimates fall into the same taxonomic unit as the plain, hill and mountain topoclimates.

The analysis of the main world's climatic classifications, accompanied by a thorough assessment of the climatic characteristics resulting from the specific interaction between the various climatic factors in Romania, leads to the identification of three main types of climate with corresponding sectors: **the sector with mid-latitude climate of transition** (between the oceanic mid-latitude climate and the continental mid-latitude climate) extending over most of the Romanian territory; **the sector with**

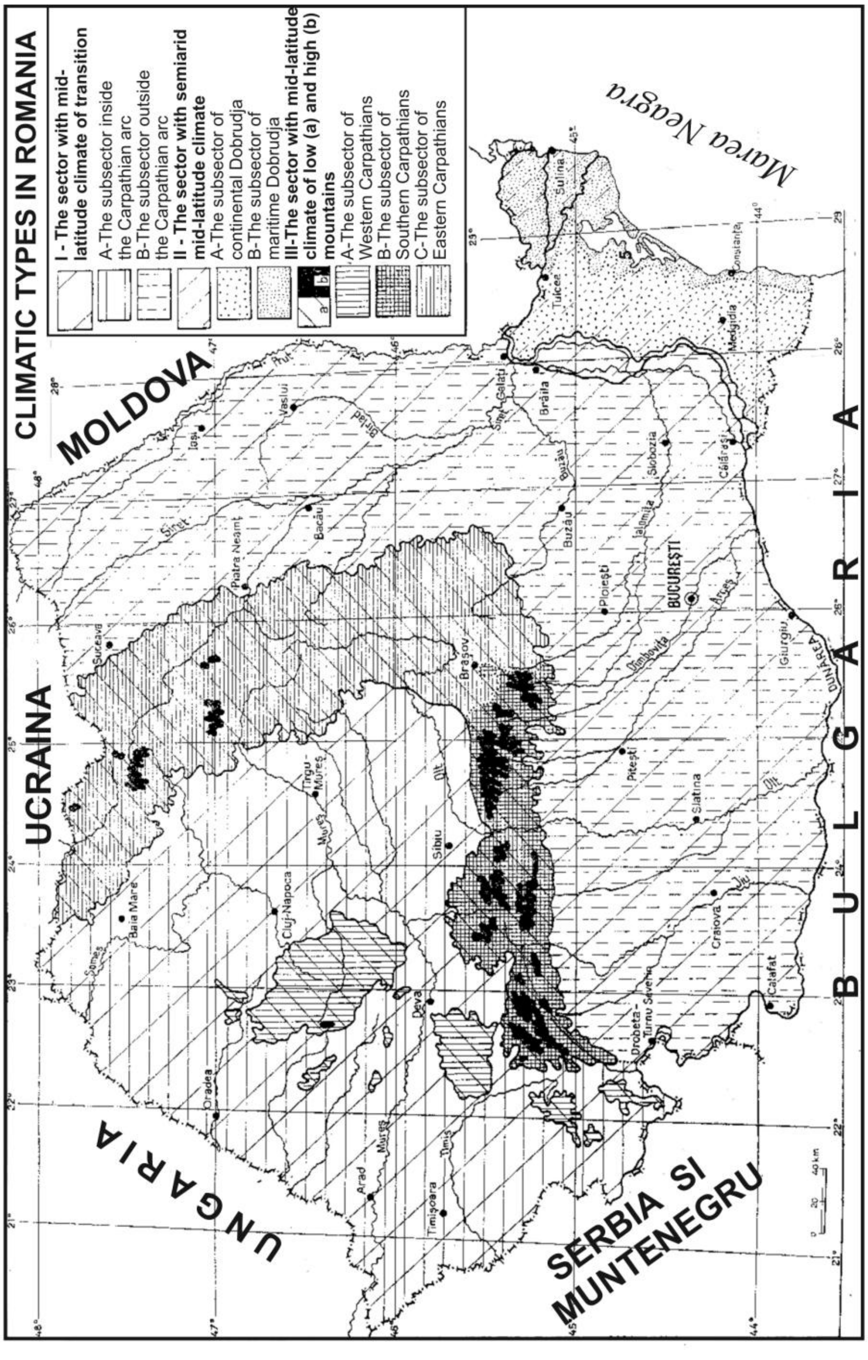

Fig. 1. Climatic types in Romania

semiarid mid-latitude climate (specific of the Dobrudjan Tableland) and **the sector with mountainous mid-latitude climate** (in the Carpathians).

The identification of the previously-mentioned types of climate is advantageous not only because it is fully concordant to reality, but it also eliminates language improprieties blurring clearness and precision which are essential requirements of scientific texts.

As one may notice on the map of the climatic compartmentalization in Romania (Fig. 1), the sector with mid-latitude climate of transition divides into two climatic sub-sectors which are separated by the Eastern and the Southern Carpathians; the former sub-sector including the regions lying to the N and to the W of the Carpathian Mts. and the latter, the regions lying to the E and to the S respectively.

On its turn, the sector with semiarid mid-latitude climate divides into the subsectors of continental and maritime Dobrudja. In the latter case, the characteristics of semiarid mid-latitude climate interfere with the features of the maritime mid-latitude climate which fail to become prevalent so that one can't speak of a typical maritime mid-latitude climate.

Finally, the sector with mountainous mid-latitude climate can be divided into three subsectors with distinct features, due to their geographical position, orientation, height and specific forms that have interacted with the incoming solar radiation and the general circulation of air over Romania. The three mountainous subsectors are the Eastern, the Southern and the Western Carpathians, respectively.

By detailing this compartmentalization, one may also distinguish further climatic regions (in subsectors), climatic sub-regions (in regions), climatic districts (in sub-regions) s.o., depending on necessity, on one side, and on possibility, on the other side.

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GEOMORPHOLOGICAL RISK IN ROMANIAN GEOGRAPHICAL RESEARCH. A THEORETICAL AND APPLIED VIEW

FLORINA GRECU, MIHAI GRIGORE, LAURA COMĂNESCU

1. Conceptual framework

Concerns for and interest in *geomorphological risk* nowadays, as emerging from publications or congress and symposium, debates, etc., illustrate the diversity of viewpoints in defining the theoretical, conceptual framework of the problem. However, they all accept the existence of extreme phenomena with direct, immediate or remote impacts on human society. In the beginning, the highlight fell on some natural phenomena considered to be extreme, and defined as natural disasters.

Disputes usually focus on the notions of *geomorphological hazard and risk*, given their etymology and perception in everyday speech. In our view, analysing hazards is someshow synonymous with analysing risk phenomena, because both have severe negative effects on the population and are basically dangerous, being also labelled dangerous phenomena. Whenever the dynamic of a phenomenon or hazard surpasses critical values producing damage to society, we are dealing with risks, estimated in quantity by such notions as great, moderate, small, etc. Geomorphological risk phenomena also have a negative connotation for landform, that is, they are a risk for nature, and indirectly have negative consequences for the population over the time, by affecting the productive potential of land, people's health, etc. Let's define the content of some notions designating phenomena with negative repercussions for the population.

Hazard represent a situation (favourable or not) usually occurring in unknown circumstances; it is equivalent to unpredictable event, fate, destinity. Hazard also implies the probability for a phenomenon, or process to appear, often associated with extreme manifestations, signifying that certain thresholds or critical intervals have been superceded, that there is a transition from one state to another, from equilibrium to disequilibrium.

Hazard can be viewed as anticipating risk. Hazardous manifestations are very diverse in respect of quantity and quality, producing disorder, imbalance in the system of environmental evolution. Looking at the Earth's geospheres as a whole, it appears that any phenomenon might be a hazard. Hazard turns into risk the moment it affects man or a human (social) community. Mac and Petrea (2002) define hazard as an *objective, lawlike necessity,* the source of an extreme event associated with discharge of energy and likely to occur at any hardly predictable moment; its main significance is disruption of the linear trend of evolution.

Risk is generally perceived as a manifestation of phenomena and processes in connection with their effects on the human (social) community. Here are some basic features af the geomorphological risk phenomena, that vary in period of manifestation and spatial dispersion; most geomorphological risks are those occurring continuously (however, continuity should be accepted with a certain degree of precaution, because it works only in exceptionally few cases). Geomorphological risk is due mainly to soil falls, topples, rockfalls, big snow movements incorporating stones (avalanches), and massive landslides.While geomorphological risk has initially a negative effect on nature itself, in time its consequences are detrimental for man as well. There are cases when this type of risk is confined to nature alone, without damaging society in any way. Criteria of hazard (risk phenomena) classification:

- *charactersitics and impact* (Frampton *et al.*, 1996 in Grecu, 1997), the indexes used afford appraisals on a maximum-to-minimum value scale by calculating variables of intensity, duration, area size, loss of human life, social effects, movement velocity.
- *the natural phenomenon viewed as extreme event* refers to terrestrial physical processes that can materialise into meteorological, hydrological, geophysical and geomorphological hazards, as well as hazards triggered by biological agents (epidemics, pest invasions). This criterion also includes the origin of a hazard, for example, natural hazards, distinguished in terms of the extreme event (geophysical, meteorological, climatic, geomorphological, geological, hydrological, complex) and biological hazards (floral, faunistic);
- for many researchers, the hazard-generating environment: (marine, coastal, insular, continental, complex), or possibly correlated with the Earth's covers, also including rather exceptional phenomena, is a reliable criterion

Here are some relevant examples:

- atmospheric hazards (hailstorms, tornadoes, hurricanes, lightning, tropical storms);
- seismic hazards (connected with faults, earthquakes, after shocks, tsunamis, seiches);
- geological and hydrogeological hazards (rock avalanches, landslides, submarine slides, rockfalls);
- hydrological hazards (floods, desertification, salinisation, erosion and sedimentation, overflows);
- volcanic hazards;
- natural fires;

Size of damaged area outlines global, regional and local natural hazards. In our opinion and in the light of the notions used, this criterion is not very relevant. The last two criteria are also very relative, even though their structure englobes subordinated criteria (possibility, velocity, precision of prediction within useful time), depending on which some natural hazards are unpredicted, or can be predicted only shortly before they occur. The same for the criterion of hazard frequency scale within a given area (very frequent, frequent, rare, very rare); since assessment limits are missing, the issues are devoid of probability. By and large, risk phenomena fall into three big categories: technologic, anthropic, social, natural, ecologic or geographic. Insofar as natural, geographic risk phenomena are concerned, it should be remembered that, although they are presented separately, in terms of the dominant phenomenon or cause, yet they are intertwined, which leads to distinguishing the following large groups of hazards (risk phenomena): geological (risk phenomena triggered by endogenous processes); geomorphological and soil degradation; atmospheric and hydric; biotic (Grecu, 2004).

Vulnerability should not be perceived as a manifestation of the state of geomorphological risk. The term expresses a certain degree of exposure both to natural processes and phenomena and to man-induced ones. Its functional framework should not necessarily produce casualities and material damage. An acceptable modality to assess vulnerability effects remains percentage quantifications (0%-100%), with the proviso of specifications and additions being made. Obviously, vulnerability does express certain types, categories of effects, results and consequences, because the very method of percentage losses indicates it. What needs be added is the intensity of vulnerability processes, its degrees of manifestation, the low-resistance elements specific to some geographical components, other type of elements, causes and factors, etc., which together are more relevant for a particular state of vulnerability.

Natural disaster in English, ***catastrophe*** in French**,** is defined in the *IDNDR Dictionar***y** (1992) as severe disruption in the functioning of society, causing human, material and environmental losses; and the definition goes on with a bizzare emphasis: which the affected society cannot overcome by its own means. We shall not dwell on aspects of disaster classification, eg., mode of occurrence (sudden or progressive), of origin (natural and man-made). Setting the limits beyond which a hazard becomes a disaster depends on several aspects, criteria as it were: the scale on which phenomena (or their amplitude) is analysed. In this case, too, it is fairly difficult to elucidate what the notion of disaster actually means, because doing it depends on the available information on the subject, and the partial, effective analyses of the phenomena.

2. Characteristics of geomorphological risk mapping

The cartographic representation of the geomorphological risk is by no means a recent preoccupation, although major achievements have been obtained mostly over the past two decades (Bălteanu, 2004). As a matter of fact, not only past beginnings but alo present concerns prove that studying and representing present-day morphodynamic is the first step in assessing and mapping out geomorhological risk. Early cartographies in this domain targeted mainly extreme phenomena, processes and landforms with catastrophic effects, engendering major radial changes in the geographical landscape, loss of human life and huge economic damage through earthquakes, volcanic eruptions, big landslides, typhoons and disastrous floods.

The map of geomorphological risk can be conceived as a generalised synthesis, or analytical representation, illustrating expressive interference among the elements of present and future modelling with highly negative effects, that is, degradation of the geographical landscape and of human life (Grecu, 2003).

Without procceding to a full retrospective view on the subject between 1978 and 2004, one may say that Romanian geomorphologists have shown throughout a constant interest in the theoretical, and partly in the applied character of the issue, some of them conducting local geographical investigations for a long time. In the beginning, Romanian preoccupations in this domain were rather isolated focusing preferentially on small landform and using different methodologies: Cioacă (1975) in the Perşani Mts; Bălteanu (1983, 1986) in the Buzău Subcarpathians; Schreiber (1980) in the Harghita Mts., etc. The necessity for having risk maps was pointed out by Coteţ (1978). In time, such maps were drawn up for the units discussed in Ph.D. theses, but the study methodologies had not a unitary character. Significant contibutions were made by Bălteanu et al., (1994, 1996), Sandu (1994, 1997), Loghin (1997), Dinu (1999), Constantin (1999), Grecu (1994, 1996, 1997, 2001, 2002, 2003), Grecu, Comănescu

(1997, 1998), Grecu, Cruceru (2001), Dinu, Cioacă (1997), etc. Risk maps depicted almost exclussively hill and tableland zones of great agricultural and habitat potential (the Buzău Subcarpathians, the Transylvanian Tableland, the Getic Subcarpathians and Tableland, the Moldavian Plateau).

3. Types of geomorphological risk map

The classification criteria for this type of maps depend on the complexity and diversity of their content, purpose and destination, and methods of representation and scale. In terms of content and destination, risk maps can be partial and general. In regard of method of representation, one may choose area and qualitative background, conventional signs, hachures or a combination of the three.

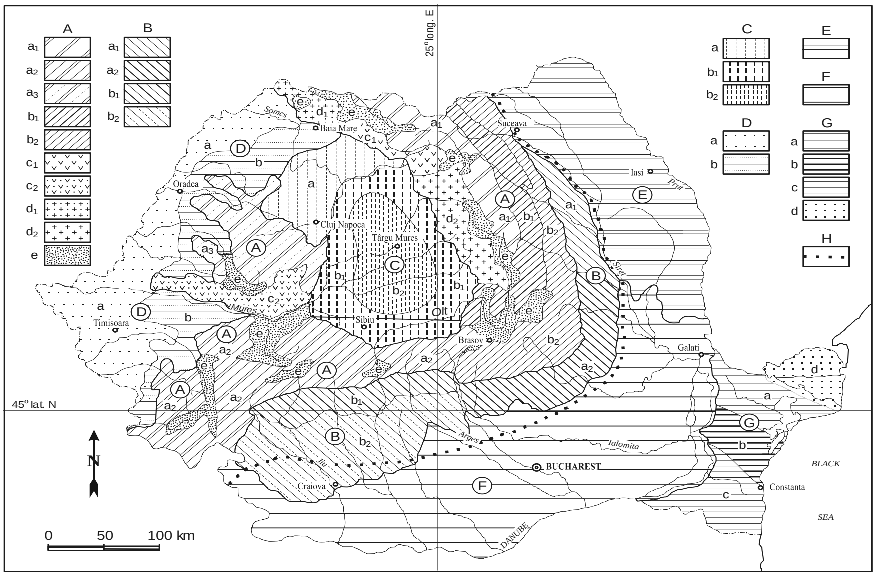


Fig.1 Romania. Map of Morphostructural Units

I. Orogene morphostructural units: A. Carpathian Mountains *a.:* crystalline- Mesozoic sub-units (a_1:Eastern Massif; a_2: Southern Massif; a_3:Western Massif); *b*:flysch-sub-units (b_1: internal flysch; b_2: external flysch); *c*: volcanic – sedimentary sub-units (c_1:Ţibleş-Bârgău Mts.; c_2: Metalliferous Mts); *d:* neovolcanic sub-units (d_1: Oaş-Gutâi-Văratec Mts; d_2: Călimani-Gurghiu–Harghita Mts.); *e:* intra-montane depressions (tectonic or barrage). B. Pericarpathian Hills : *a:* Subcarpathians of Moldavia and of the Bend area (a_1: Moldavian Subcarpathians; a_2: Bend Subcarpathians); *b:*sub-units of the Getic Subcarpathians and Piedmont Hills (b_1: Getic Subcarpathians; b_2:Getic Piedmont); C. Intracarpathian depression of Transylvania; *a*: sub-units of Someşan Plateau; b_1*:* sub-units of Transylvanian Tableland (sector of diapir folds); b_2: central and dome sector; D. Plain (*a*) and Hills (*b*) of Banat and Crişana**.** II. Platform morphostructural units: E. Moldavian Plateau; F. Romanian Plain; G. Dobrogea**:** *a*: Nothern Dobrogea sub-unit; *b*; Central Dobrogea sub-unit; *c*: Southern Dobrogea sub-unit; *d*: Danube Delta sub-unit. H. Dotted line- platform- to- orogene boundary (after Badea *et al.*,1983).

Classification by scale has rather a relative relevance (even if referring to Romania's territory alone).

Utility or practical applicability is a wide-ranging criterion, given the numerous directions, interests and possible solicitations for geomorphological risk information by various social-economic entities.

Mapping geomorphological risk. Working inventory: topographic plans and charts, photoaerogrammes, some geological and hydrogeological maps, morphodynamic maps (with present-day geomorphic processes and the phenomena unleashed by them).Risk maps do not have a unitary structure, because working methodologies are so very different, fact that objectively influences the structuring of the legend. The same results has purpose and destination, which somehow modify the content of the map. Scale remains equivalent to modelling making the legend more unitary in content by adding or dismissing a given volume and type of data to illustrate aspects of geomorphological risk. It follows that the legend sections may differ in point of ordering, number, data included within each section, and extent of detail.

4. Mapping geomorphological risk. Working stages

The modality and phases of elaborating a geomorphological risk map include a succession of research episodes, primarily field surveys. Methodological details can be changed in terms of the geographical and geological traits of the surveyed area.Working stage (Grecu, 1997, 2002a): analysis of the morphodynamic potential, analysis of present-day geomorphic processes; regionalisation of morphodynamic factors and processes in relation to quantitative variables and field mappings.

The morphodynamic potential implies analysing the geological, geomorphological, climatic, hydrological, biological and anthropic factors.

Analysing geomorphological processes means basically making a complex approach to the modelling dynamic of various genetic categories of landform, expressed in quantity (by risk state indicators) and in quality (essentially by mapping out relief processes and landforms). In cartographying geomorphological risk maps one uses, beside direct mapping on the ground, also maps of present-day geomorphic processes (as types of morphodynamic maps), of relief energy, of relief fragmentation density and of slopes.

Other quantitative values might be used, too, for example, these yielded by a manysided analysis of the drainage network. Any data (hydrological, geophysical, pedological, cadastral sketches, various engineering information)liable to adding to clarity and complete the representation are useful complementary elements.Whether synthetic or general, and analytical, geomorphological risk maps reveal both the current relief dynamics, signs of change and moreover leaps, disturbances, imbalances, often accelerated, induced by morphogenetic phenomena and processes, that also engender specific landforms.

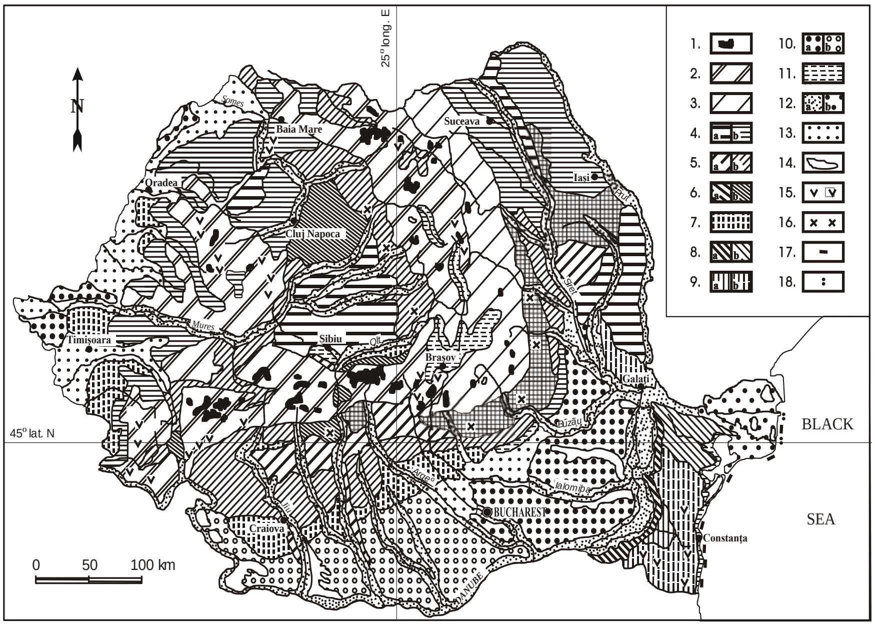


Fig. 2 - Romania. Map of present- day geomorphic processes.

1: Cryo-nival, eolian and rilling processes; 2: fluvial-gullying, rockfalls and topples; 3: fluvial-gullying, landslides and mudflows; 4: sheet erosion and gullying associated with mass movements (*a*, intense; *b*,moderate); 5: gullying and sheet erosion associated with mass movements; 6: mass movements associated with gullying and sheet erosion(*a*, intense*;* *b*, moderate); 7: mild and moderate sheet erosion only in the valleyside. 8: sheet erosion and gullying, asociated with piping: intense *(a);* moderate (*b*); 9:sheet erosion associated with piping: intense (*a*); moderate(*b*); 10: down-sagging and piping (*a*) associated with mild erosion in the valley sides(*b*); 11: colluvial, proluvial and alluvial accumulation; 12: fluvial accumulation (*a*), fluvial, mineral and biogene (*b*); 13: fluvial accumulation during exeptional floodwaves, local water stagnation; 14: wind- induced deflation and accumulation; 15: dissolution of carbonate rocks; 16: dissolution of salt; 17: abrasion; 18: coastal accumulation (after Badea *et al*., 1983).

5. Map of geomorphological risk on Romanian territory

5.1. Conditioning factors

Geomorphological risk in this country is governed by a complex of factors as follows:

-*geological*, involving big morpho-structural and petrographic units, eg. the Carpathian and the Subcarpathian orogene, depressions and subordinately piedmonts and plains (fig.1);

-*seismic***,** particularly active, with violent earthquakes, disasters in their own right (eg. magnitude< 7º on the Richter scale in the years 1940, 1977 left 1,570 people dead, 11, 275 wounded, and over 2 billion USD worth of damage);

-*climatic*, very diverse manifestations of specific variables. This factor is involved in triggering geomorphological processes, with daily, monthly, seasonal and annual variations of different intensity.

FIG. 3

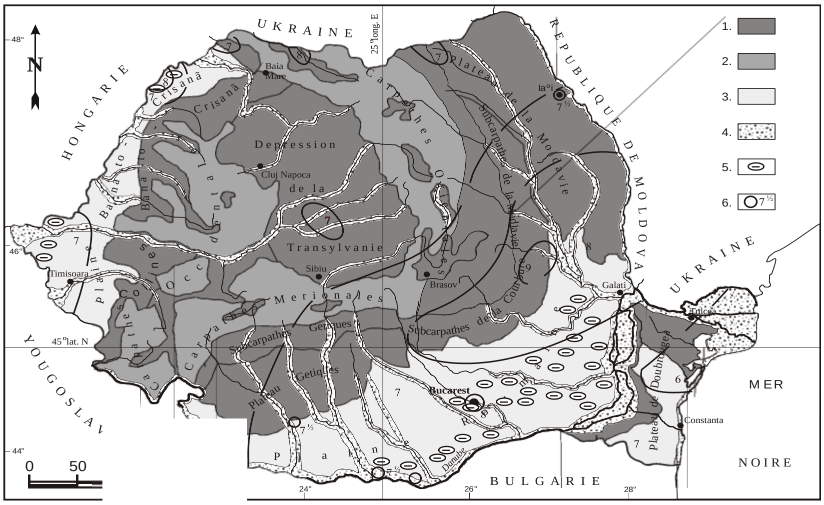


FIG. 4

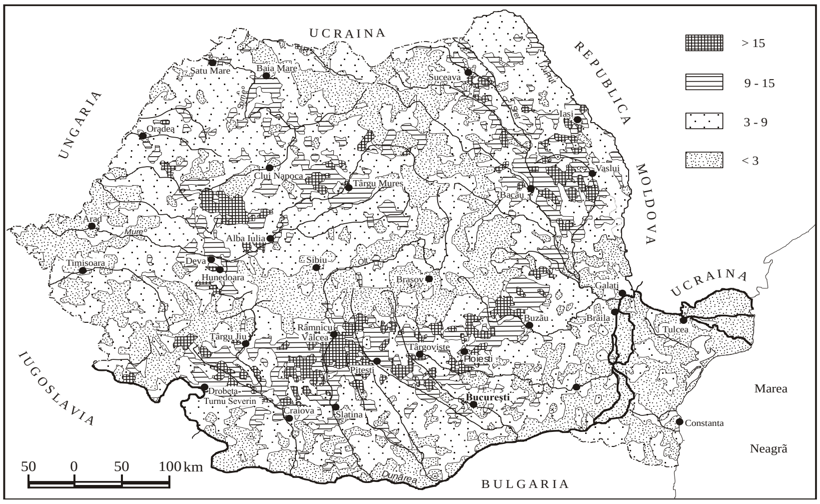


Fig. 3 Map of geomorphic risk in Romania.

1. high geomorphic risk, 2. moderate geomorphic risk, 3. low geomorphic risk, 4. high risk of channel/related processes (periodic looding), 5. high risk of down/sagging and piping, 6. seismic line

Fig. 4. Map of settlements density (10 people/km.sq)

When determining these factors, *several modelling systems* can be individualised in connection with the geomorphological risks in this country, with several relationships between these modelling systems and the relief risk categories. In terms of Romania's territorial particularities, the following modelling systems have been outlined (fig.3):

-*the cryo-nivation system (periglacial)*corresponds to the alpine and subalpine Carpathian space, affected by cryoclastic processes of disaggregation, nivation and cryo-nivation, and frequent avalanches;

-*the pluvial system* models the relief of the major units through splash erosion, especially on slopes and contact surfaces;

- *the torrent and the fluvial systems* are characteristic of hills and tablelands. Gullying is paticularly active in soft rocks, also in some mountainous sectors dominated by sedimentary formations;

- *the fluvial system* is peculiar to mountain, hill and plain regions and is at high risk from silting, braiding, subsidence in the plains and floodings;

- *the gravitational system* is active in all slope-governed relief units and sub-units; on the vertical plane it acts in areas subjected to mass movement- triggering processes of various intensities and duration;

-*the maritime system* is specific to the Romanian Black Sea Coastline, prone to the action of waves and currents, abrasion and accumulation;

-*the aeolian system* is manifest in sand-covered areas (cca 540,000 ha, of which 100,000 ha of shifting and partly shifting sands); winds are also specific to the barren lands of the high mountain zones;

-*the anthropic system* is overridingly present, its intensity varying from one region to the other and from one relief step to another. Its change-induncing impact is particularly severe in hill and tableland regions, but also in the very densely populated plain regions (fig.4).

5.2. Geomorphological risk and typology of Romania's geographical landscapes. Elements of regionalisation

Generally speaking, types of lanscape in this country show some essential characterstics. Thus, the big geomorphological units, corresponding by and large to the main morphogenetic steps, are somehow matching the specific distribution and grouping of geomorphic risk forms and processes. However, the grouping and distribution of risk within these big geographical categories of landscape is not strictly individualised. There are obvious similitudes among them, just as there are spaces with elements of interference (strips, areas); such spaces exist also in regard of the geomorphological risk; the latter can be considered as regionalisation sub-units for the geomorphological risk, too.

The criteria used to regionalise the functionality of geomorphological risk elements by relief units and sub-units must have the necessary specifity and quality to facilitate compartmenting and individualising these elements. The regionalisation divisions outlined here in are based on the following criteria: risk chronology (oldness); specificity of dynamics or evolution of risk elements; duration and intensity of geomorphological risk processes and phenomena; magnitude of risk; potentially active and passive (geological, geographical) factors and anthropic factors .

The Carpathian Mountains. This unit runs a moderate geomorphological risk, it being dominanted by cryo-nivation and fluvial-torrential processes. Cryo-nivation is specific to the alpine zone (above 1,700 m. alt.), on the Upper Pleistocene substrate of glacial processes. Intense fluvial-torrential processes are characteristic of the wooded sub-alpine belt, being associated with landslides in Cretaceous and Paleogene flysch areas (photo. 6).

Landslides have a different genetic substrate, evolution, age and morphology; avalanches represent an imminent and frequent risk enhanced by the practice of tourism. The above risk processes have a distinctively different frequency, duration and intensity, therefore they should be analysed in greater detail. Density of human settlements: 3/100km^2, 3-9/100km^2 in some depressions and even more in the Apuseni Mountains.

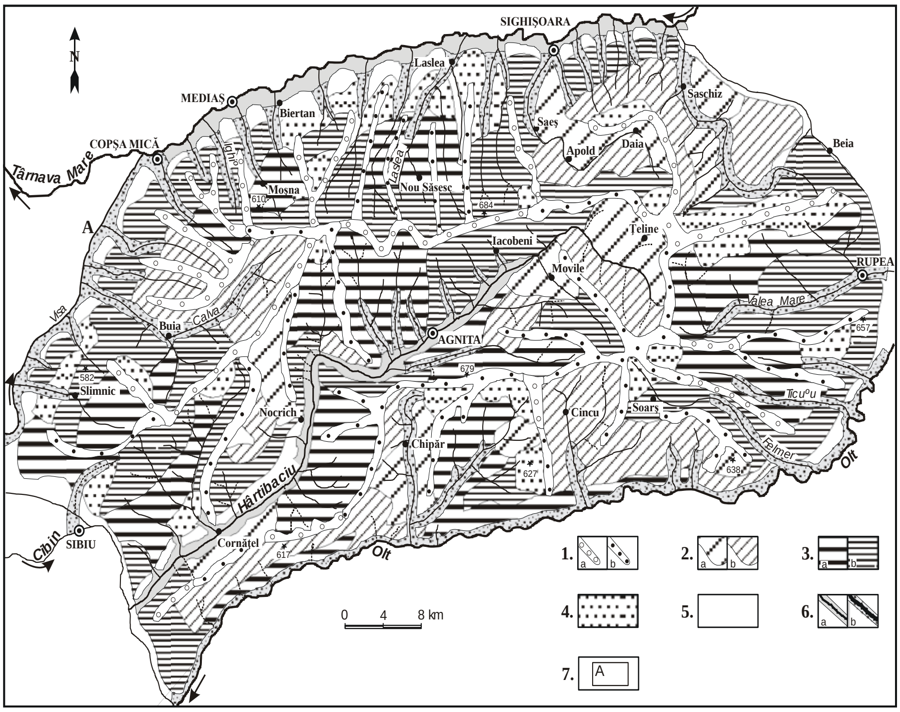
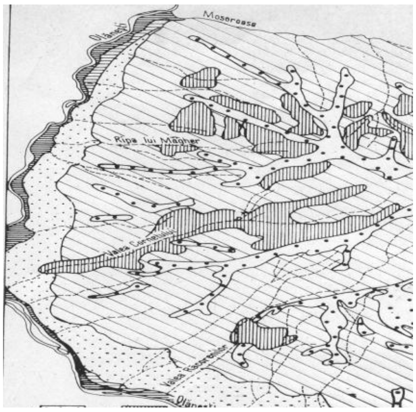


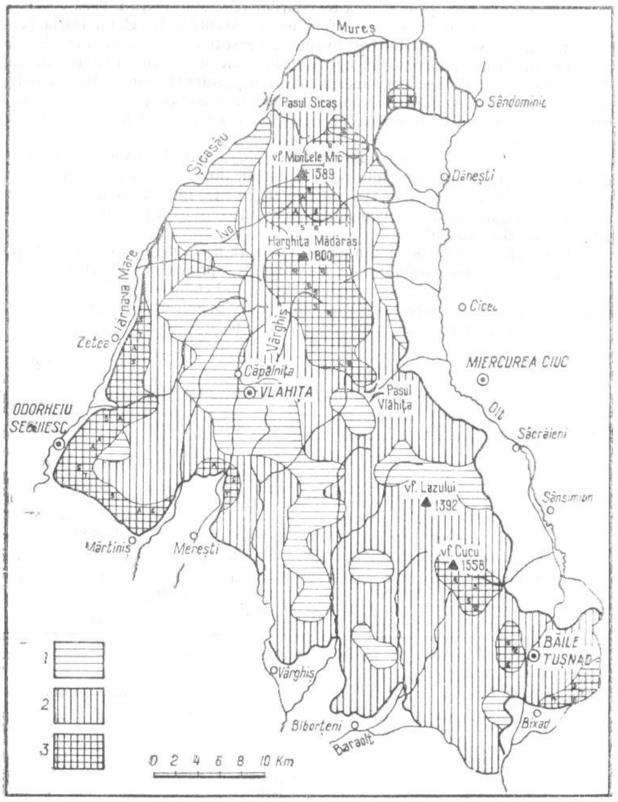
Fig. 5. Different types of risk map in Romania

5 a - Map of geomorphic hazard in the Hârtibaciu Tableland. (after Grecu, 2002)

1: Hazard-free aforested summits *(a);* low hazard deforested summits narrowed by the extension of headward ravines and landsliding *(b)*; 2: slopes at high hazard from: monticle-like (glimee) landslides thick of 5–20 m, sometime over 20 m *(a)*; deep landslides, frequently associated with gullying *(b)*; 3: slopes at moderate hazard from: annual reactivation of deep slides and of gully source areas *(a)*; gullying associated with rock-and-soil falls *(b)*; 4: slopes at low hazard from periodic reactivation of sliding and reduced sheet wash; 5: hazard-free slopes; 6: alluvial plains at high hazard from channel processes (periodic flooding) *(a)*; at moderate hazard *(b)*.



5b — Vlădeşti test area (Getic Subcarpathians). Geomorphological risk map. 1: slope with underground water near surface and little risk of landslide triggering; 2: crests with little risk of landslide triggering and with possibilities of landslides scars and gully heads reactivations; 3: slopes with a medium risk of landslides and mudflows triggering; 4: slopes with a great risk of landslides and mudflows triggering; 5: alluvial plain with a medium risk of flooding; 6: alluvial plain with a great risk of flooding (after Bălteanu,Cioacă,Dinu, 1989).



5c — Map of geomorphic risk in geographical landscape of Harghita Mountains (after Schreiber, 1994) 1: low risk at anthropic intervention; 2: natural equilibrium in imbalance, high risk at anhropic intervention; 3: natural equilibrium in great imabalnce, very high risk at anthropic intervention; R: slide rock intervention; S: sheete erosion; T: gully erosion; A: landslides

Hills are a high-risk unit to present-day processes of great intensity, density and diversity. Differentiations exist between various hilly compartmenst, in terms of the type of risks they are prone to:at high risk from torrential erosion, are the Getic Piedmont, Tutova Hills, and the Argeş Hills; at high risk from landslide associated with gullying, mudflows, sheet erosion are the Curvature Subcarpathians, the Moldavian Plateau and the Transylvanian Tableland (fig.5a,b). The degree of landslides risk is very high and high in the Moldavian Plateau (Suceava and Central Moldavian Plateaus and Jijia Plain), the Transylvanian Tableland, the Subcarpathians and the Carpathian flysch areas (photo 6). At moderate risk from present- day geomorphic processes are the Getic Piedmont and the West Hills. In these regions there is the greatest density of settlements, from 9-15 to over 15/100km^2.

The low tablelands and plains as a whole at are small risk from present-day geomorphic events except for channel and aeolian processes, down-sagging and subsidence which are a high risk. Density of settlements:9/100km^2.

The Danube Delta and the Romanian Black Sea Coastline have limited and very small geomorphological risks. The Danube Delta is affected mainly by silting and alluviation, and the specific dynamics of some secondary deltas and littoral leveles at the Danube mouths. South of Cape Midia there is intense abrasion.

Photo 6 - High risk in Prahova Subcarpathian

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THE ROLE OF URBAN TRANSPORT IN THE BUCHAREST SUSTAINABLE DEVELOPMENT STRATEGY

GEORGE ERDELI, ELENA MATEI, IRINA CIMPOERU

Bucharest, like other cities, has an urban system which needs continuing evaluation of the human activities impact (EIA-Environment Impact Assessment) in order to establish the best management practice toward sustainability. Each environmental component of the city has a definite role, but the most important is the transport system.

The assessment is a brief view of the transport system in an urban environment (use and transformation of resources) with respect to the carrying capacity, for continuing improving of welfare state of citizens on the long term.

Fig.1 Communist residential area-Crangasi

Fig. 2. Post modern building-Sofitel Hotel

1. Urban components

a. Natural capital of the city

Bucharest is the most important city in Romania and the most complex urban system. It lies between $44^o44'30''$- $44^o14'05''$ North (lat.) and $25^o49'50''$- $26^o27'15''$ East (long), in the Vlasia Plain, on an area of 238 km^2.

Bucharest is situated on flat land at almost 80 m altitude, crossed by several valleys (Colentina, Valea Dâmbovița-22 km length).

The city is under the risk of two types of earthquakes: intermediary (under 80-180 km depth) and normal (5 - 30 km). The degree of seismicity is 8-8, 30 on the Richter scale.

Solar radiation is 2228 hours/year, but it can decrease less than 2000 hours, because of dust pollution. The prevailing air masses come from the east to west and south-west. The average temperature is between 11°C (central part) and 10.5°C (north).The heat island appears in the central-eastern part. The freezing period is shorter in the city (144 days) than in the countryside (165 days).Relative humidity is lower in the city 76%, in the summer under 70%, and in winter 85-90% and there are 40-50 foggy days, especially on the Dambovita corridor and lakes, but “smog” is frequent. Cloud cover is 5.7 (tenth), bigger in November (6.8-7.1), smaller in July and September (3.6-4.2), counting 55 sunny days and 105 cloudy days. The mean annual precipitation varies from the centre (613mm/year) to the fringe (603mm/year).The wind velocity is reduced by building, but it is very strong in several areas, where it forms canyons. The north-east prevailing wind (20 %) and eastern (18%) affects population. Romanian communist politics located the industry in the east and south east of the city, so smoke was carried into.

Three types of microclimates were identified:

- Heat islands with high temperature, lower relative humidity values, low visibility under calm conditions. Changes result from the parks, squares and main roads;
- Industrial zones, surrounding the heat island, with fog, cloudy days.
- Outer residential areas (Progress, Berceni) experience no microclimate changes (E. Dumitrescu, 1973).

Water resources are different**.** Bucharest has an input from the Argeş, Dâmboviţa and Colentina Rivers. The Argeş River gives 40% fresh drinking water, 70% for industry and the Dâmbiviţa supports 50% fresh drinking water needs. The lakes system offers supplies for drinking, leisure and oxigen. The underground water resources turn into spring or lakes: The Carol Park, Cantacuzino. There are some areas where people use underground water, from over 50 m dept.

The forests have decreased since the V-XVI centuries (Bucharest dates from medieval times). Today we have still 5 % of the former forest. Flora is changed by man. Bucharest’s green space includes public areas with a good management (central parks, public gardens), poor managed (several parks from north, south east), and our out of any ecological management (block of flat gardens). Fauna registered migration, because of the houses demolition during the communist period (dogs, cats) or a bad houses management (mosquitoes, beetles, ants).

Soils are covered by buildings, much polluted, unsuitable for farming or parks.

b. City for people or for cars?

Bucharest is divided into 6 sectors (1 August 1979), different as size and inhabitants (fig.3.), and used most for buildings (table 1.).

Land use in Bucharest (ha)

Table 1.

Type of land use	**ha**
Farming land	5449
-forest	611
-build area	13499
-road and railways	3231
-water	908
-others	89
TOTAL	23787

Over the last 80 years population grew, with the most rapid increase between 1968-1985, followed by a decrease towards 2002. The Birth rate didn't exceed the death rate after 1990. Birth rate is almost 7, 5 per 1000 people per year. The death rate is lower than many Romanian regions, 10 deaths per 1000 people per year.

The population structure is dominated by females (51, 4 %) and ageing people group as the result of labour force migration. Life expectancy is higher than in the country. Bucharest has no language, race or religion conflicts that represent socio-cultural advantages for city's managers.

The pressure of population in Bucharest's land varies (2002). Overcrowded (values are higher than the 10 000 inhab./km^2) sectors are 2 and 3, then 5, 6 (table 2).

In the last 14 years, the number of cars owners increased from 200 000 (before 1989) to almost 1, 000, 000 (2004). In a lack of a good management of land use, cars are parked on the streets or on the pedestrian pavements, giving a climate of chaos and changing the transport function of them (fig.4.).

Shares of population by sectors (2002)

Table 2

Sector	Areas (km ^{2})	Population	Density
Sector 1	70	231 437	3 306
Sector 2	32	360680	11 241
Sector 3	34	391 235	11 506
Sector 4	34	294247	8 654
Sector 5	30	272305	9 076
Sector 6	38	376 430	9 906
TOTAL	**238**	**1 926 334**	**8 093**

Source: National Institute of Statistics

2. Environment impact assessment

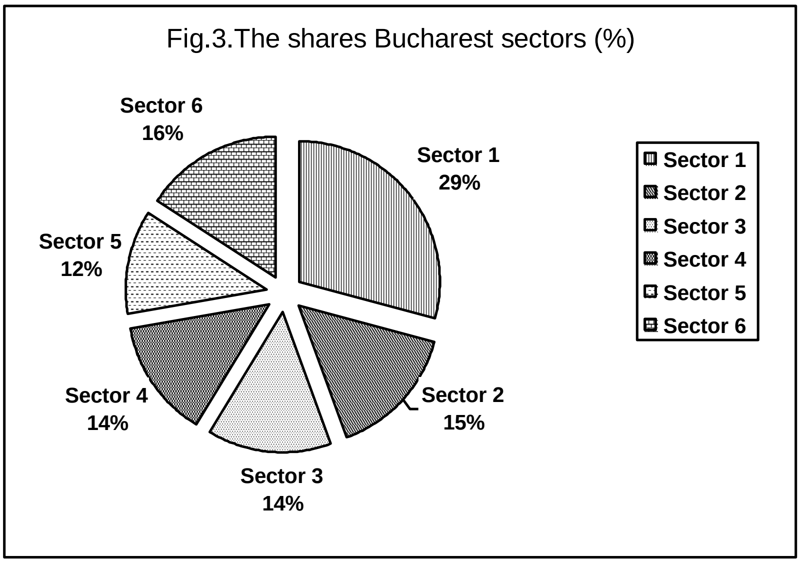
a. Air

- Central Bucharest areas register the highest level of pollution (60 μg/mc comparing with the legal value= 40 μg/mc)
- Sulphur dioxide-SO_2 (2002) come from some coal power stations but the quantity of SO_2 emission is meaningless.
- SO_2 registered lower values than other European cities and very close to Bruxelles or Milano,12 μg /mc.
- The higher values were recorded to Romaero. NO_3 has higher values but is still reduced comparing to other cities, 13 μg /mc, the most polluted point is The Accumulator Plant (table 3).

Noise monitoring on standard reveals that 58% from all samples recorded in Bucharest exceeded sound level.

b. Rivers pollution

- Dambovita water quality varies from I (clean) to III (dirty) near Glina, and Colentina II (National Environment Standards 4706/88). Lakes (Cismigiu, Carol, National, Tineretului, Titan, Morarilo,Vergului) are not very clean (mezosaprobe), registering eutrophication in summer time. Most of them are unsuitable for swimming, containing domestic waste. Water supplies for Bucharest come from The Dambovita and Arges, being unsafe for drinking purpose. It contains ammonia, chlorines. There are some problems of cleaning technology and transport system. 84,2% of population has access to tap water supplies.



- The potential impact of water pollution upon Bucharest's human health increased (330 cases/100 000 inhabitants in 1992 to 480cases/ in 2002.
- Over chlorination induces a potential stomach cancer.
- Water pollution issues occur in ground supplies (15% inhabitants), and Plumbuita, Cismigiu and Bordei lakes contain ammonia and different bacteria.

c. Soil quality

Soil monitoring shows a high lead pollution caused by traffic (312,66 ppm =parts per million) (Piata Presei, Piata Rosetti, Piata Nicolae Grigorescu, Piata Sudului, Street Kiseleff -5 m distance from road comparing to maximum concentration level=100 ppm) and ammonia intake of fertilizers. Sources of soil pollution are: waste management, fertilizers, traffic, industry, buildings, deforestation (table 4.).

Waste is a problem not by quantities, but by a poor management, or the level of education. In a year Bucharest registers 366, 951.85 tons of waste, 151, 460.5 tons come from industry (116, 909.2 tons are recycled), 289, 579 tons are domestic deposed especially to Glina landfill (not very ecological).

Environment Issues

Table 3

Environmental issues	**Conditions**	**Causes**
Nitrogen oxides	NO_2 0,03-0,05 mg/m3, lower than STD level	Vehicle emission (75% non-conformed with environmental Romanian standards =EURO 2)
Sulfur dioxides	SO_2: 0,2 to 0,3 mg/ m3	Transport and industrial activities
Emission	NOx,60% from transport, 85kg/pers/year CO_2, 18% from transport, 4,6kg/pers./year	Automobiles Industrial activities
Urban noise	Roadside, 60-70 db (named A category)	Transport Commercial and industrial activities
Soil Contamination	Lead, 1,2 mg/m^3, fuel sales (leaded 59%, unleaded 7%, others 33,8%	Emission contain lead
Green area degradation	Few green area space per each citizen (12 m^2/pers).	Insufficient parking space Solid waste

The Bucharest Environment Agency Report, 2002

3. Transport system

a. Issues of the roads structure

The road network in Bucharest is basically formed by a radial and ring road pattern. The major roads are the nine radial roads centering on Universitatii Square and the two half ring roads located about 3 and 5 km respectively from the center. These major roads are mainly more than 6 lanes with a width of 21 m or greater. In addition, an outer ring road with 2 lanes is located at the outskirts of the urban area of Bucharest City, and it is mainly used for freight trucks at present.

The total road length in the city of Bucharest is approximately 1,900 km, of which 160 km is trunk roads according to the Municipality.

Land degradation

Table 4

Sectorul	Degradation area (ha)
Sectorul 1	75
Sectorul 2	27.2
Sectorul 3	3.5
Sectorul 4	10.14
Sectorul 5	35
Sectorul 6	30
Total	180.84

Sources: The City Hall Annual Report

The total road area is about 21 square km, about 80% of which is paved with either asphalt (6,348.42), concrete (2,412.64) or stone. Except for the major arterials, the road surface is generally not in a satisfactory condition due to insufficient maintenance work.

Road width generally varies by road section, ranging from 7m to 68 m, but there are many narrow roads, where sometimes sidewalks are not provided. The one-way system is applied to the following main roads (Calea Victoriei).The number of lanes is that they are not continuous over the whole stretch of road. In the case of radial roads, the number of lanes normally does not change or diminish with respect to the distance from the center, corresponding to the traffic volume. Rather, the number of lanes changes irrespective of traffic intensity. This situation is not desirable from the viewpoint of improving traffic flow (fig.2).

b. Traffic Inflow to the Center

At the Outer Ring Road, the total amount of vehicle inflow from the outside of Bucharest is found to be about 61,000 veh./day. At the Inner Ring Road, the total amount of traffic inflow from the outside increases to about 250,000 veh./day, which is more than 4 times the traffic volume at the Outer Ring Road. This fact indicates that although the expansion of the urbanized area is proceeding toward the outside of the Outer Ring Road, most of the densely populated area still remains inside the Outer Ring Road, namely within approximately 8 km radius from the city center (fig.5).

c. Parking Conditions

The parking problem in Bucharest should be analyzed from two aspects: one is the lack of parking facilities in the central area combined with the densely populated residential area and the other is on-street parking, which reduces effective traffic capacity and sometimes can serve as an obstacle for the passage of vehicles and pedestrians.

Because of the shortage of parking facilities, regulations regarding on-street parking are not strict in Bucharest. Generally parking is not prohibited along most streets except for sections designated as "No Parking" or "No Stopping" (fig.4).

Further, parking on the pedestrian pavements is not illegal unless the vehicle blocks the entire width. The traffic volumes of the major roads at the Inner Ring Road are not so different from these obtained at the Outer Ring Road. so, the daily traffic inflow ranges from 15,000 vehicles to 25,000 vehicles.

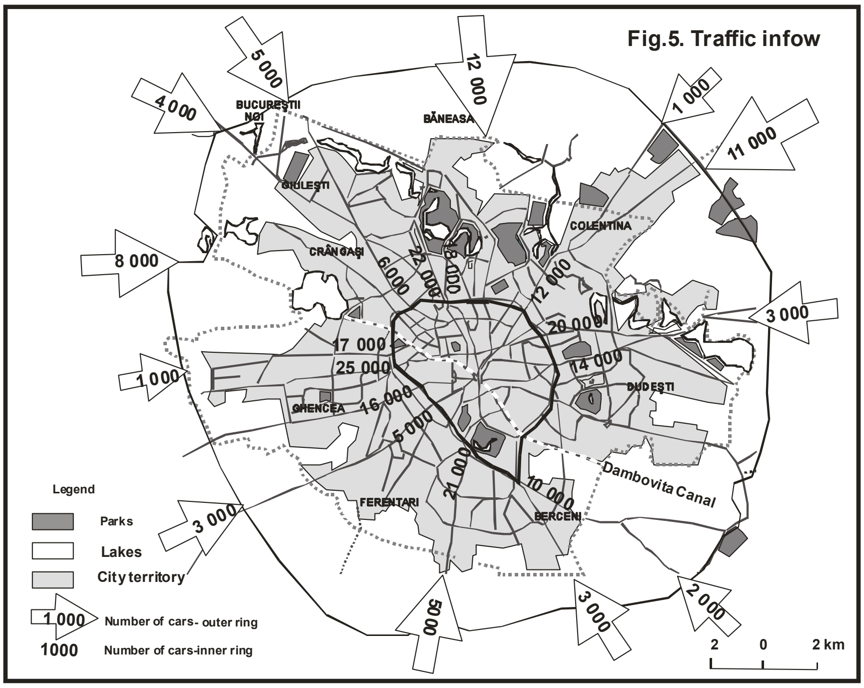
d. Problems by Mode

The problems identified by public transport mode are the following:

a) Metro - There is a route having its terminus in an industrial estate and which doesn't cover the nearly residential area demands;

- The interval of stations is rather long (1,463m on average) which detracts from the availability of the metro;

- Due to the lack of funds modernization of rolling stocks has been delayed, only one route is modernized (M1) which crosses the city from the North to South.



b) Tram- There are some routes which pass through idle industrial land and do not correspond to the transport demand. Two modern routes were realized in the North-Western part of the city.

-Old tram cars and deteriorated tram tracks lower the operating speed and comfort of passengers.

- Deterioration of infrastructure is proceeding due to its insufficient maintenance work.

- Insufficient power supply system curbs the modernization of operation.

- Chain operations with less than one-minute interval is made in some sections at peak periods.

- Total cost per passenger-km is high due to high fleet cost.

c) Trolley bus - Operating speed is low except for trolley exclusive lane.

- Incomplete trolley routes to access the central area exist in the peripheral area.

- Many routes are unprofitable.

d) Bus- Duplication of bus routes by RATB bus and other bus routes to/from “autogara”, passenger facilities are poor.

e) Maxi taxi- The role as an area service public transport is not well defined.

f) Taxi- Taxi meter is not always used and users are then compelled to negotiate the fare and some vehicles are usually old.

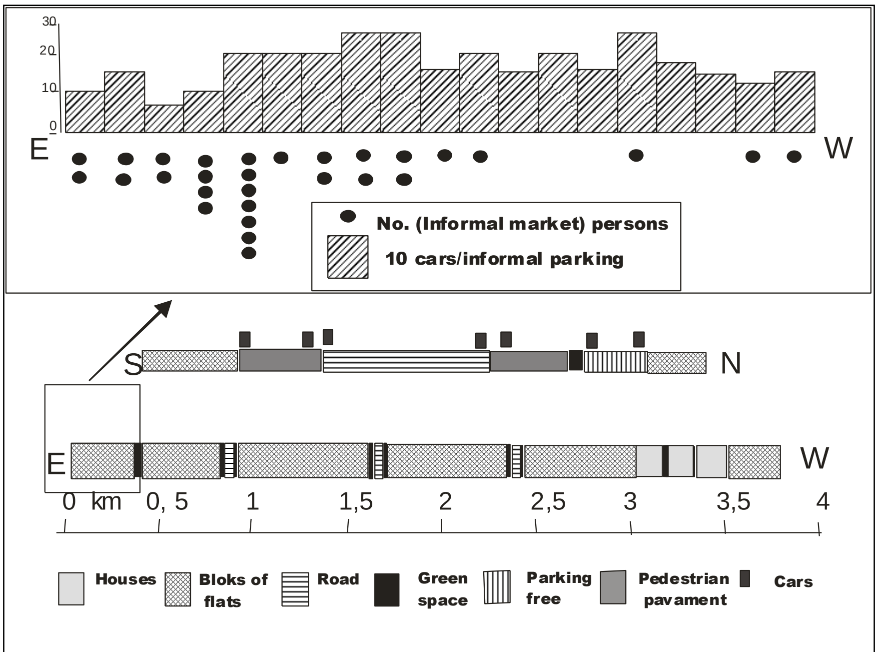


Fig.4. Road transect pattern in new residential areas

5. Problems faced to urban transport

a**.** Sprawl of Urban Area

According to the city map in the 1930s, the built up area has now by about 5-km radius, corresponding well with the principal part of the present built up area. This compact city feature is one of the main structural characteristics of Bucharest. However, recently the sprawl of the housing area can be observed along the major transport axis in the outskirts of the city, so the traffic congestion is getting severe on these major roads because of much dependence on the private car usage.

The transport network is insufficient. The road density of Bucharest is still at a low level compared with other major European cities. Traffic congestion is found in some places within the at the major intersections. The mixed traffic with tram, cars gives the traffic more conflicts at the intersections. In addition, the road network system lacks continuity in terms of road width and functions.

b. Increase in Vehicle Ownership

The number of cars has been rapidly increasing after the revolution. Today there are over 900, 000 cars. In our survey every the average of using car is two persons, instead of four or five. So, we assist to a deterioration of environmental conditions and to a decrease in public transport usage. The number of passengers using public transport systems has been decreasing during past 12 years.

c**.** Mismatch between Transport Supply and Transport Demand.

d. Deterioration of Public Transport Service.

e. Inconvenient Transferring and Ticketing Systems (two types of tickets are used different for metro and ground transport).

f. Dependence on Subsidy.

g. Problems on Traffic Management System (a) Disorderly Parking, (b) Inadequate One-way System (table 5.)

h. Transport and urban regeneration. Defined as all activity designed to combat urban obsolescence and improve social and environmental conditions, including development, redevelopment and improvement, urban regeneration is a priority in Bucharest and it should take place în the same time with the metropolitan development plan.

Sustainable measures required: 1. Reformation of urban structure; 2. Restriction on private vehicles; 3. Revitalization of Public Transport Systems; 4. Car parking infrastructure; 5. Increase in green space; 6. Education; 7. Environment monitoring; 8. Integrate management;9. Growth of the National Economy; 10. Noise control; 11.Community involvement.

SWOT Analyze of sustainable transport system in Bucharest

Table 5

Variables	Statements	Short term 2-4 years	Medium term 5-10 years	Long Term 25-50 years
Strengths	Existing infrastructure	x		
	Bigger GNP and employment than other Romanian cities,		x	
Weaknesses	Pollution		x	
	Lack of money		x	
	Transport, buildings	x		
	Lack of green space			x
Opportunities	Increasing welfare			x
Threats	Political instability, accidents, funds	x		

x How could it affect the people

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THE REGIONALISATION OF LANDSLIDES AND MUDFLOWS IN ROMANIA

NICOLAE POPESCU, MIHAI IELENICZ, MARIAN ENE, FLORINA FOLEA

1 Generalities. Landslides in this country are present in all the relief units. Disparities of type and occurrence frequency are due to complex factors, primarily to rock, slope, fragmentation of relief, deforestation and degree of moisture in deposits. The proportion of landslides within the present-day processes is not the same in all the regions. In the Carpathian Mountains, in the Subcarpathians, in the Moldavian Plateau and in the Hilly Depression of Transylvania landslides are a determinant factor of slope modelling, while in the plain regions they are very seldom recorded (mainly on some river banks) and then associated with other processes.

Potential landslide-triggering factors are the physical–mechanical properties of rock (porosity, permeability, cohesion, friction, shearing and tearing strength), structure (mode of association and bedding of strata with distinct physical–mechanical properties, as well as the binding of the component particles of rocks), slope and vegetation.

The great diversity of structure-controlled and petrographic units in Romania, sometimes experiencing frequent changes over small areas, shapes a variety of potential landslide-triggering aspects (fig.1). Clays and marls, rich in colloids, with numerous cracks and a high plasticity are often favouring this phenomenon. Whenever clays and marls are intercalated between complexes of low-plasticity layers, big mass movements are unleashed that occasionally affect all the valley slopes. Even the weathering of sandstone, limestone, fissured granites, etc. engenders the formation of a crust which, enriched with plastic elements, becomes prone to sliding.

In hill and mountain regions in particular, steep slopes and the scarcity of a forest vegetation felled to make room for grazes, cropland and residental areas stimulate landsliding. However, the type and magnitude of slides depend on rock, slope and the complex triggering forces.

Triggering factors. Landslides occur due to variations in the weight and volume of the masses of rock through materials added from the upper part of slopes; location of socio-economic constructions; moisture variations within the mass of rocks and deposits through oscillations in the underground water sheet of slopes under the action of a precipitation regime, intensity of rains, and links with the stream water level; thermal oscillations (freeze-thaw in the Alpine and sub-Alpine meadows); slope foot erosion in concave-shaped river banks; man-induced sectioning of relatively stable slopes within the residential perimetre and along highways; earthquakes, especially if recorded after alternations of dry and rainy periods.

Most land movements take place right after intervals of increased soil moisture (in spring and autumn; in the aftermath of low-intensity lasting rains, of heavy rains following long periods of dryness, or falling on a highly disturbed relief, of earthquakes and subsequent rains).

2. Regionalisation of landslides

Regions of distinct landslide frequency have been singled out in terms of the interconnection between potential conditions and triggering conditions (fig.2).

Regions of high landslide frequency have a great and moderate potential for the occurrence of this phenomenon. The intense fragmentation of relief, the frequent variations in the weight and volume of rocks, together with the weathering of the cover are as many conditions making slopes highly vulnerable to large-scale slides and mudflows that usually entail over 50% of the slope surface.

The sub-units often experiencing these processes are the following:

The Moldavian Plateau, deeply fragmented by the tributaries of the Prut and the Siret rivers, contains Tertiary surface deposits with a mild South-East dip and a high diversity of rocks (oolitic limestone, sandstone, marls, clays, tuffs, sands and gravels).

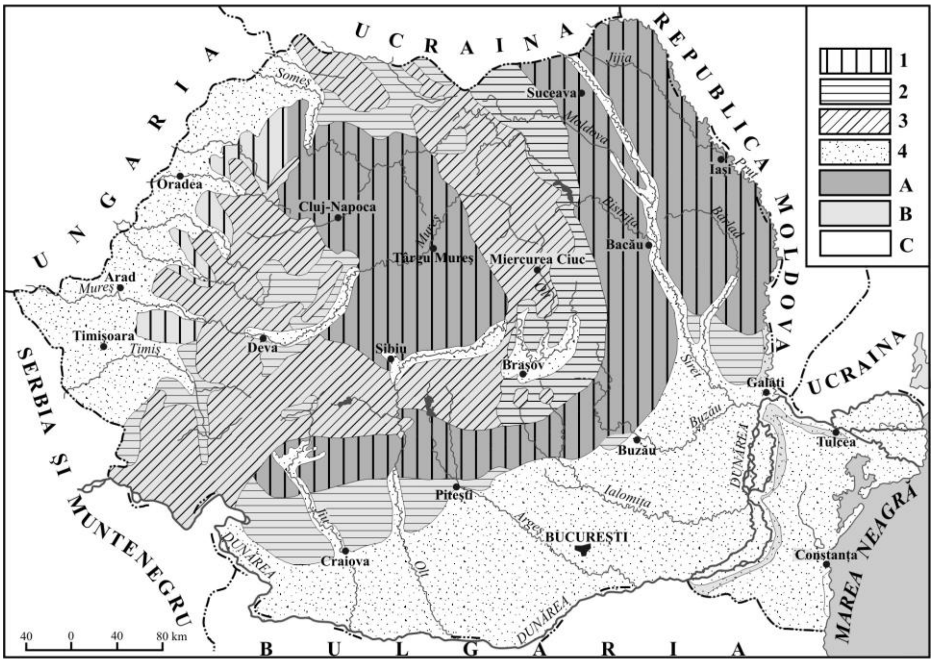

Fig. 1: Landslide potential in Romania. 1. Regions of high potential; 2. Regions of moderate potential; 3. Regions of low potential; 4. Landslide-free or low potential regions.

The way in which rocks are distributed determines the mode in which landslides are grouped and the frequency of their occurrence. For example, the Lower Sarmatian deposits (alternations of sandstone, oolitic limestone, clays and marls), that are dominant in the Suceava Plateau and the Moldavian Plain, account for the high incidence and types of slide on the valley slopes of these regions. In the Central Moldavian Plateau, where thick series of limestone and oolitic sandstone are prevalent, with clay horizons at their base, and local intercalations of clayey sands and marls, there are few landslides compared to other displacements (rockfalls, topples) and their incidence is high in the sectors of thick clay layers. Slides take the form of steps and monticles. In the South of the Plateau, Pliocene deposits exhibit an alternation of sands, clays and tuffs which contribute to unleashing numerous landslides and mudflows. Since rocks are very brittle, movements are of small depth rather than step-like. Displacements by catchment basins sometimes involve the entire slope, also associating the mudflows.

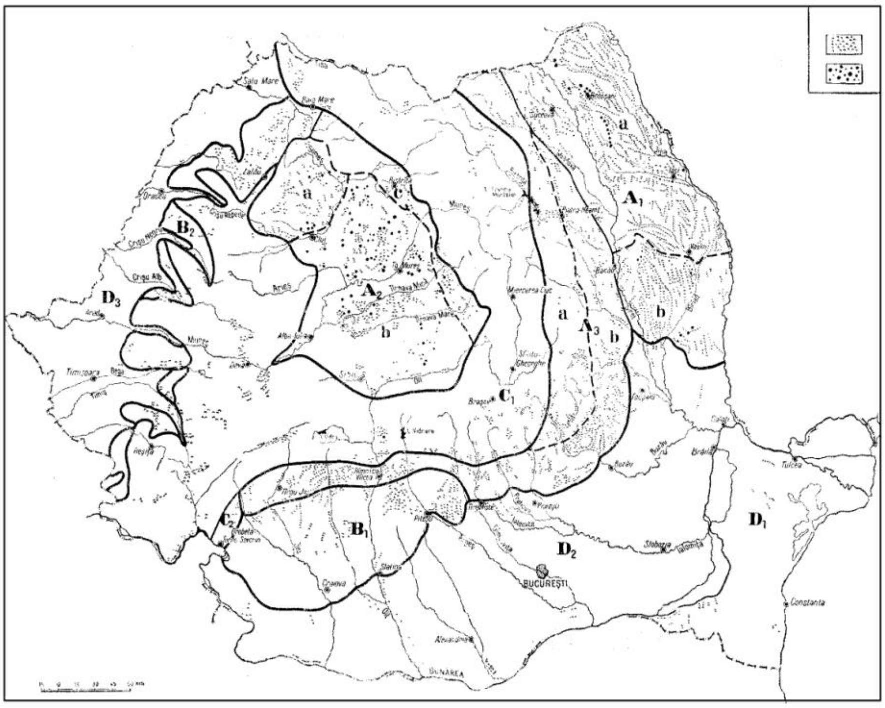

Fig. 2: A regionalisation of the Romanian territory in terms of landslide frequency.
A. Regions of high landslide frequency: A_1. The Moldavian Plateau (a. mainly on Miocene deposits; b. on Pliocene and Quaternary deposits); A_2. The Transylvanian Tableland (a. on Miocene deposits, secondary on Palaeogene deposits; b. on Miocene and Pliocene deposits; c. on Palaeogene, Miocene and Pliocene deposits); A_3. The Eastern Carpathians, the Curvature Carpathians and the Subcarpathians (a. on Palaeogene Flysch in the Carpathian Mountains; b. on Miocene, Pliocene and Quaternary deposits in the Subcarpathians). **B. Regions of moderate landslide frequency:** B_1. The Getic Piedmont; B_2. The West Hills: **C. Regions of low landslide frequency:** C_1. The Carpathian Mountains; C_2. The Mehedinţi Plateau: **D. Regions of very low landslide frequency or landslide-free:** D_1. Dobrogea; D_2. The Romanian Plain; D_3. The West Plain; 1. Active and recent slides; 2. Old slides (Upper Pleistocene-Holocene) with frequent reactivations.

The types of landslides registered in the Moldavian Plateau are intimately connected with the nature of rock and the monocline dip. In its Northern and Central parts, large-scale obsequent slides (some old) with well-marked steps line the cuestas.

On the structure–controlled surfaces slides are consequent, weakly developed and entail thin portions of the layers. Typical movements are the slip-ridges and the mudflows.

There are also other factors beside rock and structure involved in this process on the Plateau, e.g. the intense deforestation of slopes which, deepening the network of torrential valleys weakened the stability of materials, facilitating frequent landsliding. The underground sheet present on various levels due to the alternation of pervious and impervious rocks, as well as the intense moisturing of deposits, mainly in the years when snowmelt coincides with spring rains, contribute to this process.

Mass movements are different in shape. Mounds represent outliaers of the vast Pleistocene landslides that took place in the conditions of a Periglacial climate (V. Băcăuanu, 1968), having been left facing the main cuesta chains (e.g. Cuesta Iasilor on the righthandside of the Prut River West of Dorohoi town); dormant step-like slides (pseudo-terraces), which preserve rather well the geological structure, were formed during the excessively rainy epocks of the Holocene. They are formed in front of the cuesta chains from the South and East of the Moldavian Plain (V. Tufescu, 1961); present-day active landslides, in the form of mounds or heaps, are developed on the valley slopes of the Jijia, Bahlui, Bahlueţ, Sitna and of other streams and entrain significant masses of rock in their movement (they recorded a maximum development at the end of the 19th century, when large forest areas were cleared); local slip-ridges affect the deluvia on the Miletin, Başeu, Jijia, Berheciu and other valley slopes; landslides in catchment basins occur throughout the Plateau, but especially in its Southern part. This type of movement represents a complex form that combines several simple types of slide developing within a secondary valley basin.

The differences encountered between the sub-units of the Moldavian Plateau depend on the density and age of the landslide types. In the Suceava and the Central Moldavian plateaus landslides are old, of the step-like type, some of them dating from the Pleistocene; others are recent, of small depths, forming monticles and extending along the main cuesta lines. They are associated with rockfalls and topples.

In the Moldavian Plain, where clays, marls and sands prevail and slopes have been deforested, landslides are of the simple, small-depth type, occasionally forming monticles.

In the hills of Tutova, Huşi, Lohan and Fălciu, small-depth and sheet slides are customary; large-scale movements are old (Pleistocene), and date to the time when the main drainage net was rapidly deepening and creating instability on slope. More extended active slides relate only to the development of gullies.

In the Hilly Depression of Transylvania there is an obvious link between landslide areas and the spread of certain rocks. Massive slides overlap Sarmatian formations with frequent intercalations of clays and marls with sand, sandstone, conglomerate and tuff layers. Their lower incidence in the Someşan Plateau is due to the presence of thick layers of Palaeogene-Miocene sandstone. The same happens in the Secaşe Plateau, dominated by Pannonian deposits (sands with tuff intercalations).

The occurrence of massive landslides in Pliocene deposits is connected with the deepening of the 2nd – order valley network (the tributaries of the Târnave and the Mureş rivers) and with the erosion of some thick Pliocene and Sarmatian series of clays and marls.

The presence of distinct monocline structures (diapir and domes) shows up in the frequency and magnitude of landslides. The old slides, developed on the sides of the domes (at Dumbrăveni and Telega, in the Transylvanian Plain and the Hârtibaciu Tableland), but especially on the monocline structure, represent the most extended movements, covering hundreds of hectares (615 ha at Saschiz, 825 ha at Movile and 1,550 ha at Saeş), the initially slided mass exhibiting 2-5 parallel rows. Although the old slides that line the cuestas represent deep movements, they affect only small areas, and the dislodged mass, showing numerous slip-ridges, is an indication that this was a several-stage process (fig.3).

In addition to rock and structure landsliding relates to intense logging on the valley slope over the past few centuries to make room for agriculture. The deepening of the secondary valley network also disturbed the slope balance, and the climatic variations, especially the rainy periods begun with the Upper Pleistocene, have all contributed to this situation.

The old, relatively stabilised landslides, the so-called glimee, encountered in the Transylvanian Plain and the Târnave Plateau, are the most extended ones. They are consequent and insequent, long of 2-5 km and no more than 3-5 km wide, with a step-like deluvium, and entail the upper part of slope, seldom reaching down to the channel bed. The analyses made date them either to the Pleistocene or to the Pliestocene-Preboreal age (T.Morariu *et al*., 1964).

These slides are very numerous and extended in areas underlain by Sarmatian deposits, or in the Pontian/Sarmatian contact zone. This type of slides, but of much smaller dimensions, is recorded nowadays mostly on deforested slopes, in the wake of high-moisture periods. Sheet slides involve the deiluvium and sometimes the surface rock layers; they are consequent and widespread mainly in deforested areas.

In the Transylvanian Subcarpathian zone and on the higher hills of the Transylvanian Tableland they usually start in spring, when the snowmelt interval coincides with the rain season. The mass of rock slips on a muddy–gelid plane. The movements unleashed in catchment basins are characteristic of the Târnave Plateau.

The distribution and incidence of landslides is not the same in all the sub-units of the Hilly Depression of Transylvania. Thus, in the Someşan Plateau, present-day landslides are not extended, they involving only the topsoil, or occasionally the deluvial covers on slope; mass movements (glimee) are few and occur at the contact between Buglovian and Sarmatian deposits. Many are of the rotational type, resembling the glimee and generating parallel steps.

The Transylvanian Plain and the Târnave Plateau have a high record of landslide occurrence and diversity (fig.4). The old forms – Pleistocene or Holocene, are well-preserved, contrasting in size with the present-day ones. Beside consequent and insequent glimee, slip-ridges develop as well. The deepening of the network of torrential valleys, especially on steep deforested slopes enthances these processes. Today, the biggest movements take place in the secondary drainage basins and along the cuesta sides.

The Transylvanian Subcarpathian zone is affected both by old slides (glimee) at the contact between sedimentary deposits and the volcanic agglomerations (from Budac to Firtuş) and by small movements of the slip-ridge type on the deforested areas built from Palaeogene deposits (in the North) and Pleocene deposits (between the towns of

Odorhei and Năsăud). The situation is similar in the North of the area, in the Năsăud Hills, on the Brezei Summit and on some slopes of the Lăpuş Depression.

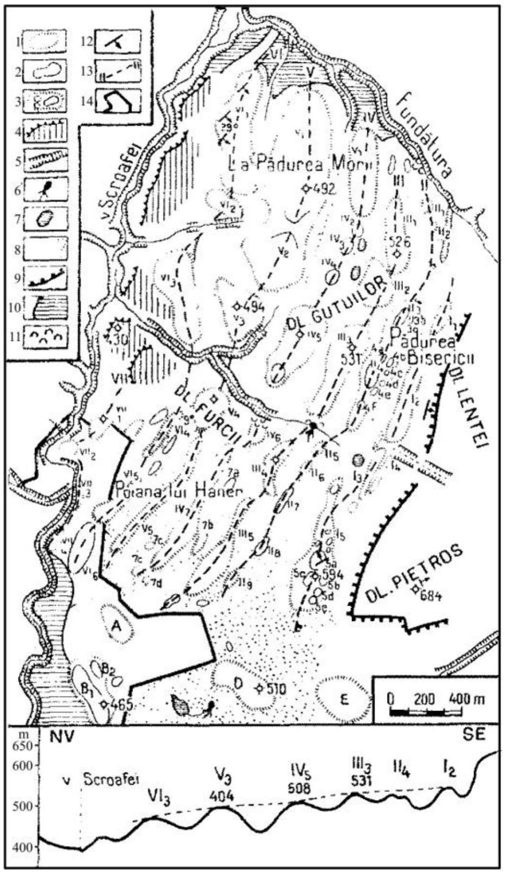

Fig. 3: Geomorphological sketch of the landslide area at Saschiz (from V. Gârbacea, simplified).

1. Slided areas well-marked in the relief; 2. Small slides; 3. Compound mounds; 4. Cuestas and structure-controlled surfaces; 5. Gullies, scarps, steep banks; 6. Springs; 7. Lakes (temporary or permanent); Microdepressions between slip-ridges; 9. Scarp; 10. River terrace; 11. Recent slides; 12. Strata dip; 13. Rows of slide; 14. Locality. I-VII. Alignments of step-like slides and slip-ridges

The Palaeogene Flysch Mountains and the Subcarpathians feature a great lithological and structural diversity (dislodged and faulted strata, folded sometimes into scales), are widely developed between the Suceava and the Dâmboviţa valleys. West of the Dâmboviţa they encompass only the Subcarpathians.

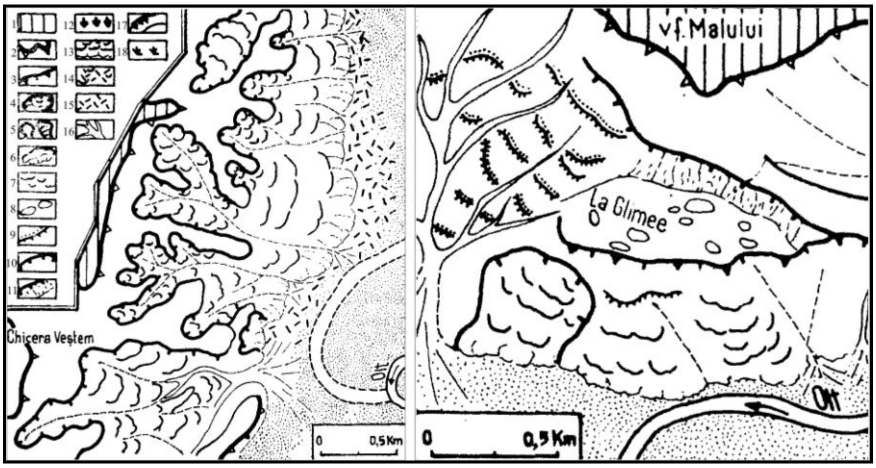

Fig. 4: Differences in landslide development on the slopes of the North-Făgăraş cuesta front.

1. Interfluvial summits; 2. cuesta edge; 3. structural steps; 4. landslides by drainage basins; 5. small slide valleys; 6. slip-ridge; 7. slip-ridges; 8. glimee; 9. step-like slide; 10. landslide scarp under 10 m high; 11. landslide scarp over 10 m high with active slope processes; 12. rockfalls; 13. very small ridges in a deluvial-proluvial glacis; 14. colluvial and slide glacis; 15. colluvial glacis; 16. gullies; 17. sideways erosion of meandre; 18. swamp.

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The distinctively different frequency of this process in the Carpathian Mountains and in the Subcarpathians relates to rock and the rate of deforestation. The petrographic facies of the Palaeogene Flysch are dominated by thick series of sandstone in alternation with clays or marls. The movements unfolding here are generally of small depth, with slip-ridges in which blocks of sandstone are stuck. The Subcarpathians, which are formed mainly from alternations of clays, tuffs, sands and gravels, are affected by mud slides on the slopes of the major valleys and of the torrential valleys.

Fig. 5: Mudflow in the Vizăuţi Valley, the Curvature Subcarpathians (from V. Tufescu)

The large-scale deforestation that went on in the Subcarpathians at the end of the 19th and in the early 20th centuries led to landsliding on nearly every slope; in the mountain region such events had rather a local character, involving the main valley slopes and the surroundings of localities, that is small sectors.

In the Curvature Subcarpathians, these processes were accelerated by seismic activity and by meandering associated with severe erosion of the concave-shaped bank. Under the impact of a high-moisture content the brittle Subcarpathian rocks turn into mudflows, followed by slip-ridges which differ in terms of the volume of the moving mass dislocated. In the deforested mountain regions, the moving earth layer is not very thick; landsliding is usually a spring process when the snow melts and there is plenty of rain; often enough, the slip plane is of the plastic-gelid type. In the Subcarpathians, landslides frequently affect the bedrock, creating small ridges on a plastic slip plane, as a rule. Sometimes, after a period of heavy rains the materials become strongly imbued with water and so mudflows develop (fig.5).

The shape and size of small-depth movements depends on the local conditions, on rock and slope. When particularly extended, sliding complexes may cover all of the slopes. Two regional situations can by distinguished in terms of frequency, intensity and dominant types of slide:

The flysch mountains, featuring sheet slides in the Alpine and sub-Alpine sectors (solifluxions and stripe slides), and deep slides (frequently mudflows), often forming sliding complexes on the slopes of the major valleys (the Buzău, Putna, Zăbala, Bistriţa, Ialomiţa, etc.).

The Subcarpathians, where landslide, rilling and gullying are modelling the slope; today, sheet slides on old slide deluvia, deep slides, step-like slides and mudflows that often grow into mud torrents, are a frequent occurrence (fig. 6, 7).

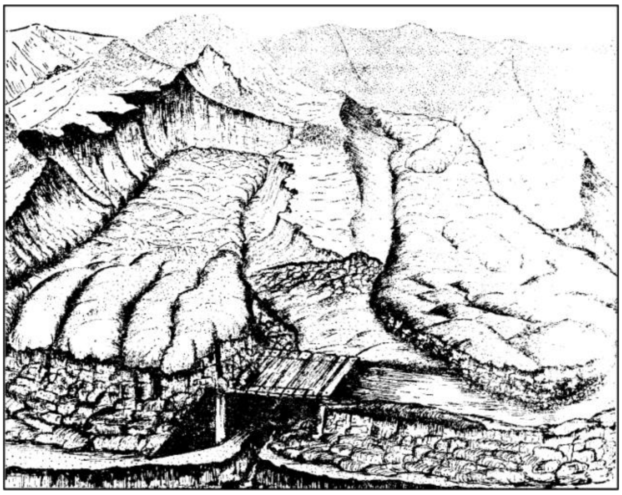

Fig. 6: Landslides on the righthandside of the Arva Valley (Milcov Basin)

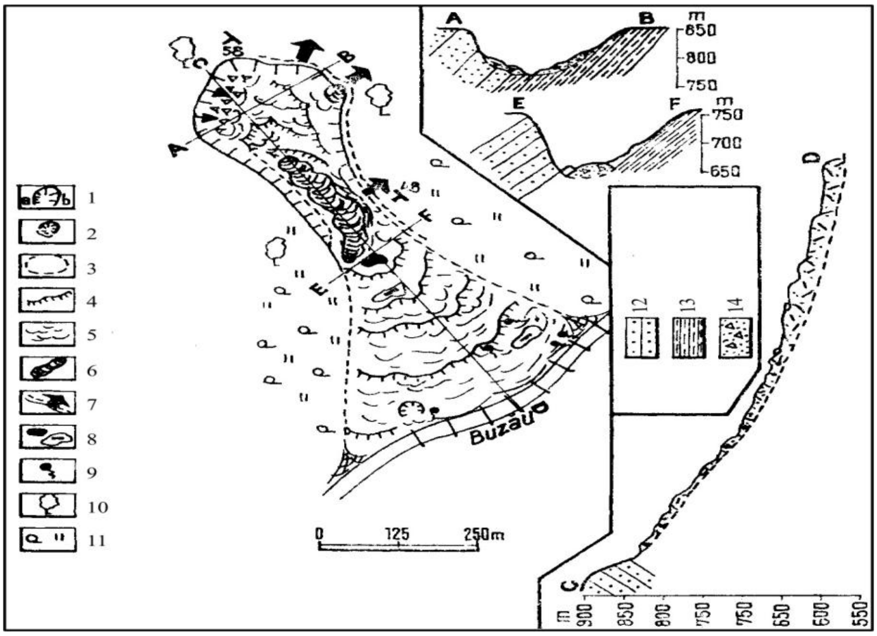

Fig. 7: Mudflow in the Buzău Valley at Priporul Bonţului: 1. Landslide scarp: a – under 10 m high; b – over 10 m high; 2. Secondary landslide scarps; 3. Body of the slide; 4. Steps within the slided mass; 5. Slip-ridges; 6. Mudflow; 7. Sectors of active recession; 8. Lakes and microdepressions; 9. Springs; 10. Forest; 11. Pasture and isolated trees; 12. Fusaru sandstone; 13. Marls and argillaceous schists; 14. Moisted mass

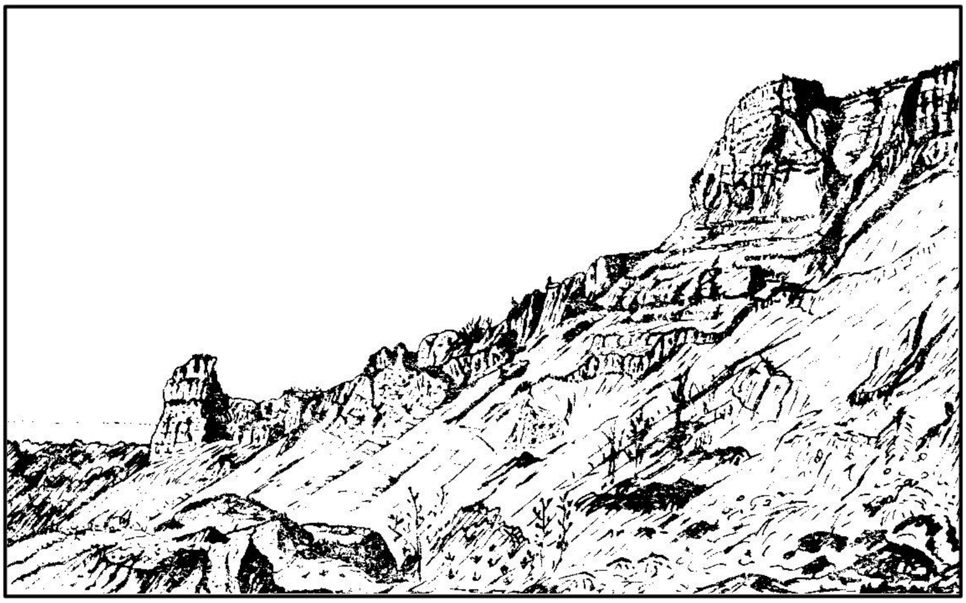

Fig. 8: The upper part of a plastic-piping slide on the lefthandside of the Amaradia Valley (the Getic Piedmont) North of Melineşti locality

There are three characteristic types of movement: large slip ridges in the North of the Cotmeana Plateau, in the Cândeşti Piedmont and in the Amaradia Basin (fig. 8); complex slides in the catchments and at the sources of subsequent valleys; and mixed movements involving piping and sliding. The last ones are a two-stage process: in the first stage there is chemical and mechanical removal of the fine-grained elements from clayey-sand deposits followed by rockfalls; in the second stage, there is the landslide proper, when materials begin moving on the slip plane. The aspect of the large ridges that are forming is rapidly changing due to the friability of the rocks. They are found throughout the Getic Tableland, but especially in its Northern part.

In the West Hills landslides occur on Mio-Pliocene deposits of sands, gravels and clays (North of the Mureş River) in terms of rocks, fragmentation, deforestation and major types of landslide. The region is somehow similar to the South of Romania.

Regions of low landslide frequency correspond to the Crystalline-Mesozoic, Cretaceous flysch and volcanic mountain zone and to the Mehedinţi Plateau, where despite triggering factors having optimum conditions to act the sliding potential is reduced. The process usually affects slope deposits and sometimes the rock itself. The different distribution of slide types is closely related to rock, the extent of deforestation and the degree of fragmentation in the region.

In the mountainous units landslides affect two sectors: 1) the Alpine and the sub-Alpine domain subjected to solifluxions, small slip-ridges, rock-creep, topples-slips and slips-topples; 2) the low mountains and the intramontane depressions (Braşov, Haţeg, Petroşani, Loviştea, Brad, Bozovici, Oaş, Maramureş, Dorna, etc.) featuring slip-ridges that affect either the soil or the weathering cover, or the Tertiary plastic rocks. There are situations when previously dislodged masses accumulated at the slope foot in the form of talus, display rockfalls and sliding after the minerals had been weathered and the clay content had increased, sometimes barring the channels and forming lakes (e.g. in the Bicaz Valley). In the case of very steep slopes the materials scatter about without forming ridges and topple towards the slope base.

In the Mehedinţi Plateau slides are small and develop only in the slope sectors frequently built from clays and marls.

Regions of very low landslide frequency, or landslide-free are the Romanian Plain, Dobrogea and the West Plain, where the process is sporadic and depends on the action of the triggering factors. Typical slides occur where the river depth has left outcrops of Lower Quaternary clay lenses (in the Romanian Plain) or of Romanian clay lenses (in the South-West Dobrogea, or at Tuzla on the coast) on the slopes. Slides may also start on the steep slopes, facilitating the movement of heavily rain-moisted deposits (North Dobrogea). In the first case a big volume of materials is dislodged, producing even well-marked ridges. Such typical landslides have been registered around the localities of Greaca (Burnaz Plain), in those of the Oltenia region, at Mârleanu in Dobrogea, and at Tuluceşti situated North of the city of Galaţi. Besides, mixed processes of piping, sagging and sliding also take place. Sliding usually starts after heavy rainfall and affects the materials previously displaced and accumulated at the base of slope. It is the most common type of movement on the high slopes of the Romanian Plain and of the West Plain.

In Dobrogea, sheet slides involve the steeper slopes, whereas on the Danubian side typical processes are the slip-ridges and the step-like slides. Along the cliff South of Constanţa city-port, slides are of the mixed type (piping-plastic).

Frequent movements of the piping-plastic type with outcrops of clay lenses on the loess-built slopes develop in the *plain areas from the South and West of Romania*.

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THE ROMANIAN RIVER AND MARITIME FREE TRADE ZONES

ION MARIN, ROMEO BOŞNEAGU, MARIAN MARIN

Free zones also know as „porto franco”. These are, commercial yones where the merchandise is tax free good.

Are commercial zones where the merchandise has the general meaning of tax free goods.

- Cartagina (814 î.Hr.) the first free port known in history
- 13thc the tours of the Hanseatic League, the forunners of the modern free zones.
- The formation of free parts (1700-1850): Gibraltar, Bangkok, Singapore, Hong Kong
- Free zones = Ancient Greece depositing of merchandise on Greek islands to avoid taxes required in the citadel
- Europe, 16th-17thc : - Flandra
- America , 16th-17thc: - Jamaica

Modern times

Free zones, good tools to attract capital for services with high tax value added; a means of attracting the capital helped by an adequate legislation, that can turn the free zones into nuclei of economic integration.

The free zone is specially created by the state in order to promote some political objectives as well as to attract capital; it consists of a free port, a free zone and a transitional zone.

The free port is a port or part of a port which is extraterritorial and can allow importing goods without paying taxes, can preserve them by storing them as long as it takes without any banking security or guarantee for the customs. The advantages of the free port are.

- The going in and going out of ships without the custom house’s help;
- The imports, exports and goods in transit can be loaded, unloaded and transshipped on another ship with no custom limitations;
- Customs dues are paid only when leaving the custom area;
- No bade or security is needed for stored goods, as they are not destined to entering the country.

The free zone is that territory surrounded by a real or fictions customs beet which allows some special advantages for this zones, such as: privileged fiscal liberty, assistance in investment, developing commercial activities.

The transitional zone is an enclave, usually situated in a part of a country which offers facilities regarding the harbor ducs for exporting goods.

Nowadays there are free trade zones in over 70 countries, some of theme having remarkable economic achievements.

Romania. The beginning of free ports at the end of the 19th century: Brăila (1836-1883 and 1930-1940); Galaţi (1836-1883); Tulcea (1880-1881); Constanţa (1880-

1883). These first free zones contributed to the development of the Romanian commerce after obtaining its independence in 1877. The traffic through Galatia and Brăila pats has grown considerably especially following the facilities given to the Romanian and foreign merchants, mainly from the Mediterranean Countries and Western Europe; therefore new building and harbour storehouses appeared. But the economic importance of the port of Brăila and Galaţi has declined gradually after 1875 as a result of various actions of Germany and Austro-Hungary who wanted liberation of their commerce on Romanian territories as a measure of counteracting the competition of goods from England or other areas.

Between 1870-1913 the town of Sulina gained the status of porto-franco, which led rapidly to a great economic importance at the time. But unfortunately this role didn't last long as a result of the German and Austro-Hungarian oppression . this fact causing in the end the disappearance of porto-franco Sulina.

Although in 1903 at the Congres of the Chambers of Commerce the possibility of reappearance of free zones was discussed, no practical measures were taken and it was only in 1929 that the law for creating a new free trade zone Sulina was agraved, a law which remained in function until 1931.

In the recent years, after 1992 there was a favourable movement towards creating free trade zones for river and maritime parts, for the Danube Black Sea Canal, other navigable canals and areas close to the customs (Constanţa Sud, Basarabi with new perimeters in Medgidia, Mihail Kogălniceanu, Cernavodă şi Tulcea).

- ***The free zone Sulina*** is the first one established in Romania after 1878 (The Independence War) situated at the flow of Sulina arm into the Black Sea. It is foreseethat a road should link Tulcea with sulina on Sulina canaln which would interest the neighboring countries, especially the Republic of Moldavia.
- ***The free zones Galaţi and Brăila*** are areas with a high industrial and agricultural function which could ensure the traffic of goods towards the Black Sea and the Mediterranean Sea as well as towards Western Europe with the help of the Danube river.
- ***The Free Zones Constanţa de Sud and Basarabi*** was established in 1985 when Constanţa Sud port was created to connect the Danube to the Black Sea through a canal. In fact, the free zone Constanţa Sud, as a continuation to the south of Constanţa harbor was established in 1993 based on a legislation concerning the regime of the free trade zones in Romania (H.G. 410/1993 and Law nr. 84/1992). In 1997, the free zone Basarabi started to exist in the Basarabi harbour, having specific facilities just like any other company existing in a port area.

Constanţa has a favourable position, being situated at one of the heads of pan-European corridors of transport: (corridor IV: Constanţa-Bucureşti-Arad-Budapeste-Bratislava-Praga-Dresda, corridor VII: Constanţa-Canalul Dunăre-Marea Neagră-Dunăre-Main-Rhin (Rotterdam), corridor IX: Constanţa-Bucureşti-Iaşi-Chişinău-Kiev-Sankt

Petersburg-Helsinki).The location of Constanţa free zone in this particular area was based on the following reasons:

- the extension to the south of Constanţa port;
- the existence of the Danube – Black Sea Canal;
- the existence of the Rhine-Main-Danube Canal;
- the favorable position of Constanţa port on the lines of commercial routes between western Europe and Middle and Far East (fig 1);
- the existence of a road network connecting all the country's areas;
- the proximity of an international airport (Mihail Kogălniceanu);

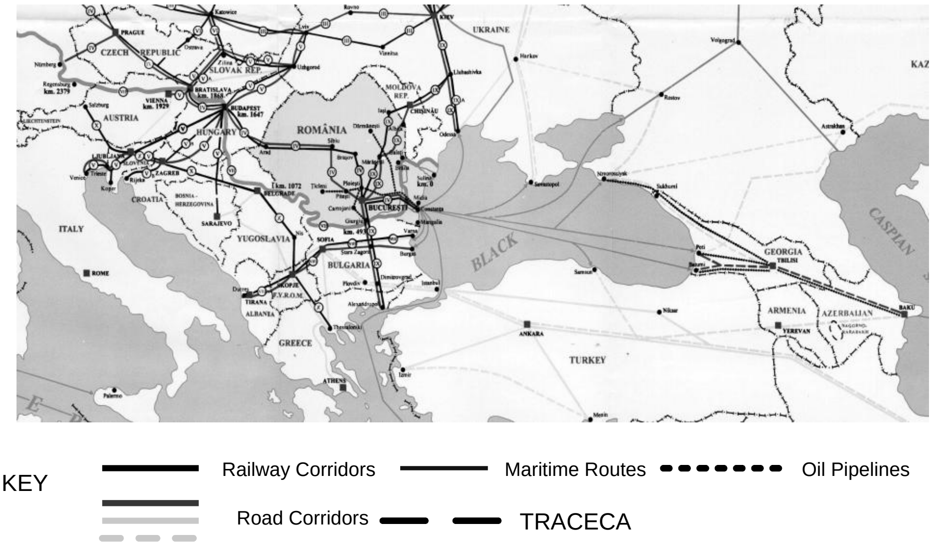

Fig.1

The Danube Black Sea Canal transforms the port of Constanţa as an important port of Romania into a very important transit port for many counties on the Gulf Area, South East Asia, Far East and Australia (fig 2).

As Constanţa South is a port for ships with a maximum draught of 17.07 m that go through the Suez Canal, this whole geographical area with benefit from a shorter route to get to Central Europa on water.

Romania contributes to the development of an attractive open market for the western investors in the Caspian Sea area, which benefits from large oil reserves; at the same time it opens the access to consumers of 50-79 million tons of oil annually.

There is also an agreement for transport signed with Georgia for opening a ferry-boat line and Ro-Ro, according to which in the South Constanţa Free Zone for storing and conveying in transit industrial, chemicals and oil products from the Caspian Sea. Their manufacture will be duty free so that its access on the European markets will be very easy.

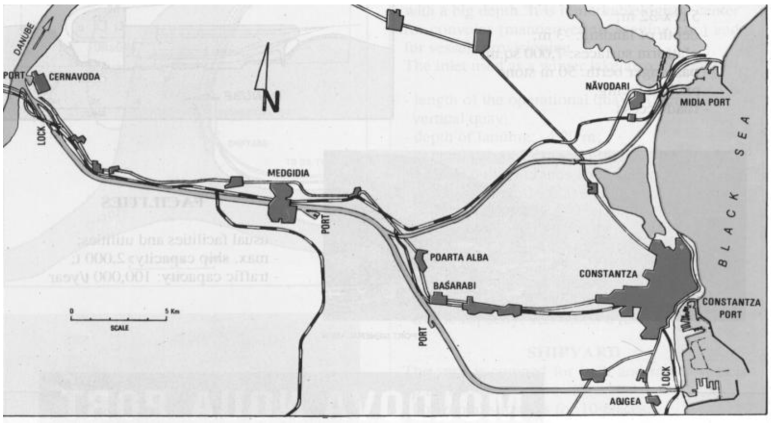

Fig.2

The largest maritime port at the Black Sea, Constanţa is continuously modernizing being adapted to the new economic reality in the Black Sea basin. The following berths are specialized on various types of goods in Constanţa port as follow (fig. 3):

- berths 64-96 for ores, cake and coal, from which 4 are specialized in transferring bulk goods on river ships storage capacity 4,5 million tons;
- 2 terminals Ro-Ro (roll on-roll) for loading-unloading vehicles, one in North Constanţa of 364 m, 13 m depth, 2 car parking (for 2000 cars-1.7 ha and 2800 cars – 2.5 ha) and the other one in South Constanţa of 214 m, 14,5 m depth and a 1800 car park capacity-1.5 ha;
- the ferry-boat installation with a length of 227 m, 13.5 m depth for loading-unloading locomotives and carriages of normal range;
- berths 54-63 for chemical, fertilizers, phosphate, apatite in sacks, big bags and as bulk goods; storage capacity 30.000 t for phosphate and apatite, 25.000 for urea, 48.000 t for chemical products in sacks:
- berths 17-33 for cereals, barley, soybeans, wheat, sunflower, corn, etc with a monthly capacity of 250.000 t; storage capacity 90.000 t in 3 silos of 100.000 t in Constanţa South.
- Berth 23,47-48, 49-51, 68, 122 for building materials (cement) ; storage capacity 40.000 t in bulk;
- Oil berth 69-79, for the import of raw oil, fuel oil, diesel oil, petrol and the export of refined products, petrochemics cal and liquid chemical products;
- Berth 1-21, 35-46, 53 for common goods
- Berth 11 and 53 for refrigerated goods; storage capacity 1500 t and an area of 4.600 sq m at berth 11 and terminal of refrigerated goods from berth 5 of 219 m long and capacity of 17.0000 t /2.4 ha area and 13.5 m deep

- Berth 19 for oil and molasses; storage capacity in 7 oil tankers (25.000 7)
- Container terminal, berth no 52, 232 m long, storage platform of 11,4 ha and a capacity for 3-4.000 containers;
- Berth no 109-125 in Constanţa South, out of which berth 119 (307 m) for common goods in the "free zone".

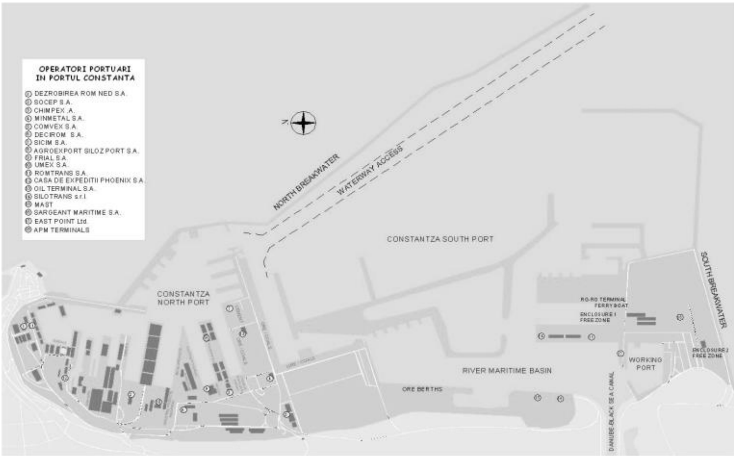

Fig.3

South Constanţa Free Zone it occupies an area of 134,5 ha divided into three precincts of various dimensions and locations, which offers multiple access and infrastructure endowment. There are also accosting berths for high tonnage vessels with all the facilities needed for a depth of 14,5-16,5 m; platforms for handling and depositing merchandise (covered and uncovered, various buildings, car parks platforms, areas for productive and commercial activities, cereals terminal (fig 3). The superintendent of the two free zones of the Autonomous Direction is the South Constanţa and Basarabi Free Zones Administration.

In the free zones, the following activities are permitted: handling, storing, sorting, measuring, wrapping, assembling, freighting manufacturing, marking tested goods, selling/buying store market operations, renting and leasing lots, providing ships with goods, etc.

This area will have a trans shiping capacity of over 700.000-1.000.000 containers a year. Thus, it will became an important European centre for operating. A new terminal of containers is under construction having an initial capacity of 325.000 TEU (end 2003). This terminal will develop in stages till 2010 (625 berths and 14,5-16,5 m deep) for vessels of a post Panamax type.

Precinct 1A in the south of the port, in its western side, divided into two parts A and B with a total area of 26,53 ha. It has accosting berth for ships of 13,5 m depth, and is leased for depositing goods in covered areas and for activities of processing and distribution. This precinct is connected to the railway and road network. The territory for 1B is taken from the sea, filled with old materials from the Danube Black Sea Canal (15 year ago) the area is connected to the ferry boat terminal and at its southern part, at from the closest railway. The road access follows the port road Constanţa South linked to the 39 DN. This zone is foreseen to have: a business centre that would contain stock exchange management firms headquaters, consultancy and expertise, insurance agencies, etc.

Precinct no 2 is destined for industrial and productive activities. It is a large platform with the same origin as the previous one (about 5 m above sea level of materials). It is also connected to the rail and road ways.

Precinct no 3 has an area of 130 ha, separated from the harbour acvatory ; to the N by the protection pier, to the S by the terminal for accosting Ro-Ro ships ; to the East by the interior pier situated at the half of section IV. This area is not entirely finished as it also needs other piers, draggnigs for ships access towards berths, the limiting pier to the east, an access to the transport network, etc.

The foreign companies headquatered in the Free Trade Zone working outside Romania, have the status of Offshore companies which gives them important economic and financial facilities.

The Basarabi Free Zone is situated on the shore of the Danube Black Sea Canal, 24 km from Constanţa, between 39,5-40,5 km having an area of 11,4 ha (out of which 7,6 ha harbor territory). It is mainly destined for industrial activities of processing. Its position is established by the existence of transport river no 7 paneuropean which connects the Back Sea and the North Sea through the 2 canal Danube Black Sea and Danube Main-Rhine. Basarabi zone has an industrial-agrarian function trying to develop the service sector and is situated (near) close to national and international road, rail and canal transport network. The town of Basarabi (situated in the middle of the agrarian south Dobrogea basin) has favorable climatic conditions which keep the economic activities open all the year round the free zone is in the east of Basarabian harbour limited to the west by the land and the break water and the north by the canal and a berth.

The Medgidia Free Zone is located on the Danube Black Sea Canal at the km 27+500 with a direct access to the canal, with berths for ships of a maximum draught of 6 m the town of Medgidia has the same industrial-agrarian nature, being situated at 39 km from the Black Sea and 25 km from the Danube close to internal and international access roads, railways and river ways. The free zone consist of two perimeters: I with an area of 11,1 ha and 5 ha of break water on the Medgidia harbour territory and having operational berth 1700 m long; II with an area of 15,7 ha on road and rail with the exterior area.

The Cernavodă Free Zone situated at the point called km 0 has a direct access to the river Danube and Danube Black Sea Canal. It consists of 2 perimeters: I in the new harbour area; II in the old Cernavodă harbour are. The town Cernavodă is a river port having piers; it is a major industrial agrarian centre as it is as well famous because of the nuclear power station. It is an important zone, also the bridges across the Danube and the National reserve “Pădurea Caiafele” and canal lock. It is 59 km from Constanţa and 166 km from Bucharest The free zone is 44.5 ha large, the two perimeters having access to the Danube and harbour basin and to the Danube and the Canal (perimeter II). It also has good rail and road connections with the exterior.

The Mihail Kogălniceanu Free Zone is placed within the International Airport Area which is considered as an extension of the South Constanţa Free Zone (8.45 ha).

The Mihail Kogălniceanu Airport situated near Constnaţa serves the Romanian Coastal area as well as other regions (when necessary). This free zone is situated not far from some regions important from the economic point of view. All the Romanian free trade zone are in different stages of fitting out modernization and construction of new access route, with especially with specific harbour installations. They create new possibilities of collaboration with various European regions that are situated neaver or farther from Romania.

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THE BLACK SEA LEVEL OSCILLATIONS IN THE LAST 150 YEARS

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Introduction

The Black Sea level rise appeared like evident after 1940, when are processed the first data rows both on the Romanian and on the Russian coasts (Cotovu, 1945, 1958). Subsequent, especially in Romania, more researchers are concerned with the topic of sea level oscillations with quite interesting results (Mirică, 1953; Banu, 1961; Bondar, 1963, 1974; Şelariu, 1971; Leabu, 1984; Vespremeanu, 1987, 1992, 2004; Malciu, V.Diaconu, 2000; Şuiski, 2000; Dachev, 2000).

The analyses performed on medium and large time series (between 30 and 130 years) point out different rhythms of Black Sea level rise: 5.66 mm/y-Odessa, 2.02 mm/y-Nikolaev, 0.84 mm/y-Sevastopol, 2.25 mm/y-Novorosiisk, 1.29 mm/y-Tuapse, 0.83 mm/y-Batumi (from Black Sea Environmental Programme, 1999), and 2.386 mm/y -Varna (Dachev, 2000).

Depending on the isostatic movements and tectonic readjustments of the continental margins we are witness to a Black Sea level rise with rythms between 0,84 mm/y - Sevastopol and 8.02 mm/y – Poti. Such processes developed inlusively in the historical past, giving an explanation for the emergent and then submergent oscillations of the Black Sea level undeniable recorded at Histria cemetery placed about 1.5 m below the present sea level (Bleahu, 1973; Vespremeanu, 2004).

Further we present the results of the analyses performed on 150 years monthly data series from the significant for Black Sea coast level gauge stations. The obtained results reveals the complexity of the Black Sea level oscillations and the importance to understand them in the view of the integrated coastal zone management.

Methods

For the analysis of Black Sea level oscillations we used the the monthly data series recorded at Constanţa, Sulina, Varna, Burgas, Sevastopol, Tuapse, Poti, Batumi (Table 1). For the knowledge of Black Sea level oscillations on the romanian coast we processed the data recorded at the level gauges from Sulina (1856-2002) and Constanţa (1933-2002).

Results

The monthly level data series recorded at Sulina gauge is the longest row existing for the Black Sea level (147 years), excepting short periods during the second world war. The processing of data row illustrates a 69 cm amplitude interval and a 31.13 cm as a multianual mean. The sea level rise is pointed out in the graph (fig. 1) by the thick line described by a polynomial fitting line (the nineth degree). The sea level changes at Sulina in the front of the Danube Delta, during 146 years, carried on quite uneven. This non-uniformity implies a curly contour of the trend line which corresponds to a cyclic behaviour with a wavelength of 40 years. The first interval of each cycle records high rhythms of sea level rise: 7.8 mm/y (1863-1880), 4.6 mm/y (1903 – 1925), 8.7 mm/y (1956-1978). The estimation of the sea level rise at Sulina for all the period, based on 10-years moving average, shows + 2.56 mm/y.

The Black Sea level gauges

Table 1

No.	STATION GAUGE	LATITUDE	LONGITUDE	OBSERVATION LENGTH
1	Constanţa	44^o 10' Nord	28^o 40' Est	1933 – 2002
2	Sulina			1856 – 2002
3	Varna	43^o 11' Nord	27^o 55' Est	1928 – 1950
4	Burgas	42^o 29' Nord	27^o 29' Est	
5	Sevastopol	44^o 37' Nord	33^o 32' Est	1875 – 1985
6	Tuapse	44^o 06' Nord	39^o 04' Est	1917 – 1985
7	Poti	42^o 10' Nord	41^o 41' Est	1974 – 1985
8	Batumi	41^o 38' Nord	41^o 42' Est	1882 – 1985

The monthly level data series recorded at Constanta gauge starts in 1933 and was processed by different authors for different periods. For a 22 years long period was obtained 4.25 mm/y (Banu, 1961), for 36 years data – 2.56 mm/y (Selariu, 1971), for 53 years – 2.27 mm/y (Leabu, 1984), for 59 years – 2.15 mm/y (Vespremeanu, 1992), for 65 years – 1.28 mm/y (Malciu, Diaconu, 2000). The velocity of crustal movements at Constanta is quite small (-0.008 mm/y) to affect significantly the sea level values.

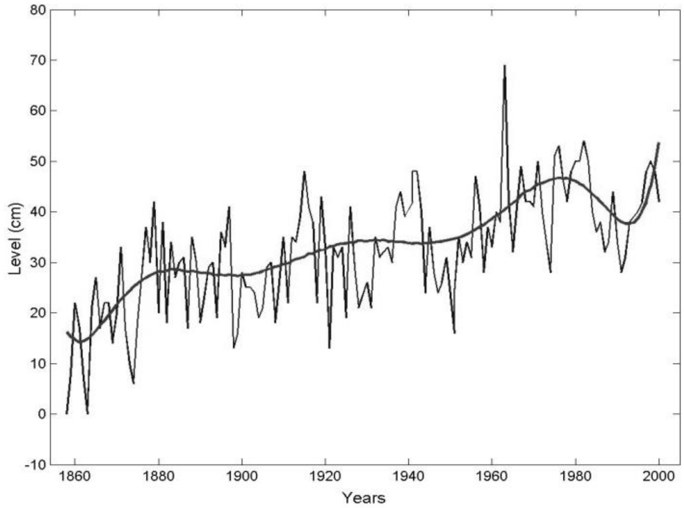


Fig.1 – The sea level oscillations al Sulina (1856-2002)

The graph for sea level oscillations at Constanta, although smaller than at Sulina, presents similarities with those recorded in the same period (fig. 2). The estimation of the sea level rise at Constanta for all the period, based on 5-years moving average, shows + 1.22 mm/y. These tendencies, both at Sulina and Constanta, confirm the mean general values of the Global Ocean level rise with 1-2 mm/y (NOAA Coastal Services Center, 2003), as consequences of the global warming and the associate complexe phenomena.

Different situations are occurring on the extreme eastern Black Sea coast, in the front of Rioni Delta at Poti, where the intense subsidence impose high rates of the relative sea level rise as 8.1 mm/y for 1874-2002 period (fig. 3). The eccentricity of data at Poti extracted by the comparison with the trend line shows a decrease for the last decades (fig. 4). The superposition of the trendlines for the Black Sea level from more circumpontic station gauges shows an acceleration of the ordinary sea level rise for the last 20 years (1982-2002), excepting the most part of the crimeean coast (Sevastopol) where small positive isostatic movements are interposing (fig. 5).

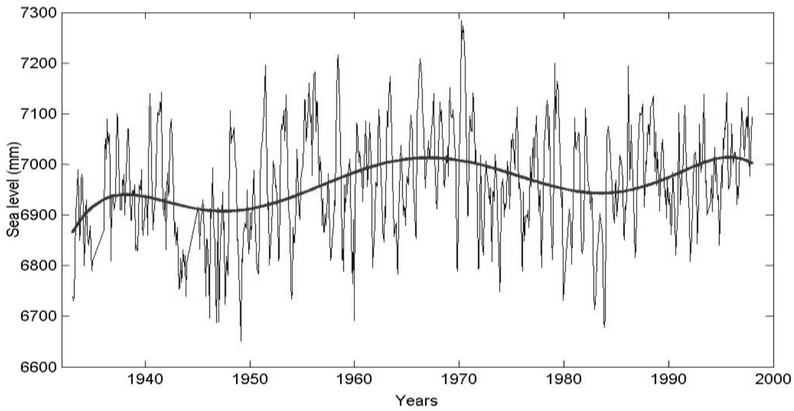


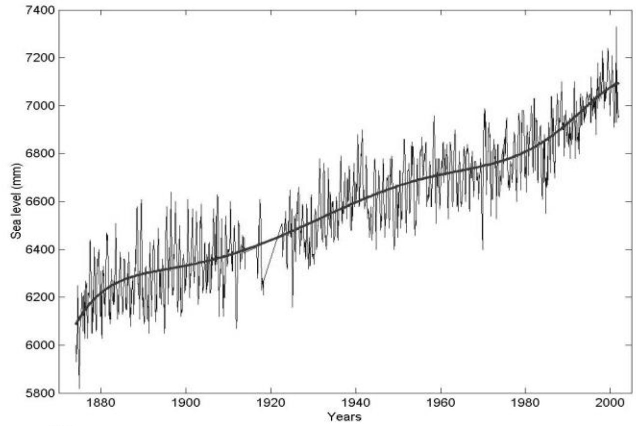
Fig.2 – The sea level oscillations al Constanta (1933-2000)

The seasonal and monthly sea level oscillations. The analyses of sea level oscillations recorded a year lengthways point out serious differences both from a season to another and for months too (Vespremeanu, 1992, 2003; Malciu, Diaconu, 2000). We present the graphs with the multiannual monthly mean level for Constanta and Batumi (fig. 7):

- In the winter on the western Black Sea coast is recording moderate levels with very large amplitudes from a year to another; on the caucasian coast.
- During the spring are recording the highest sea levels on the western and southern coasts, when the amplitudes of interanual differences are decreasing to the summer and autumn months.
- During the summer there are the highest sea levels on the caucasian coast and generally on the eastern Black Sea coast, but on the orhers starts the decrease of them.

- During the autumn, especially October-November interval, are recording everywhere the lowest sea level with the smallest interannual level changes.

All these seasonal and monthly sea level oscillations are directly correlated with the main tributaries discharge regime and with the climate of the proximal areas (Bondar, 1972; Malciu, Diaconu, 2000; Vespremeanu, 2003). For all the pontic basin, but especially for the northwestern domain the most important role is played by Danube. The strong linkage established between Danube flow discharge and the sea level regime is pointed out in figure 6 for the Romanian southern coast (Constanta).



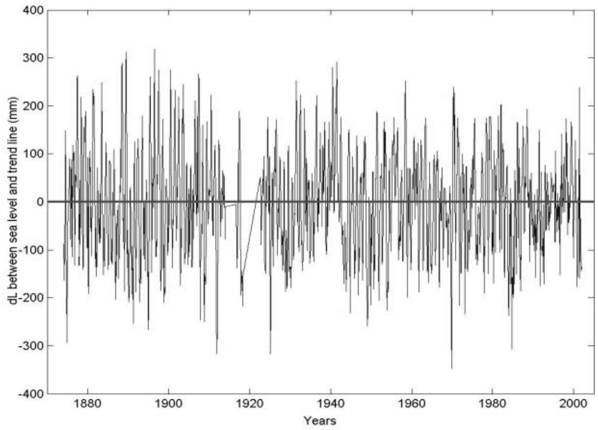


Fig.3 – The sea level oscillations al Poti (1874-2002)
Fig. 4 – The eccentricity of data at Poti

Excepting the western Black Sea coast where the maximum rain activity occurs during the summer, the main part of the pontic basin, inclusively the Caucasian coast where is recorded the biggest rain water quantity (800-1100 mm/y), reaches the pluviometric maximum during the winter months.

The deviations of the mean decadal sea level in comparison with multiannual sea level at Constanţa (after Vespremeanu, 2004)

Table 2

No.	INTERVAL	DECADAL MEAN (cm)	DEVIATION FROM THE MULTIANNUAL MEAN (cm)
1	1933 – 1942	11.26	-3.1
2	1943 – 1952	7.58	-6.8
3	1953 – 1962	15.81	-1.4
4	1963 – 1972	19.53	+5.2
5	1973 – 1982	16.72	+2.4
6	1983 – 1992	14.94	+0.6
7	1993 – 2001	18.1	+3.7

–

Furthermore, the evaporation regime – high during summer when sea level is high too and low in the winter – is in out of time with the monthly Black Sea level changes and the Danube flow discharge diminishing the amplitude of the seasonal and monthly sea level oscillations. To assess the importance of the seasonal and monthly rhythmic sea level oscillations we undertook a spectral analysis on the Batumi data series (fig. 8).

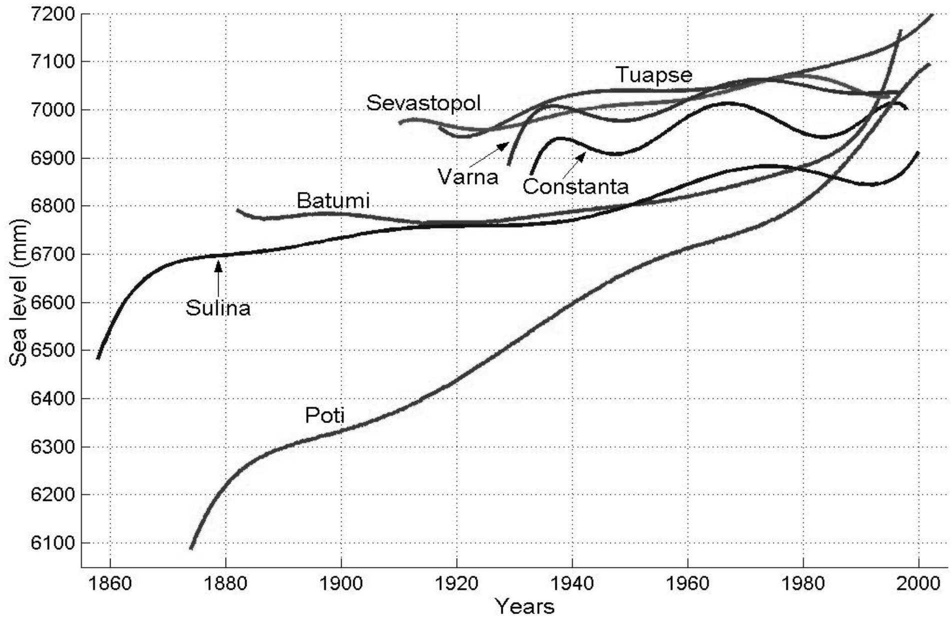


Fig. 5 – Black Sea level oscillations (polynomial fitting trend lines applied to monthly data from the coastal station gauges)

The daily sea level changes. In 24 hours sea level oscillations due to wind and tide regime are recorded. On the west coast of the Black Sea there is a semidiurnal microtidal regime (nanotidal) with the high tide spring of 16 cm. These tides are imperceptible in fact, the only situation where they can be seen are on the gently sloping beach faces of the lagoons. The wind imposes significant local sea level changes; for instance on the western Black Sea Coast alligned north-south, the eastern and northern winds bring about 0.35-0.6 m raising for the winds with 15-20 m/s. The negative oscillations imposed by the offshore winds reach 0.15- 0.3 m.

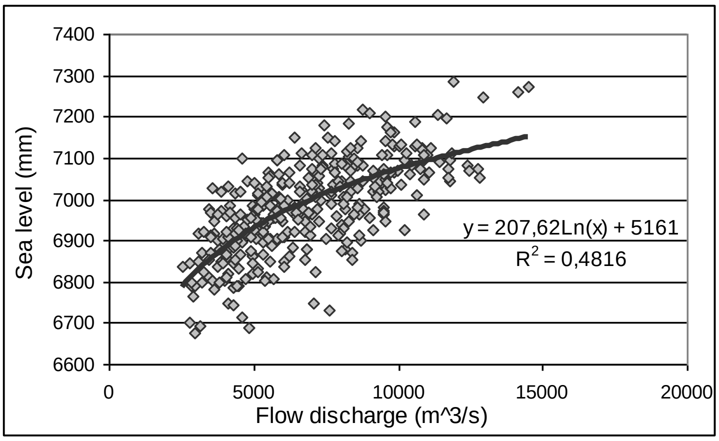


Fig. 6 – The correlation between Danube flow discharge and Black Sea level at Constanta

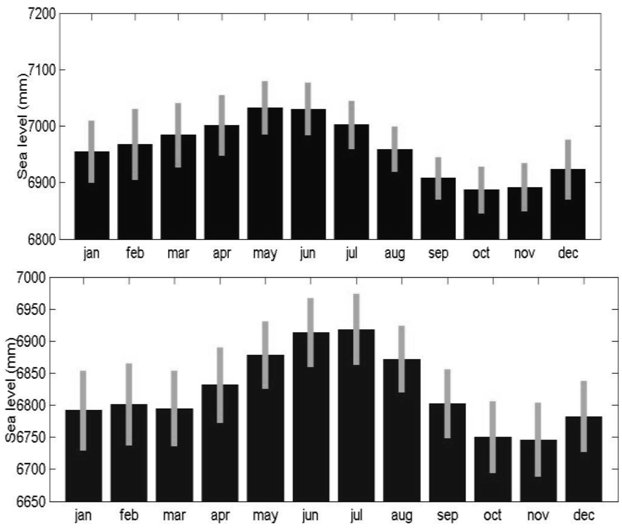


Fig. 7 – The multiannual monthly mean Black Sea level at Constanta (left) and Batumi (right) – the upper gray lines represent the standard deviation

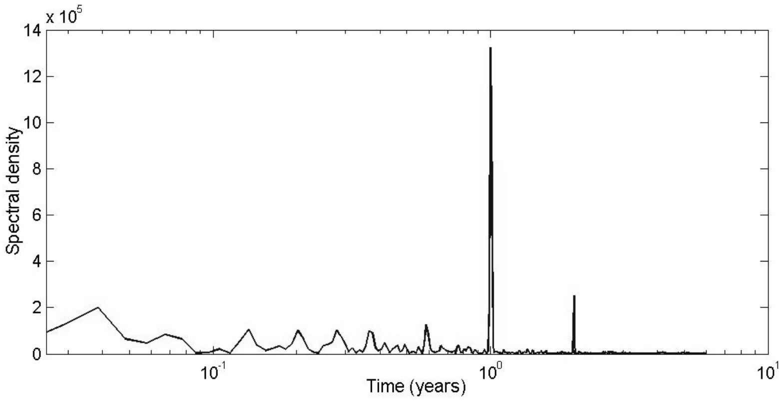


Fig. 8 – The spectral analysis of sea level changes at Batumi

Conclusions

During the last 150 years the Black Sea level rises continuously but with significant differences in rythm from a period to another and from a coast to another depending on the isostatic movements and tectonic readjustments of the continental margins. The multidecadal rhythms of sea level rise range between 0,84 mm/y - Sevastopol and 8.02 mm/y – Poti. On the romanian coast is a recorded a rise of 1.22 mm/y for the southern shore and 2.56 mm/y for the deltaic one.

Regarding the seasonal and monthly sea level oscillations the regime of the main tributaries flow discharge, which plays the first role in the controle in the monthly sea level changes, is in out of time with the temporal distribution of the rain and evaporation intensity, resulting in a diminishing of the amplitudes of the sea level oscillations.

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WATER RESOURCES OF RIVERS IN ROMANIA

LILIANA ZAHARIA

The thorough assessment of water resources quantitative and qualitative characteristics is an essential prerequisite in establishing and implementing of the water resources, whose main objective in the present-day stage of development at both European and national scale is the sustainable management of water resources.

Romania's total water potential is pretty modest as compared to other European countries. In fact, rough estimates point to a total mean volume of 140 km^3/yr., out of which only 61 km^3/yr. are technically exploitable, meaning that the average annual amount available for each inhabitant hardly reaches 2,800 m^3, which is less than the EU annual consumption amount that averages 4,000 m^3/inhabitant. The greatest part of this amount is given by rivers (the total 92% being shared by the Danube-62% and the inland rivers-30%). The underground waters provided 7% of the total water amount and the natural lakes, less than 1% (according to ANAR[*] estimates).

Although renewable, the water resources are restricted by a number of natural or anthropic factors due to climatic variations; the pressure exerted by consumers; quality degradation through water-pollution etc. Under these circumstances, the study and monitoring of water resources quantitative and qualitative characteristics of water resources represent main concerns of all water-related institutions. In this respect, the *"Romanian Waters" National Administration* (**A**dministrația **N**ațională „**A**pele **R**omâne"-ANAR), which was set up in 2002, by restructuring the former *"Romanian Waters" Autonomous Company* (established in 1991), represents the national authority in charge of the implementation of the national strategies and policies regarding the domestic waters. Its structure also includes the *National Institute of Hydrology and Water Management* (**I**nstitutul **N**ațional de **H**idrologie și **G**ospodărirea **A**pelor-INHGA) and Regional Water Administrations (River Basin Committees), organized into groupings of drainage basins, which effectively put into practice the regulations of the national water management plan devised by the central authority.

A major present-day objective of water-management activity in Romania is to implement the Framework Directive 2000/60/EC of the European Council and Parliament, which establishes, both for the EU and for joining members, a common ground of action in the field of waters. The general purpose of the Directive is that all water bodies in Europe reach a "good state", so that all European inhabitants have equal access to proper sources of water (Şerban, 2003).

1. Water-Resources of Rivers – General Characteristics

Deriving from the relief features, Romania's drainage system is basically radial; its total length reaching 118,000 km (*Geografia României*, 1983), which, related to the country's surface, gives an average density of 0.5 km/km^2. The country's territory is

[*] *"Romanian Waters" National Administration* (**A**dministrația **N**ațională „**A**pele **R**omâne"-ANAR).

almost entirely included in the Danube's drainage basin; the Danube eventually concentrating 98% of the country's rivers, either directly (58%), via most of inland rivers, or indirectly (40%), via the Tisa river. The remaining 2% of the country's territory is drained by some summer-degenerating streams flowing directly into the Black Sea.

The rivers actually represent Romania's most important water-resources. Their mean annual volume totals 42 km^3 (according to ANAR statistics, 2003), that is 30% of the entire potential volume. The mean multiannual runoff of inland rivers is 1,330 m^3/s, equal to a specific runoff of 5.6 $l/s.km^2$. According to the previously-mentioned statistics, the technically exploitable potential of inland water-courses is roughly estimated as reaching a mean annual volume of 25 km^3 (41% of the total technically exploitable resources). Out of this potential, only 5 km^3 are naturally provided; the remaining 20 km^3 coming from reservoir-lakes. Although the rivers' share in Romania's total water-resources potential comes second after the Danube, they represent the country's most important fresh-water resource. Unlike the Danube, which peripherally traverses the Romanian territory and, therefore, represents a reliable water-source only for riverine settlements, the inland rivers are more evenly distributed over the country's area and, consequently, provide ready access to various potential consumers. Besides, the Danube's water-resources can't be fully used because they must provide not only the flowing parameters convened-upon by the riverine countries, but also a safe water-course for navigation.

However, in some areas, the waters of inland rivers have specific hydrological characteristics that greatly restrict their use, such as their uneven territorial distribution, high seasonal variations and occasional pollution.

In Romania, many institutional and individual papers have synthetically or regionally analyzed the overall or some specific hydrological characteristics of rivers. In this respect, *Râurile României: Monografie hidrologică* (*Romania's Rivers. A Treatise of Hydrology*, coordinated by C. Diaconu, in 1971) is well-known for its highly synthetic approach; the complete series of Hydrological Monographs of the main drainage basins, sequentially published in the *Studii de hidrologie (Hidrological Studies)* revue, during 1962-1969, provides basic information about all rivers'main characteristics and the *Geografia apelor României (Geography of Romania's Waters* by I. Ujvári (1972) substantially contributed to the development of hydrology as an important academic topic.

2. Spatial Distribution of River Water-Resources

The spatial distribution of rivers'the water-sources of rivers is highly uneven since the drainage pattern has largely been influenced by the concentric zoning of main relief forms. Therefore, most water-resources (65% of the mean annual volume of inland rivers) come from the Carpathians, which extend over 28% of the country's territory, while the water-resources in the plain areas, which cover an almost equal area (30% of the total country's surface) provide only 7% of the mean annual volume (Fig. 1). The rivers flowing from the encircling hill and tableland regions, which occupy 42% of the country's total area, provide 28% of the total water volume discharged by inland rivers. The great differences in the distribution of river water-resources between Romania's major relief forms are also reflected by the highly ranging mean multiannual values of specific runoff and the thickness of the flowing water-layer. Consequently, the corresponding values for the mountainous region exceed 10 $l/s.km^2$ (over 200 mm/yr.), the maximum values reaching 30-40 $l/s.km^2$ (600-800 mm/yr.) at the highest altitudes in the Southern Carpathians. The specific runoff in the plain area is lower than 2 $l/s.km^2$, the minimum values being characteristic of the eastern part of the Romanian Plain and the Dobrudja Plateau. The specific runoff of rivers flowing through hilly and tableland areas ranges from 2 to 10 $l/s.km^2$, that is the thickness of the corresponding flowing water-layer may vary between 50 and 200 $l/s.km^2$ (*Râurile României*, 1971).

Moreover, Romania's drainage pattern is organized in successive generations of streams and rivers, which have large drainage basins developed on all main relief zones, so that the discharge highly varies with altitude. In general terms, the specific mean discharges at similar altitudes increase from W to E, as the climatic continental influences get stronger.

Important differences in the spatial distribution of river water-resources are also obvious between the country's main drainage basins, due to the varying conditions of sitting and forming the water-flows.

Romania's system of inland rivers is organized in 15 major hydrographical basins (Fig. 2). According to INHGA statistics for the year 2000, the mean multiannual volumes of water accumulated within these basins range from 113 mil. m^3 (in the Littoral basin) to 7,227 mil m^3 (in the Siret river basin). The greatest shares in the total theoretical resources of inland rivers fall to the Siret (17%), Mureş (13.8%), Olt (13%) and Someş (9.7%) rivers, that altogether provide half of the mean annual water-volume of inland rivers (Tab. 1).

The spatial distribution of the flowing water-layer thickness reveals that the water-resources of rivers highly range from less than 25 mm/yr. (in the drainage basins of Danube's small tributaries and the littoral regions) to over 400 mm/yr. (on the upper course of the Tisa river and Nera-Cerna confluencing zone) (Tab. 1).

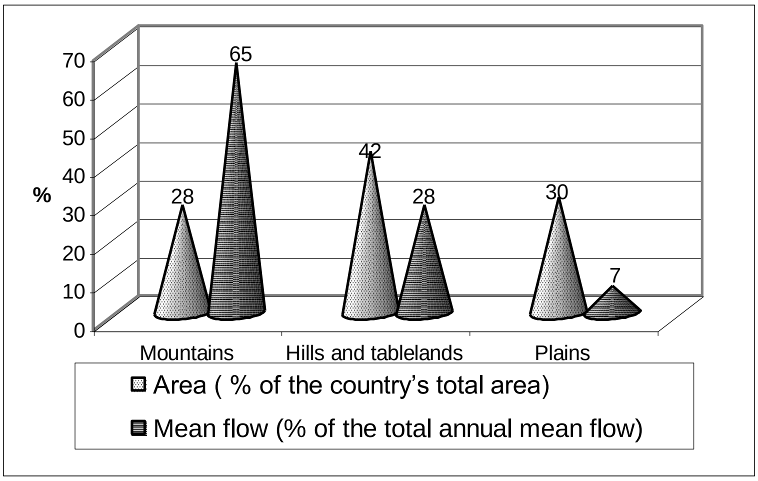

Fig. 1. The Water-Flow Distribution of Rivers on
Main Relief Forms in Romania

According to the water-flow characteristics, Romania's drainage basins may be grouped into three main regions: the western, southern and eastern regions. The western grouping includes the upper courses of Tisa and Olt rivers and the Someş, Criş (Alb, Repede, Negru), Mureş, Bega-Timiş-Caraş and Nera-Cerna basins. The water-supplies of the western region are generally greater than the other two regions not only because of heavier rainfalls due to the oceanic influences of mid-latitude climate, but also on account of their location within the major relief forms and mainly westward orientation, favoring rich pluvial nourishment.

In the southern region (including the Jiu, lower Olt, Vedea, Argeş, Ialomiţa, Danube and Littoral basins) and eastern region (comprising the Siret and Prut basins), the stronger continental influences of the mid-latitude climate and the mainly southward and eastward of river basins account for lower rainfall amounts, so that the river flows are generally lower and some streams even degenerate or recover only slowly from the period of dryness and drought in the E and SE parts of the country.

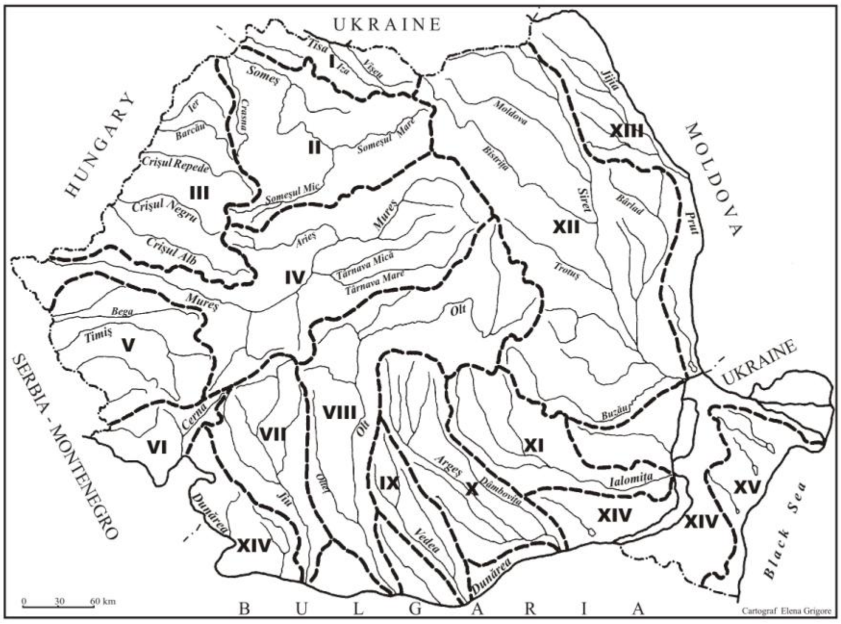

Fig. 2. The Major Hydrographical Basins in Romania: I – Upper Tisa; II – Someş; III – Criş; IV – Mureş; V - Bega-Timiş-Caraş; VI - Nera-Cerna; VII – Jiu; VIII – Olt; IX – Vedea; X – Argeş; XI – Ialomiţa; XII – Siret; XIII – Prut; XIV – Danube; XV – Littoral.

3. Time Variation of River Water-Resources

Romania's river water-resources are highly variable in time, from one year to another and from one season to another, mainly due to the varying climatic conditions. The multiannual variation is generally larger in the plain areas, where the variation coefficients of the mean annual runoff range from 0.5 to 0.7, exceeding 0.7 in the eastern parts of the Romanian Plain and in Dobrudja. The variation coefficients of the mean annual runoff in the mountainous region are lower than 0.3, and in the hilly region, they range between 0.3 and 0.5 (*Râurile României*, 1971). During 1980-2000, the mean annual volume of inland river water-resources in Romania have ranged from 21.6 km^3 (in 1990) to 57.9 km^3 (in 1980) (according to INHGA data).

The distribution of river water-resources among main drainage basins in Romania

Table 1

Nr.	Drainage Basin	Total Area		Mean annual volume		Thickness of Water-Layer
		km^2	%	mil. m^3	%	mm
I	Upper Tisa	4,540	1.77	2,020	4.77	445
II	Someş	17,840	6.95	4,102	9.67	229
III	Criş (Alb, Negru, Repede)	14,860	5.79	2,903	6.85	195
IV	Mureş	29,390	11.4	5,838	13.84	199
V	Bega-Timiş-Caraş	13,060	5.08	2,462	5.82	188
VI	Nera-Cerna	2,740	1.07	1,253	2.96	457
VII	Jiu	10,080	3.92	2,771	6.55	275
VIII	Olt	24,050	9.36	5,491	13	228
IX	Vedea	5,430	2.11	388	0.92	71.4
X	Argeş	12,550	4.89	2,193	5.18	175
XI	Ialomiţa	10,350	4.03	1,436	3.39	138
XII	Siret *	44,871	17.5	7,227	17.09	161
XIII	Prut *	28,396	12.9	789	1.86	23.7
XIV	Danube (small tributaries)	33,250	12.9	789	1.86	23.7
XV	Littoral	5,480	2.13	113	0.27	20.6
	ROMANIA	**256,887**	**100**	**42,300**	**100**	**165**

* Including the basins extending abroad. INHGA data

Over the course of a year, the mean water-flows greatly change from one season to another and from one month to another. In winter, the ratio of the country's total mean annual flow range from less than 15% in the high mountain areas, to 30-35% in the Romanian Plain and the Western Hills and Plain; the maximum values being characteristic of the Someş and Criş basins. The mean water-volume of rivers gets higher in spring, when spatial disparities are lower (40-50%), although slightly greater values occur in the Romanian Plain and eastern Moldavia. During summer, the mean water-flow increase from 15-20% in the hilly and plain areas, to more than 30% in the mountains. On the contrary, in autumn, the river water-flows degenerate to the lowest values; their ratio of the mean annual total runoff varying between 5% and 15% (5-10% in the lowland regions and over 15% in the Carpathian areas) (*Râurile României*, 1971).

The analysis of the seasonal distribution of mean water-flows in the main river-basins reveals that the higher water-resources occur in spring (about 40% of the mean annual runoff) and in summer (27%); the corresponding flows getting much lower in autumn and winter (14% and 19% respectively) (Fig. 3).

The annual runoff is generally characterized by late spring and early summer high-floods, as well as degenerating water-courses in the dryness and drought periods to the end of summer season. This is why the rivers reach higher water-volumes in April and May (each month contributing with 14.3% of the mean annual flow) and lower volumes (<5%) in autumn (Fig. 3).

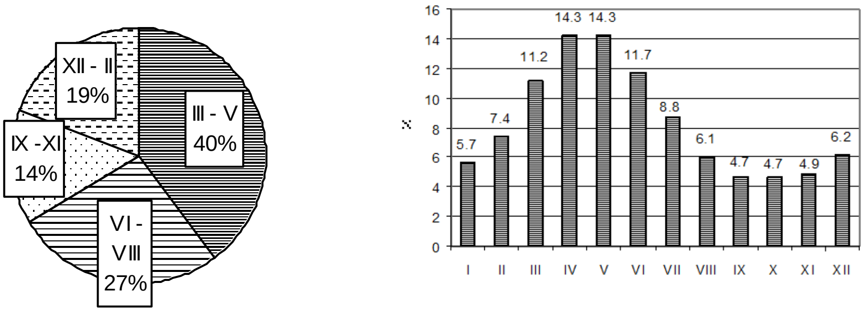

Fig. 3. The Seasonal and Monthly Variation of River Water-Resources in Romania (% of the total annual mean runoff)

However, there are obvious differences between water-flows in various river-basins located in different parts of the country. For example, the rivers grouped into the Littoral basin produce the largest water-amounts in winter (30.3%) and summer (27.5%), while degenerating in spring (20.8%) and autumn (21.4%). The rivers in the western grouping reach higher levels in winter, which is the second important month as regards the seasonal flow, after spring, while the rivers in the eastern grouping are characterized by low winter flows.

Because of permanent time variations, the natural exploitable potential of rivers hardly reaches 5 km^3/yr Regulation works have greatly modified the effects of sudden changes in discharge, so that, by means of reservoir lakes, the water-potential of rivers can increase to 25 km^3/yr. (according to ANAR statistics, 2003). In 2000, there were more than 1,400 functional reservoir lakes on inland rivers (Stegăroiu & Negriu, 2003). Out of these, 400 reservoir lakes exceed volumes of 1 million m^3; most of them having complex functions, but only 17% of them have strictly regulating functions destined to regulate discharges and mitigate high-floods (Zaharia & Pătru, 2000).

4. The Water-Quality of Rivers

Water-quality of rivers in Romania is greatly influenced by various (industry, agriculture or population-related) polluting factors with punctual or spatial extension. According to STAS 4706/1988, the rivers' water may be classified into four distinct groups of quality:

- the Ist class (very good) includes water-supplies for population, animal and trout-rearing farms;
- the IInd class (good) contains waters that may be used for pisciculture (except trout-rearing activities) and industrial or recreational purposes;
- the IIIrd class (satisfied) comprises waters that may best be used for irrigation and hydro-power works or in industrial cooling and washing installations;
- the "degraded" waters are improper to any use.

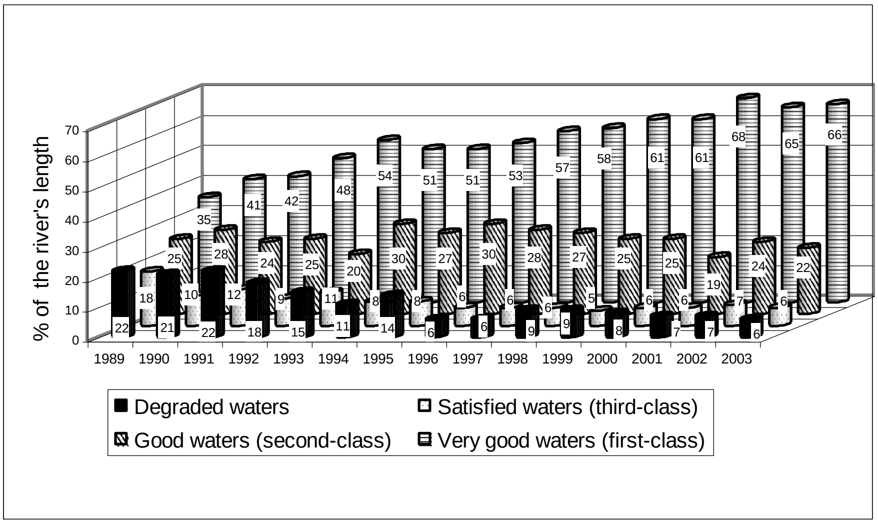

Fig. 4. The Evolution of River Water-Quality (according to ANAR data)

In 2003, out of the 22,000 km total length of river courses that have been qualitatively monitored, only 66% were included in the Ist class; 22% in the IInd class; 6% in the IIIrd class and 6% were actually degraded waters (according to ANAR statistics). If analyzing the evolution of river water-quality in Romania, after 1989, one can easily notice that the proportion of the waters falling in the Ist category has increased, while the proportion of degraded waters has decreased (Fig. 4). This water-quality improvement is basically the result of restricting (and sometimes even suspending) the activity of some great polluting economic agents and, to a lesser extent, the result of a more strictly applying the provisions of the laws concerning the water-quality protection.

If the overall picture of water-quality in Romania doesn't seem too worrying, at regional scale, there appear cases of severe water-pollution on various river segments or even discharge basins. For instance, in some river-basins, the proportion of river-lengths with degraded waters is pretty high: 22% in the Prut basin; 20% in the Ialomiţa basin; 11% in the Vedea basin (Tab. 2). The rivers being most seriously affected by anthropic pollution are: Jijia, Bahlui, Miletin (in the Prut basin); Ialomiţa, Prahova and Teleajen (in the Ialomiţa basin); the Olt river, downstream from the confluence with Bârsa, Bârsa and Cibin (in the Olt basin); Arieş and the lower course of the two Târnave rivers (collected by the Mureş river) and, finally Dâmboviţa (downstream from Bucharest urban area, in the Argeş basin).

Conclusions

The river water-resources hold an important share in Romania's total fresh-water potential. They provide water for various uses, but their management is restricted by three factors: uneven spatial distribution; significant time variations and pollution-degraded quality.

Due to their important spatial and time variations, the water-resources of rivers can't naturally provide the necessary amounts for population, industry, agriculture and other activities. That's why, regulating works (reservoir lakes, inter-basin derivations) were, and still are, needed to regulate the rivers' flow in time and to ensure a more even spatial distribution of water-supplies, according to consumption requirements. The thorough quantitative and qualitative assessment of river-waters must be the top priority of water-resources management and the national strategy for water, so that water be more efficiently preserved and protected for its best sustainable development. At present, the entire water-management activity in Romania focuses on the implementation of the Framework Directive 2000/60/EC establishing the water-development guiding lines in Europe.

The Distribution of River-Lengths by Categories of Quality (2001)

Table 2.

Nr.	River Basin	Total Monitored Length (km)	The Distribution of River-Lengths by Cathegories of Quality							
			I		II		III		D	
			km	%	km	%	km	%	km	%
1	Upper Tisa	467	410	87.8	-	-	21	4.5	36	7.7
2	Someş	1,681	1,291	76.8	331	19.7	-	-	59	3.5
3	Criş (Alb, Negru, Repede)	1,093	995	91.0	23	2.1	34	3.1	41	3.8
4	Mureş-Aranca	2,434	1,483	60.9	686	28.2	59	2.4	206	8.5
5	Bega-Timiş	1,119	1,036	92.6	83	7.4	-	-	-	-
6	Nera-Cerna	258	258	100.0	-	-	-	-	-	-
7	Jiu	944	866	91.7	78	8.3	-	-	-	-
8	Olt	2,335	1,430	61.2	523	22.4	271	16.6	111	4.8
9	Vedea	875	670	76.6	57	6.5	55	6.3	93	10.6
10	Argeş	2,344	2,011	85.8	278	11.9	24	1.0	31	1.3
11	Ialomiţa	1,327	415	31.3	246	18.5	401	30.2	265	20.0
12	Siret	4,135	2,551	61.7	1,006	24.3	234	5.7	344	8.3
13	Prut	1,588	757	47.7	181	11.4	302	19.0	348	21.9
14	Danube (small tributaries)	1,073	646	60.2	427	39.8	-	-	-	-
15	Littoral	358	160	44.7	198	55.3	-	-	-	-
	ROMANIA	**22,031**	**14,979**	**68.0**	**4,117**	**18.7**	**1,401**	**6.4**	**1,534**	**7.0**

I = Ist category; II = IInd category; III = IIIrd category; D = degraded waters

According to ANAR data

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PROSPECTS FOR ROMANIA REGARDING THE REGIONAL POLICY OF THE EUROPEAN UNION

ILEANA PĂTRU, ION MARIN

Historical background

The history of the European Union is based on the chronology of the most important achievements of the Union and its institutions.

During time (starting 1950) there were different stages in creating this Union; thus, from Robert Schuman's declaration (the Minister of Foreing Affairs of France, who, inspired by Jean Monnet suggested a plan on which CECO (the European Comunity of Coal and Steel-would be based-„Schuman's Declaration"), the first waves of admition come in the 70's and 80's and later on the set up of the Single market in 1993; on January 1st 1999 the Euro Currency was launched and finally opening the adhering for the Central and East European Counties.

The sever crises to which Europe had to face, gave birth to the "European Idea" and raises the bid several times during centuries. But it was only after the Treaty of Rome[1] had been signed and the economic success of the Common Market in the 60's that the European Union imposed itself as a powerful alliance. The extension of the European Community represented the dynamic factor in the 70's and 80's.

If initially there were six founding states that signed the Treaty of Paris in 1951 (CECO) and the Treaty of Rome in 1957 (the European Economic Community and ECNE), later on in time there were registered four successive extensions:

1973 – Denmark, Ireland, Great Britain;

1981 – Greece;

1986 – Portugal and Spain;

1995 – Austria, Finland and Sweden

after the political changes of the year 1989, East Europe faced the problem of integrating the ex-communist countries in the European Structures, after they had joined the Council of European in Strasbourg. In 1989, the Phare Programme, as a Structural Fund for ex-communist countries, was constituted.

For Romania, it was only the year 1999 that this country was invited to adhere to the European Union, an invitation addressed by the Council of Europe from Helsinki, and then, in February 2000 the official adhering negotiations take place.

The EU policy is based on "the adhering partnership" that deals with the adaptation of the policies and structures of each member country to the criteria establishes by the Conference of Copenhaga[2].

After 1989, EEC (the European Communities), the EU (the European Union) decided to help Central and East European Countries (PECO) in order to obtain sufficient progress for adhering to the EU. In 1998, the Commission established a partnership for adhering PA for each country, individually, its main objective being to revise priorities, objectives, finances.

In order to reduce the deficiencies and disparities of development, the EU promotes a series of policies: the Common Agrarian Policy (CAP); the Regional and Cohesion Policy (RCP); the Environmental Policy (EP).

The structural funds and the Cohesion Fund, are European Financial instruments for co-financing the member states for various actions of development that complete the financial efforts of the states. This policy has been applied by:

-the European Fund for Economic and Regional Development (EFERD) ever since 1975 and aims to the investments for assisted areas;

-the European Social Fund (ESF) set up in 1975, whose action is based on professional FSE development.

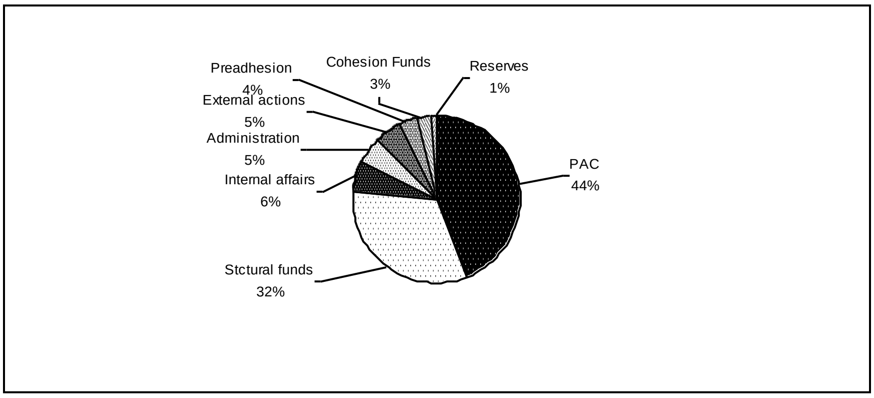

Fig 1 (Sourse: http://europa.int/)

-The European Fund of Orientation and guarantee, set up in 1962 that claims (EFOG) the adaptation of the agrarian structures and rural development actions.

Fig.1 shows the EU budget and the highest percentage for regional policy (RP) 32% and Common Agrarian Policy (CAP) 44%.

Prospects for Romania

After a decade with no policy of systematization (just some isolated actions), the increasing inequalities in Romania and the necessity of re-orientation packages of the international public funds has led to the institution of a new legal frame represented by the Phare Programme of the EU that rests on a Model/pattern of territorial action based on regions such as NUTS II.

The principle of decentralization and partnership of the local actors is the most important (Atlas de la Roumanie, Violette Ray, O. Groza, Ion Ianoş, Maria Pătroescu, 2000, pg 152).

Romania, as a candidate to the European Integration, benefits from financial support based on development programmes. Between 2000-2006, the support is doubled (3.120 mi euro/year) for Romania. This program contains three instruments of pre adhesion:

-Phare Programme – annual budget of 1.560 mi euro centered on the adhesion objectives and coordinated by the General Board of extension, with the help of a financial administration Committee of Phare Programme.

-ISPA programme (1.040 mil euro7year) to finance the infrastructures regarding transportation and environment.

- SAPARD programme (520 mil euro) that finances agriculture and rural development.

In 1997, the European Bank for Investments (EI) approved to a earn of 3.520 mil euro for pre-adhesion, being also supported by various youth programmes, such as Socrates, Leonardo. Between 1990-2000, Romania, benefited by the Phare Programme for 1.5 millions of euro and for 2004-2006 of 240-270 millions of euro/year, a sum of money that placed our country on the second place after Poland.

The Regional Policy in Romania and Phare Programme

The policy of regional development was enconvarages in Romania by Phare programme, after 1996. the overall objective of the programme was to help PECO Countries, including Romania, to prepare for the adhesion candidateship.

Phare Programme 2000-2006 in Romania

For the period of time 2000-2006, the priority directions of programme are.

-reinforcement of the civil society and fulfilling the political criteria from Copenhague;

-reinforcing the capacity of analyzing the macro-economic situation and creating a functional market economy for fulfilling the economic criterium from Copenhague;

-reinforcement of the administrative capacity so that the EC assistance gets decentralized;

-harmonization of the legislation with the Community experience;

-establishing a cohesion social and economic policy;

-participating to the European programmes.

The objectives of great priority for Romania were still are: harmonization with the European Regional Policy, regional development, decentralization of the administrative structures and investment support.

Regarding regional development in Romania there are eight regions of development (fig 2). They were created so that the areas will develop economically speaking, even if they are not administratively independent as in a federal state. The eight regions of development function in parallel with the 41 countries, assisted with European funds. There are council for regional development of the regions (each region has 4 to 6 counties) south-east, south, south-west, west, north-west, centre and Bucharest region.

This regions were set up as a recommendation of the EU, that considers the country “as a very small with compared to the whale country which is too big to he associated with the regions in the member states of the Union”.

According to the political declaration on regionalism, adapted in 1996 by the European Regions Committee, the basic structure of the region is made up of a representative meeting (a sort of miniparlament) and an executive organism (a sort of minigoverment). There are also eight Council of Regional development, that are fundamentally to put into the practice the regional policy; these council are governed by a president, vicepresident, elected by mayors of the main cities. And there are eight ware Agencies of regional development (ARD) that are meant to prepare and apply the decisions taken in 1999, agencies that are coordinated by the Regional development Agency RDA and a National Council (DR), Coordinated by a Prime Minister.

One of the objectives of the Phare programme is to prepare the Romanian administration to ensure the use of the structural funds and Cohesion Funds in a decentralize way. Therefore, the European experience must apply to the regional policy and economic development of the eight regions created by law no 151 /1998, as well as to the coordination of the eight regional agency of development.

It is also necessary the elaboration, of a regional development plan (RDP) for 2004-2006, and also all the preparations necessary to move forward from the pre-adhering assistance SAPARD, Phare to the structural contributions of the member stats (FS, FC, FEDER) that require special procedures (Fig. 3).

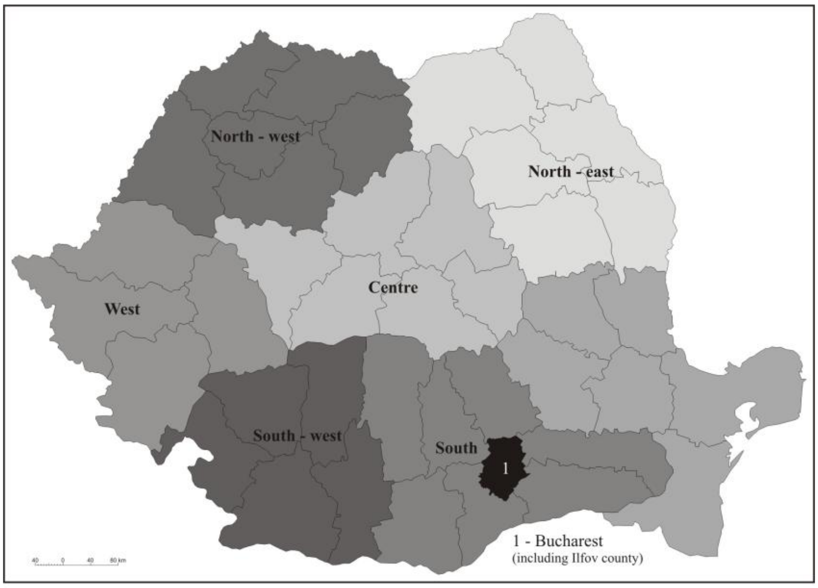

Fig.2 Regions of development

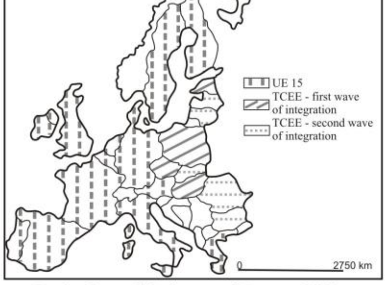

Fig.3 Geopolitical map of Europe, 2003

In conclusion, the European integration of Romania will be possible only by following certain steps little by little. That's brow the main constituents of the EU appeared, that is the common market, the agrarian policy and monetary union.

This whole process will be fulfilled with the overcoming of the most difficult stages, respectively the political union and European citizenship. Only the future generations will see only and if, for Romania, they will be myth or reality.

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ON 'IMAGINATIVE GEOGRAPHIES'

DUNCAN LIGHT, DANIELA DUMBRĂVEANU

Introduction

Although Romanian geographers may not yet be widely familiar with the concept, the study of 'imaginative geographies' has, in recent years, risen to the forefront of Anglo-American human geography. The term 'Imaginative geographies' is used to refer to ways of thinking about other places in the world. Geographers have a long history of studying and interpreting the geographical world around them. But geographical knowledge is not only confined to an observable geographical 'reality'. There is also a wealth of geographical knowledge about other places (and the people who inhabit them) that exists in our minds. Such 'mental geography' may seem irrelevant or too commonplace to be worthy of study. However, our mental geographical knowledge of other places can exercise a significant influence on the way we feel about such places and such knowledge also directly influences our behaviour. In this paper we aim to introduce the idea of 'imaginative geographies' to a Romanian geographical readership and we use a range of examples to illustrate the importance of such geographies.

Imagination and Imaginative Geographies

Before considering imaginative geographies we need to consider what is meant by 'imaginative' and 'imagination'. The term 'imagination' is frequently associated in everyday speech with creativity, particularly artistic creativity (Driver 1999). For example, we might talk about a particular writer as having a powerful imagination that is reflected in his/her writings. However, 'imagination' also has other meanings. The Concise Oxford Dictionary defines imagination as "a mental faculty forming images or concepts of external objects not present to the senses". This definition refers to the ability of the human mind to form mental pictures – of objects, events, people or places – which we cannot see directly in front of us. In the absence of direct, first-hand experience, our minds are still able to form ideas of what something is like. Similarly, the term 'imaginative' refers to the ability to use the imagination in this way.

The use of the imagination is essential in enabling us to understand the world. One obvious example concerns the past. If we do not have direct personal experience of a particular historical event (which is usually the case) then we have to use our imagination to understand it. For example, many Romanians have a well-defined idea of what Bucharest was like in the inter-war years, a period when the city was widely known as the "little Paris". In most cases this knowledge is not derived from personal experience. Instead it is a construct of the imagination which forms a mental picture of interwar Bucharest, based on images and representations from the period.

Just as we can imagine other times, so too can we imagine other places. The study of imaginative geographies focuses on the ways in which we form images in our minds about places, whether these places are within our own country or in other parts of the world. On one hand we all gain knowledge about some places through direct personal experience (for example by growing up there or visiting during the course of a holiday). Our knowledge of such places comes from seeing them with our own eyes. It is for this reason that fieldwork is considered so important to a geographical education: it is all very well teaching students about something from a textbook, but at some stage, as geographers, they should go and see it for themselves. However, we also gain knowledge about places that we have not been too. We form ideas or images or pictures in our minds about the nature of other places: we 'imagine' what such places are like in the absence of first hand experience of them.

The importance of imaginative geographies can be illustrated by a few simple examples. For eight years now, one of the authors (DL) has used the following exercise with British first year geography undergraduates to illustrate the power of imaginative geographies. Students are presented with a list of ten countries and asked to select the one they would most like to visit on holiday. Every year, despite its considerable distance from the United Kingdom, New Zealand is the most popular choice (irrespective, in fact, of which other countries are on the list). Those students who have selected New Zealand are then asked if they have previously been to the country. To date, not a single student who had selected New Zealand had previously visited the country! What is at work here is the imagination. Despite the absence of first hand experience, New Zealand is imagined or pictured in very favourable terms by British students.

Another example illustrates the ways in which Romanians imagine other countries. If Romanian students were to be asked which country they would most like to visit, the majority would almost certainly say America. However, very few of them have previously been there: yet America is imagined in a particular way which has a strong appeal to young Romanians.

Imaginative geographies of other places are rarely confined only to the physical characteristics of such places: such mental geographies frequently involve ideas about the people who live there. Returning to the example above, when students are asked why they selected New Zealand, many say that they imagine New Zealanders to be friendly (and more importantly, English speaking!). There are numerous examples of how imaginings of particular places are inseparable from the people who live there. Such imaginings may be at a national level (for example, "the Romanians have a Latin temperament" or "the English are reserved"). Alternatively they may be regional: for example, many people from northern England describe southern England as "full of snobs". Within Romania, the people from Transylvania are often described as civilised and hard-working but stubborn and 'heavy-headed', while Oltenians are often described as friendly but noisy and anarchic.

Imaginative geographies of places of which we do not have direct experience are not simply abstract mental constructions that bear no relation to the real world. On the contrary, the way we imagine other places to be is inextricably connected with our behaviour. Our mental ideas about another place can affect a variety of decisions about where we would choose to live, to work, to visit and so on. The activity of tourism is intimately connected with our imaginative geographies of the potential destination. The decision to go on holiday to a place we have not previously visited is determined by how we imagine the destination and its people to be. Destinations that are imagined in negative terms will not be visited. Many young Romanians imagine the countries of Western Europe as countries of opportunity and prosperity: for some this imaginative geography influences their decision to immigrate to Western Europe in order to find work.

Behavioural Geography and Imaginative Geographies

Although there are distant parallels, the study of imaginative geographies should not be confused with behavioural geography (a topic that is becoming increasingly popular within Romanian geography). Behavioural geography enjoyed considerable popularity in the 1970s and early 1980s within Anglo-American human geography (for example, Gold 1980, Walmsley and Lewis 1984). Behavioural geography adopted approaches borrowed from environmental psychology in order to understand the relationship between mental processes (primarily perception and cognition) and spatial behaviour. One of its main concerns was in understanding mental images (or mental maps) of the environment (which were assumed to be objectively measurable).

Although popular for a time, behavioural geography was the subject of vigorous criticism (Unwin 1992, Johnston 1997). Some questioned whether mental images of the world are in fact measurable and indeed whether behavioural geographers had the necessary methodological tools to do so. In addition, the assumption of a clear relationship between spatial perception and actual behaviour was questioned. Others pointed out that behavioural geography's focus on the individual (Gold 1980) failed to take into account the broader social, cultural and political contexts in which mental maps and images of the world are formed.

The study of imaginative geographies shares with behavioural geography a concern for mental pictures or understanding of the world and seeks to explore how our knowledge of other places affects our behaviour. However, unlike behavioural geography the study of imaginative geographies is not underpinned by environmental psychology and an emphasis on cognitive processes. Neither is there a concern for measuring and recording mental images (and indeed, the term 'image' is used in a different way from behavioural geographers). Perhaps the most important difference from behavioural geography is that, unlike mental maps and images, imaginative geographies are not considered to be simply individual mental constructions (Driver 1999). Certainly, no two individuals will imagine another place in exactly the same way, but at the same time, imaginative understandings of other places are formed in, and are the product of, particular social, cultural, political and historical contexts. They are therefore as much collective as they are individual.

Understanding the nature and significance of imaginative geographies involves paying particular attention to the broader contexts in which such imaginings take place – in other words, questions of 'who', 'when' and 'where'. This can be illustrated by considering the ways in which Romanians imagine France. For a start, France would mean very different things to an urban intellectual in Bucharest and a rural peasant in Maramureş. The former might regard France as the source of major influences on

Romanian culture and language, while for the latter, France may be the temporary home of friends/relatives who have travelled abroad to look for work. Similarly, Romanian understandings of France have changed over time. France was a major reference point for Romania (as a 'Latin sister') up to the Second World War, but during the isolationist period of the 1950s (when Romania was orientated towards the Soviet Union) France, as a representative of the capitalist West, was viewed with hostility and suspicion. After 1989, France has once again become a reference point for Romanians (although it is being eclipsed by America). In various ways, imaginative geographies of France are rooted in their contexts and to understand fully such imaginings means paying detailed attention to these broader contexts.

Representation and Imaginative Geographies

Central to the formation of imaginative geographies of places to which we have not been is the ways in which such places are represented to us. Representation has been described as "the cultural practices and forms by which human societies interpret and portray the world around them" (Cloke *et all.*, 1999:342). Such representations (or portrayals) can take a wide variety of forms. One of the oldest is travel writing which has a long history and which was highly influential in creating particular imaginative geographies of remote places. The passage below is taken from a 19th century account of Transylvania:

"Not the mere distance which separates Transylvania from Western Europe gives to it this feeling of strange isolation… Situated by nature within a formidable rampart of snow-tipped mountains, and shielded by heavy curtains of shrouding forests against the noise and turmoil of the outer world, the very name of Transylvania tells us that it was formerly regarded as something apart, something out of reach, whose existence even for a time was enveloped in mystery… The people who lived westward of this mountain rampart, knowing but little or nothing of the country on the other side, designated it Transylvania, or the land beyond the forest, just as we sometimes talk of the 'land beyond the clouds ´" (Gerard, 1888, pp 2-3).

It is not difficult to imagine how the English-speaking reader of this passage in the late 19th century would form a very vivid mental picture of Transylvania – as somewhere remote and on the very edge of Europe. Such a description may not be an accurate portrayal of Transylvania but in the absence of any first hand experience the reader would form a distinct imaginative geography of the region. As such, travel descriptions do not only describe a particular part of the world but they also 'construct' it in the mind of the reader.

In the contemporary world some of the most widespread forms of representation form part of what is known as 'popular' (or everyday) culture (which is itself a central focus of Anglo-American cultural geography). Representations in newspapers, magazines, films, television programmes and even tourist brochures bombard us with images of other parts of the world. Through experiencing (or consuming) such representations we build up mental pictures of other places that, in some cases, can be very detailed. Through exposure to the plethora of American films and television programmes currently broadcast in Romania, many Romanians have developed distinct imaginative geographies of America.

Some forms of representation are specifically intended to create particular imaginings of the place portrayed. Tourist brochures are one of the best examples: the representations in such brochures are intended to create (or reinforce) a particular mental picture of a destination in order to persuade a tourist to purchase a holiday. In this sense, tourist brochure representations are in the deliberate business of "place-making" through the construction and manipulation of imaginative geographies of the destination region.

Imaginative Geographies and Collective Identities

Although the issue of identity may not immediately seem to be appropriate subject matter for the geographer, many forms of identity have a distinct geographical dimension and for this reason the subject occupies a central place in contemporary Anglo-American cultural geography. The study of identity involves looking at the ways in which we define ourselves and answer the question "who I am" (or "who we are"). There are many ways in which such questions can be answered – senses of identity are multi-dimensional and each individual can define (or identify) themselves in a number of ways depending on the circumstances. For example, we may define senses of identity on the basis of our occupations (e.g. geographer, student), our family circumstances (mother/father, son/daughter), or our interests (football fan, music lover). However an important characteristic of all identities is that they are oppositional or relational: in other words, defining what we <u>are</u> frequently involves making reference to 'what we are <u>not</u>'. Conventionally this 'what we are not' is described as the 'Other'. Identities are constructed on the basis of 'me' and 'you', or 'us' and 'them': put another way, all identities involve thinking about 'self' and 'Other'.

While some senses of identity may be defined without any reference to geography, others have a distinct geographical dimension. For example, we may define ourselves by the town we come from (e.g. Londoner, Bucureştean), our region or county of origin (e.g. Oltenian, Transylvanian etc) or by our nationality (Romanian, Hungarian, English etc). Moreover, some collective identities - particularly national identities - are founded on particular ways of imagining space and territory. For example, many Romanians talk of Romania as "a Latin island in a sea of Slavs". Such a way of talking about Romanian identity is inherently geographical and uses a geographical metaphor to express a fundamental attribute of national identity. Moreover, imagining Romania in this way as a 'Latin island' also makes explicit reference to the imagined 'Other' (Slavs and Magyars) beyond Romania's borders.

One highly influential study of the relationship between collective imaginative geographies, identity and the 'Other is that of Said (1978). Although he was a literary critic and not a geographer Said's book *Orientalism* has played an important role in introducing the term 'imaginative geographies' to a wide audience. His work focused on the ways in which the Western world represented (and formed imaginative geographies of) the Orient (particularly the Islamic world). He argued that the Western world had a long tradition of representing the Orient as remote, exotic and mysterious, but also as primitive and backwards. At a time when the West sought to define itself as modern, rational, progressive and 'civilised', it also sought to create myths about other people, places and cultures in order to highlight differences between the Western and Non-

Western worlds. In effect, non-Western cultures were 'constructed' as the 'Other' of the West through the ways in which they were represented in the Western world (indeed, this practice of representing a place or its people as 'Other' has become known as 'Othering').

However, it is not only the Orient that has been represented by the West as 'Other': the practice has been applied more generally to places considered by the West to be non-Western. For example, there has been a long tradition within Western Europe of imagining and representing the countries and people of Eastern Europe as 'Other'. Todorova (1997) has used the term 'Balkanism' to describe this practice (which refers to representations of South East Europe in general and not specifically the Balkan region). She writes:

"That the Balkans have been described as the "other" of Europe does not need special proof… Because the geographic east of Europe and world situated to the east was lagging behind Europe primarily in economic performance, East came to be identified more often, and often exclusively, with industrial backwardness, lack of advanced social relations and institutions typical for the developed capitalist West, irrational and superstitious cultures unmarked by Western Enlightenment" (pp. 3 and 11).

Many people in Eastern/South Eastern Europe may feel that such a way of representing their region is inaccurate or unjustified. This may well be the case: however, the fact is that this way of imagining Eastern Europe is deeply rooted in the Western imagination. It was powerfully reinforced during the period after the Second World War when the idea of 'Communist Eastern Europe' as the 'Other' of the capitalist West became deeply embedded in the Western mindset. It was probably for this reason the Western Europe was initially hesitant about embracing the former communist countries of Central/Eastern Europe into the European Union. Thus, imaginative geographies are a powerful influence on the practice of international politics and Anglo-American political geographers have adopted the term 'critical geopolitics' for the study of the ways in which international politics is imagined spatially (Sharp 1999).

Conclusions

Geography does not only exist in an observable world that is 'out there': it also exists as knowledge in our minds about the nature of other places and people. Such knowledge can be termed 'imaginative geographies'. Such mental pictures of other places exist at both individual and collective levels and are created in particular social, cultural and political contexts. Moreover, imaginative geographies play an important role in the construction of collective (particularly national) identities since such identities are frequently founded on myths or stereotypes of other places. Imaginative geographies are not irrelevant or trivial: instead they matter! The ways in which we imagine other places can play an important role in influencing our attitudes and behaviour regarding those places.

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THE RECENT DYNAMICS OF THE STATE OF HEALTH OF THE ROMANIAN POPULATION WITHIN A EUROPEAN CONTEXT

LILIANA DUMITRACHE

Introduction

The state of health of a population is influenced by various factors associated with the economic, social and cultural environments. The population health status of a country often reflects its economic and social situation, the concern which that country pays to health, through economic and social policies, and the lifestyle of its inhabitants. An accurate assessment of the dimension of some phenomena, the understanding of the starting level and later developments are all currently important consideration within the context of Romania's future plans for integration into the European Union. The existing disparities between the countries of Western and Eastern Europe are evident and they are manifest in various domains, starting with the economy and also including health. The economic and social policies introduced by the political regimes in power after the Second World War within Eastern Europe have blocked or changed the normal evolution of demographic, economic and social phenomena. As a result there is a continuously increasing differentiation between the countries of Central/Eastern Europe and those of Western Europe. Despite the favored slogan of the Communist Regime – the creation of the 'new man' – issues of health were completely neglected, as will be shown in this paper. An overview of some characteristic indicators for the assessment of health state, established for the European countries show that, even before 1990, the countries of Western Europe generally had a much better health status than those of Central/Eastern Europe. In addition, even within the latter group there were significant differences. Romania stands out, even before 1990, for its poor health state, a fact which is demonstrated by the high values for general and infant mortality and also for the reduced life expectancy of the Romanian population, compared both with the countries of Western Europe and the other countries of Central/Eastern Europe.

During the last years of the totalitarian regime the Romanian population experienced a serious lack of household economic resources (meaning foods and other basic consumer goods) although, according to the principal of equal distribution of goods and income, poverty did not exist in Romania. In reality, the largest part of the population faced significant deprivation and hardship.

A systematic deterioration of the socialist economy, beginning in the 1970s and intensifying in the 1980s resulted in the reduced resources for population support, a fact which led to a continuous decrease in the quality of goods and services offered to the population. Thus, public services were completely ignored and under-financed. Health was the most badly affected. The health care system experienced a severe lack of personnel, drugs, medical equipment and instruments. Investments were seriously reduced and eventually stopped altogether. This situation led to a rapid degradation of the health care system, which, in any case, was unable to cope with the new pressures determined by changes in the morbidity model. In the last years of the totalitarian regime, Romania's social and economic situation was completely unable to maintain and improve the health status of the population.

Despite the fact that the major political and economic changes introduced after 1989 were orientated towards correcting the malfunctions, in reality they generated new problems, which in their turn, had a negative impact on the population health status. The structural changes produced within the economy have generated new problems such as low productivity, unemployment and job insecurity. At the same time prices have increased while salaries have decreased in real terms. This situation has impoverished some population groups, especially elderly people and large families who have experienced a decline in living standards. The chronic under-financing of the health care system through the reduction in resources and the deterioration of existing financial and material resources as a result of rapid inflation had a negative impact on the structure and quality of health care provision. Significant problems such as increasing costs and poor resources and conditions have resulted in delay in implementing the health reform. All these aspects, along with poverty, have contributed to the continuous deterioration of the population's health state.

The health state of the population, inherited from the communist regime, is poor and its future improvement depends largely on economic and health care policies undertaken by the post-communist governments, as well as the way in which the authorities understand the importance of maintaining the health of the population and the long-term financial benefits of prioritizing 'prevention' over 'cure'.

The dynamics of the state of health of the Romanian population: an overview within the European context

In order to assess the health state of the Romanian population relative to that of other European countries, and also to identify the changes within the Romanian health state a *Health Index* was calculated. This was obtained through standardizing and aggregating existing indicators such as general mortality rate, specific mortality rate, infant mortality rate, life expectancy and incidence of certain diseases. This index reflects the changes produced over time at the health status level and also spatial disparities. Its values range between 0 and 1: the lower the value, the better the health state of the population, and the higher the value, the lower the health state. The negative trends of indicators of health registered in Romania before and after 1990 have a negative influence on the health state of the population. Romania is not unique from this point of view: the majority of Central/Eastern European countries have displayed similar trends, at least up to 1990. The differences between the formerly socialist countries of Central/Eastern Europe and Western capitalist countries became significant after the 1970s when economic and political failure of the socialist countries affected all aspects of social life, including health.

If, up to 1990, the countries of Central/Eastern Europe experienced a deterioration of living standards and public services, with significant impacts on population health states, after this date the former communist countries sought to reduce disparities in health state, although each country has gone about it in its own way.

The disadvantaged position of the Central/Eastern European countries meant that it was difficult for them to catch up with the Western European countries since after the fall of the communist regimes they faced new phenomena which amplified or deteriorated the existing situations, sometimes generating crisis. According to abilities of the public authorities in these countries to cope with the situation and also according to the policies adopted in all socio-economic sectors, the achievements are more or less significant. Thus, according to the levels of some social and economic indicators, by 2000 the Central/Eastern European countries have tended to reach a situation, which is closer to that of the Western European countries.

The values calculated for the health index characteristics calculated for 1980 in selected European countries clearly show the poorer health state for the countries of Central/Eastern Europe compared with those of Western Europe. At this time, the highest values of the health index were registered for Romania (0.633) and Hungary (0.644) indicating the poorest state of health, compared both with countries of Western Europe and other Central/Eastern European countries (see Figure 1)

However, the difference between Romania and Hungary and other Central/Eastern European countries is not that significant, taking into account the values of the health index of 0.600 in Bulgaria and Czechoslovakia, but a lower value in Poland (0.501). Among the Western European countries the highest value for the health index is found in Italy (0.467) and the lowest in Switzerland (0.308).

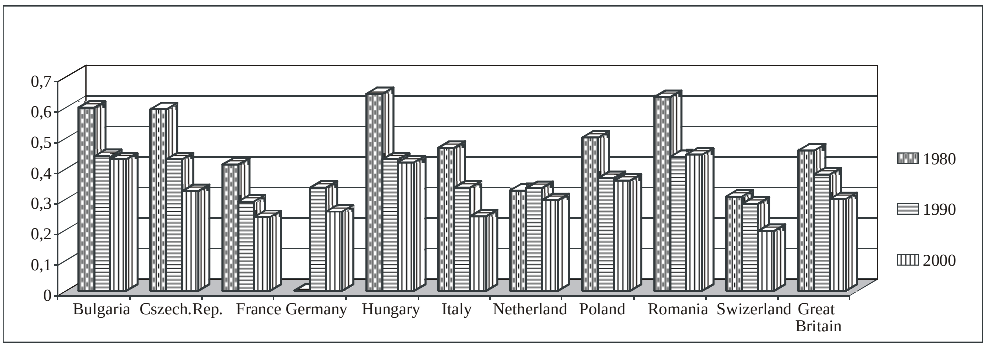

Fig 1. The evolution of health index in selected European countries.

Between 1980 and 1990 the progress within the medical field determined an improvement in the population health state in the majority of European countries, demonstrated by lower values of the health index. The most significant progress was apparent in some Central/Eastern European countries where the values had formerly been highest. Even so, the CEE countries were in an unfavourable position compared to the Western European ones. The *health index* for Romania was 0.438, which indicates a better health state compared with 1980 but the situation is still poor compared to other countries of both Western and Eastern Europe. The disparities are certainly more significant in relation to Western European countries.

At the same time the highest value of the health index is found in Great Britain and the lowest in Switzerland (0.284).

After 1990 the CEE countries show different trends: Czechoslovakia and Poland register evident progress while in others (such as Hungary and Bulgaria) progress is less significant.

Romania is a special case, being the only studied country in which the *health index* registers an increase from 0.438 in 1990 to 0.445 in 2000, fact that proves a deterioration of the population health state.

Though the disparities between East and West are still noticeable, the population of the Western countries being characterized by a much better health state than the one in the former communist countries, the latter are currently in barked in a catching up process.

In countries such as Hungary and Romania, the process seems to be more difficult, even worst, Romania experiencing an amplified negative dimension of it.

This process of Romania's population health state deterioration it is not a continuous one, between 1990 and 2000, the health index registered yearly variations (See Figure 2).

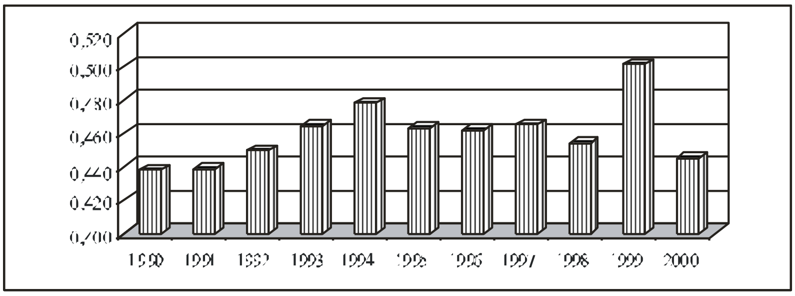

Fig 2. The evolution of health index in Romania

Generally speaking one can notice three time slots, characterized by differentiated evolution of health index.

Thus, the period between 1990 and 1994 is featured by an positive evolution of health index starting from 0.438 to 0.478, with a highest rate between 1992 and 1994. This tendency shows a continuous deterioration of the population health state starting with 1990.

The next period, 1994-1997, is characterized by a constant health index which reaches values comparable with 1993 (0.465). This stagnation in the health index value proves the lack of clearly oriented policy toward health and the failure of the health programmes. In fact, this is a long-term effect of unsuccessful economic social and health policies, implemented by the former regimes still acting.

The latest period, 1997-2000, the health index presents fluctuant values with a climax in 1999, when the health index reaches the highest level for the whole period of 1990-2000 (0.445) but also higher than 1990.

Practically, after eleven years, the Romanian population health state has continuously deteriorated. In addition, the later health index fluctuant dynamics do not show a clear descending tendency in its evolution, fact which would suggest a near improvement of the health state.

This yearly fluctuant level of health index influenced by more or less controlled factors demonstrates once again a lack of coherent health policy and inefficient health expenditures.

This situation it is not singularly generated by the health care system but also by the other factors of cultural, social or economic nature similarly important for the population health state.

Spatial disparity in health index dynamic

The health index shows differentiated evolutions at the territorial level, some regions such the Central and Western ones being characterized by a better health status while in the others the health status is considerable low.

Significant differences can be noticed at the county level (a total of 41 administrative areas) the health index presenting various evolutions for the studied period of time according to the relative contributions of some indicators such as general mortality rate, mortality by the main causes of death, infant mortality rate and the life expectancy.

Thus, the health index evolution for the last eleven years followed different tendencies the county level, generating various situations possibly synthesized such as (See figure 3):

- *Ascending dynamic without significant yearly fluctuations.*

This category includes about ten counties where the population health state registered a continuous depreciation, with increasing values for health index (for example the counties of Prahova, Buzau, Vrancea, Braila, Vaslui, Botosani, Bihor, Maramures).

- *Ascending dynamic with significant yearly fluctuations.*

In this category can be included counties such as Teleorman, Calarasi, Iasi, Satu Mare where the values of health index registered important variations by year.

Though the general tend was an ascending one, some times the yearly fluctuations have reduced the dimension of the phenomena, the above mentioned counties registered progresses for selected period of time with episodic improvement of the population health state, eliminated by the later evolutions.

- *Descending dynamic without significant yearly fluctuations*

This category include those counties where the population health state registered a continuous improvement, the health index values decreasing during the studied period of time.

Unfortunately, this positive situation is only characteristic for a small number of counties such as Suceava, Covasna, Timiş (see figure 3).

- *Descending dynamic with significant yearly fluctuations*

This situation is characteristic for an important number of counties as Caraş Severin, Mehedinţi, Olt, Giurgiu, Cluj, Sălaj. Here, despite the general increasing trend of health index values for the whole period of time, the health state of the population didn’t necessarily improved; the fluctuations of health index being some times significant, with alternance of high and low values times slots, the previously progresses occurred could diminish lately.

According to the depth of the yearly fluctuations the counties included in this category are characterized through different aspects concerning the health status.

- *Constant dynamic*

Shows stagnant values of health index for the whole studied period. This is a case of Harghita county, which doesn’t register any yearly variations between 1990-2000.

Romania’s counties find themselves in different situations, according to the health index way of evolution after 1990, resulting in differentiations from a population health status point of view.

By considering the ‘distance’ between counties health index values and the multi annual average one can identify “unfavorable cases” for the counties with health index value much higher than the average and “favorable cases” for those where the health index values are lower than the average.

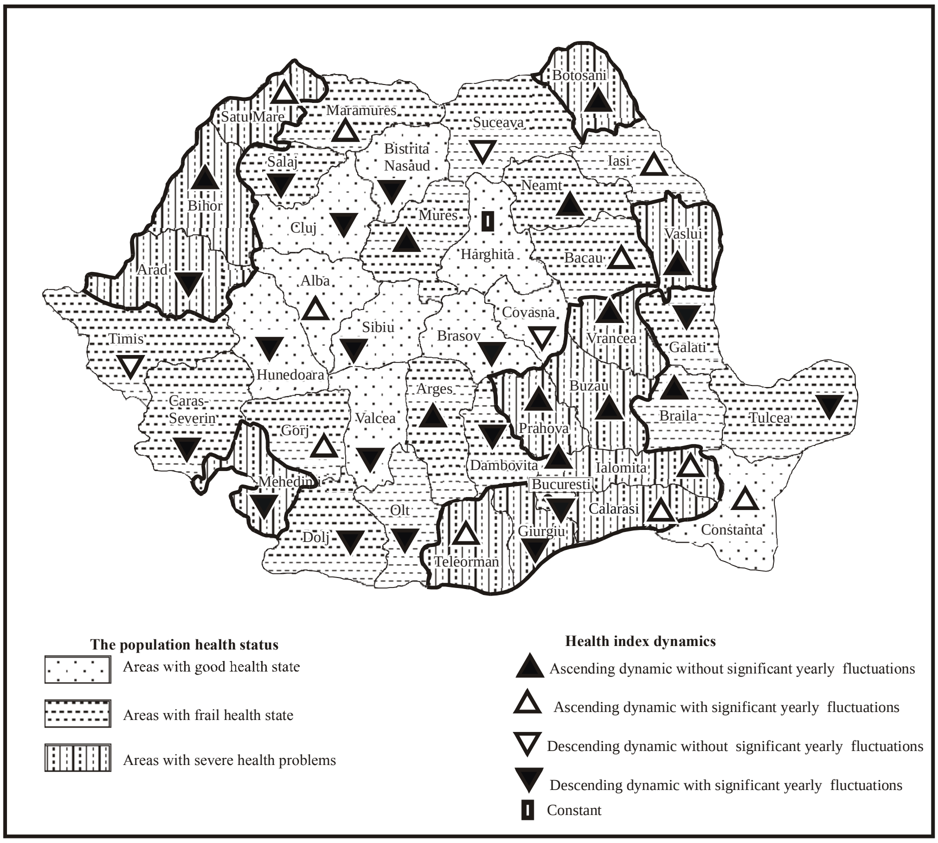

Fig 3. The health state of the Romanian population (1990-2001)

Against multi annual average value of0.460, the counties such as Giurgiu (0.609), Teleorman (0.578), Botoşani (0.576) are the “most unfavorable cases” and counties such as Braşov (0.347), Sibiu (0.351), Harghita (0.351), are the “most favorable cases”.

On an overall, 22 counties with health index values higher than the multi annual average have a population health state deteriorated at various rate. In the same time, 18 counties with health index values lower than the multi annual average can be considered positive cases, with acceptable health state (See figure 4).

The spatial distribution of the health index multi annual average by county shows territorial clusters of counties with similar or close health state. According to the health index values and their evolution for the studied period, the following areas can be identified: *areas with acceptable or good health state, areas with frail health state and areas with severe health problems (see figure 3).*

The last two categories should be paid special attention in terms of health resources and policies.

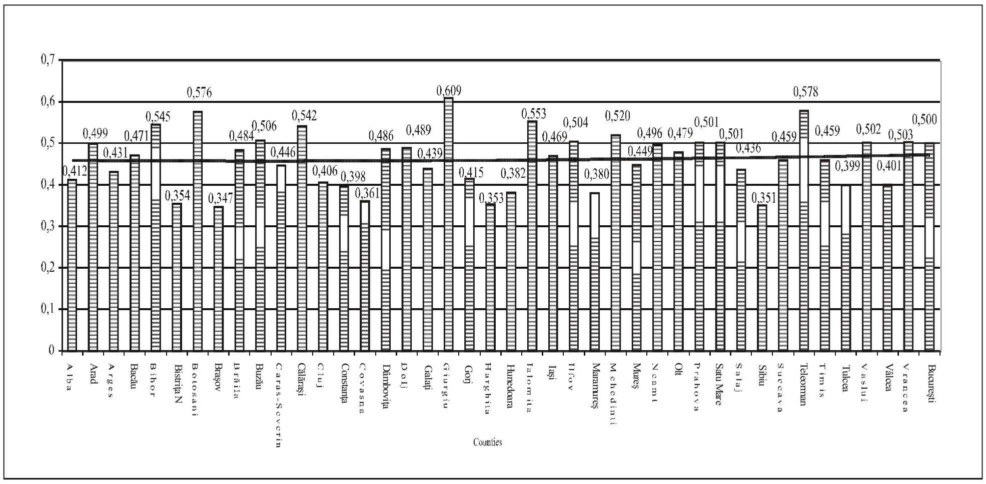

Fig 4. The Romania's counties population health state

The reduced dimension of the areas with acceptable or good health state compared to the areas with frail or precarious health state proved that Romanian population is confronted after 1990 with serious health problems.

In addition, taking into account the number of counties with frail health state it easily foreseen that sensible changes in some determinant factors for health will further deteriorate.

Health index territorial changes after 1990

Assessing Romanian population health state at the beginning and the end of the studied period of time one could notice some territorial variations, the majority of the counties have registered health state changes meaning either an improvement or a decrease for the last eleven years.

Identifying the counties with worsen health state and its degree it's very important, thus contributing to a correct report for a better management or orientation of health funds.

It is similarly important to know the situations where the health status significantly and evidentially improved, assessing the generating factors being useful for better understanding the key elements respectively actions needed to adjust the unfavorable situations, characteristic for an important number of counties.

If at the national level the population health state worsen for 2000 compared to 1990, proved by a higher health index value in 2000 (0.445) as opposed for 1990 (0.438), at the territorial level the situations are slightly differentiated, many counties having by the end of the studied period of time a better health status or at least considerably better compared to the beginning of it (see figure 5).

Taking into consideration the health index values for 1990 and 2000, one can notice the following territorial cases:

- Significant deterioration of the population health state. This is evident for the northern and eastern parts of the country.

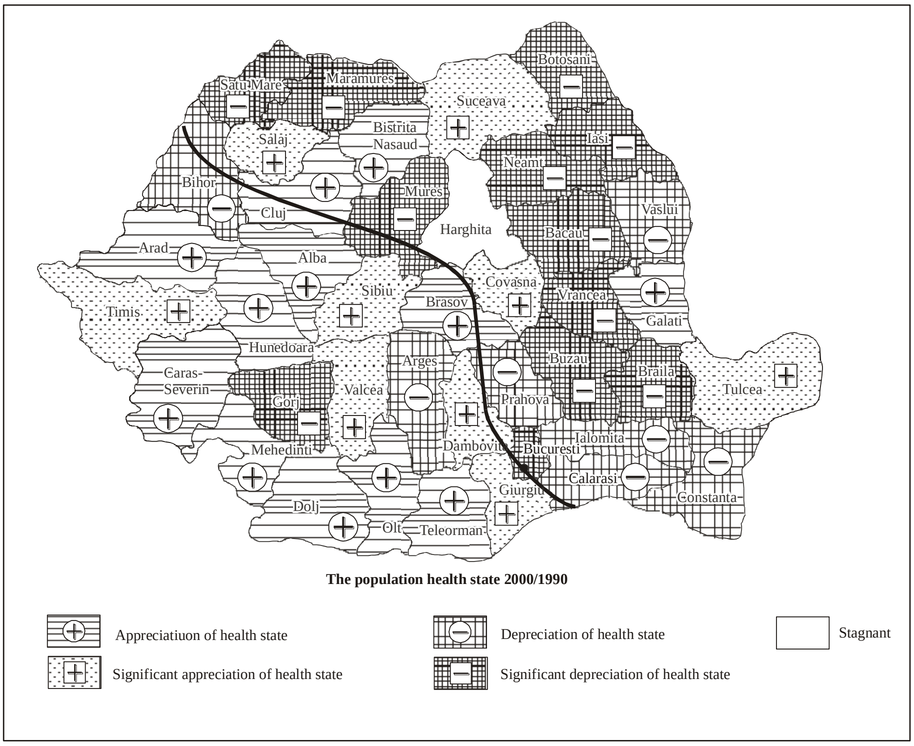

Figure 5.The health state of the Romanian population 1990/200

- Appreciation of population health state. This situation is characteristic for the western and south western part of Romania, where counties registered positive aspects in population health status evolution, with decreasing values of health index (Alba, Arad, Hunedoara, Cluj).
- Significant appreciation of population health state. This is the most favorable situation, which unfortunately is characteristic for a small number of counties, predominantly located in western and Central Romania (Timiş, Sibiu, Vâlcea,)
- Stagnant population health state. There are rare situation, characteristic for one county only, where the health index value didn’t registered any changes over the studied period of time (Harghita).

Conclusions

The evolutionarily and comparative approach in studying the population health state has proved the fact that Romania inherited a precarious health state, this being showed by the value of health index.

Analyzing these values within an European context has showed the existing disparities between Romania and both eastern and western European countries.

The yearly variations of the health index between 1990 and 2000 showed that population health state has continuously decrease after 1990.

Spatially, this deterioration was not continuous, the value of health index registering different evolutions, generating different typologies and from a general point of view, the "most favorable" cases and the "unfavorable cases" becoming evident.

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MIHAI IELENICZ, *GEOMORPHOLOGY*, Universitary Editure, Bucharest, 2004, 344 pages., 55 figures, 171 photos

A General Geomorphology Course is welcome anytime, especially when it is long-expected. The Geography Faculty from Bucharest University, by its great number of students, masters, phds, graduated teachers waited with deep interest and consideration this course, written in a new vision by professor Mihai Ielenicz. This work represents a long time keen on preoccupation of the author, finished in 2004, together with many other books previous published as well as others will come. A book like this can be written by scientist, deeply involved in research work, I dare to say, that spiritual abnegation helps people to leave something for next generation, especially when it is enough experience. To elaborate this course, the author used a large field and reference documentation, offering a strong view upon geomorphology papers, enlarge by his own contribution. The book is addressed main to students, then to other people interested in geomorphology, comprising a special chapter structure but a rich collection of maps, graphs, photos, sketches. His own concept for the course structure is based on the following issues: Theoretical Global Geomorphology, Climate Geomorphology, Geomorphology Zoning and Typology, The Relief Dynamic (Relief evolution). It is normal that genetics geomorphology theme to achieve a large volume in this paper in order to rank the relief characteristics, its shapes and processes. The systemic grouping of the genetic relief forms used the criteria of main agents and modelling factors, starting with weathering and animals actions, rain denudation, rivers, surface runoff, snow, ice, lakes or glaciers to marine, coastal processes, aeolian or human influence. The rocks morphology and geological structure ends the first part of the paper, having 238 pages from all 344 pages of the book. In fact this is the main issue of an university geomorphology course. Climate Geomorphology (36 pages), zoning, typology and the general evolution of the relief represent the second part of the book. This type of presentation is logical, in order to facilitate the understanding of some characteristics and the diversity of the land processes, landforms first then to apply them in space or time at the local, regional or global scale.

The author presents also theoretical global geomorphology notions, facilitating a good understanding for every readers of the book. The course was published and spread out for many readers, scientists or applicants. Romanian Geography literature, includes this new and original book written with generosity and dignity by professor Mihai Ielenicz.

MIHAI GRIGORE

FLORINA GRECU, GIOVANNI PALMENTOLA, *Dynamic Geomorphology,* Technical Publisher, 2003, 392 pages, 220 figures, 45 labels.

In a sustainable achievements system and continuous researching concerning the relief at a micro or macro scale, the morphodynamic aspects remain a very interesting theme both in theoretical or applied science. Dynamic geomorphology was developed as a branch very specialized and thoroughgoing of the general geomorphology. Priority issues for dynamic geomorphology is the complex process system and the relief as its results.

Writing topics and methodology, concepts and contain, math analyses, having a large documentation made it a very modern, and original book, being a model of dynamic geomorphology studies. This collaboration between a Romanian and Italian geomorphologists is a success materialized by this book very useful to readers interested in theory or applied dynamic geomorphology, as a request of geographical international trends.

We've just mentioned all these features because the book had stressed the idea that the priority for the dynamic geomorphology is to help in socio-economics activities management.

Such kind of interest belongs to the authors through the structuring, knowledge, quality of explaining or exposing issues, ranking data, starting with: Main Issues, Rocks and Hypergenes, Slopes Gravitational Processes, Hydro Processes, Glaciers, Coast and wind processes. There were included the main morphodynamic issues, with many definitions, qualitative and quantity determinations, offering different fieldwork methods or procedures, measurements, counts and correlations.

It's a new book, very well, scientific documented, having representatives pictures, a good and readable text with a high value for all geographers.

MIHAI GRIGORE

MIHAI GRIGORE, FLORIN ACHIM, *Initiating and General Data Concerning Landslides and Some of Their Specific Elements in The Romania's Area*, Universitary Publisher, 2003, 141 pages, 62 figures.

Landslides represent a widespread out type of geomorphology process in Romania. This is the reason to realize o book which comprises the main notions and regional characteristics of the Romania's landslides.

The book has nine chapters:

- Landslides in the relief system;
- Landslides elements
- Specific of the landslides dynamics;
- Causes and landslides stages;
- Velocity of landslides;
- Romanian landslides dynamics;
- Landslides typology;
- Landslides and geomorphologic risks;
- Prevention, reducing, stopping and landslides' management.

It represents a target and a preoccupation of professor Mihai Grigore for a long time and it is a result of his experience and scientific passion. The originality of this work consists in a deeply utility for researchers and managers involved in landslides prevention. To be more complex and efficient the study presents environmental risks and some methods for landslides prevention, correction and limitation.

At the end of the work, the authors have written a large list containing Romanian resources focused upon landslides.

The book is very good for students, geography teachers, researchers or other interested people in, having maps, graphs, photos, air-photos which improve or helps in agood understanding. Initially, this work was only for students to the Geography Faculty, but it should be used by other scientists or teachers. Being a complex study upon landslides we recommend it for all those interested in this complex and very dynamic mechanism.

LAURA COMĂNESCU

IULIANA ARMAŞ, RĂSVAN DAMIAN, IONUŢ ŞANDRIC, GABRIELA OSACI-COSTACHE, *Vulnerability of Slide-Affected Slopes in in the Prahova Valley Subcarpathian Sector,* Edit. Fundaţiei „România de Mâine", 2003, Bucureşti, 207 pages. 82 figures.

The landslides have always been on the advanced line of practical and theoretical field of interest, engaging problems and measures for the mitigation and prevention of effects generated by this type of geomorphological risk on the natural structures and the environment; especially on people and their households. The involvement of research due to elaborate a *very consistent work for such an environment situation — paying a special attention to the research in analytical style of the vulnerability of slopes, as an objective state, according to which the background conditions which lead to the process itself appear — is of greate scientific importance*.

In fact, the work has always focused the aim of succeeding as much as possible in preventing the social dimension of this disaster. This is way we consider the publication under discussion *very complex and complete for the subject mentioned,* the original elements of research being underlined and focusing in an efficiency space large enough for future scientific debates.

Due to modern methodology, the analysis of the dynamic system of the slopes vulnerability for landslides has been achieved through computer modelation and GIS applications in the quantitative analysis of the landscape. The approache is based on the following tasks: the structural and morphological control of slopes stability, climatic and hydrological conditions, anthropic impact, landslides case studies, the social dimension of disasters etc., for all these aspects a concrete framework has been defined, indicating some probability limits of events, which can be found rather diversified on the entire length of the slope morphodinamic profile. All the elements and the applied data for the Subcarpathian space of the Prahova valley are extremely interesting and edifying regarding the ***morphodynamic*** of slopes.

The study elaborated and published constitutes a *very original research* in the field of analysis of the vulnerability dynamics of slopes. Obviously these kind of research can be developed and extended to the Romanian Subcarpathion, Carpathian and tablelands where landslides acts as a geomorphological risk. The methodology in this work proves to be undoubtedly intuitive and well-centered in the practical field, indicating mitigation techniques for the areas affected by landslides. This concept of geomorphological analysis is extremely welcome and needs to be followed by as many researchers and technicians involved in this kind of issues of social-economic interest. *The book defines itself as a valuable study, of practical priority for the future*.

MIHAI GRIGORE

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