SIMION MEHEDINȚI – FOUNDER AND ORGANISER OF MODERN ROMANIAN GEOGRAPHY

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Key-words: Simion Mehedinți, Romanian geographer, planetary global system.

This year the Romanian geographers are commemorating 50 years since Simion Mehedinți (1868-1962), the founder of modern Romanian Geography, passed away. After having completed his studies in Paris, Berlin and Leipzig with Paul Vidal de la Blache, Ferdinand von Richthofen and Friedrich Ratzel, Mehedinți was nominated Professor of Geography at the University of Bucharest in 1890. In his fundamental work written in Romanian – Terra, Introduction to Geography as Science (1931) and in other of his writings, the Earth is viewed as a complex system within which the four planetary covers are interacting both in terms of static's (spatial distribution) and dynamics. In his opinion the complex relationships among the four geospheres are reflected in such planetary circuits as regular winds and Ocean currents.
Man is considered to be one of the most active agents increasingly more involved in changing the relationships among the geospheres, thereby radically influencing the evolution of the Earth System. Mehedinți was not only the founder of modern Romanian Geography but also the organiser and promoter of secondary and university studies of Geography.

In the 20th century, Romania could boast the presence of men of science and culture whose works were known and appreciated abroad. We would recall Constantin Brâncuşi (1876–1957), promoter of modernism in sculpture; Henry Coandă (1886–1972), inventor of the jet-airplane (scale model) presented in Paris at the second International Salon (1910), later on, the playwright Eugen Ionesco (1909–1994), philosopher Emil Cioran (1911–1995) and some others, among whom Simion Mehedinți (1868–1962) the founder of modern Romanian Geography (Fig. 1). Unfortunately, his work is not known abroad as it should.

Fig. 1 – Prof. Simion Mehedinți, founder of Romanian Geography, at 60 years of age.

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This year, which marks half a century since the scholar passed away, has been declared "Simion Mehedinți Year" by Romanian geographers, as an opportunity to highlight his valuable scientific contributions in various fields of Geography and, not least, in Teaching, Sociology, Ethnography, Philosophy and Literature even.

EARLY BEGINNINGS

Simion Mehedinți was born on the 18th of October, 1868, at Soveja, a village situated in the hilly area of the Curvature Carpathians, a place priding itself with old ethnographic traditions. After having graduated the first two primary school classes (1875–1878), his father – a psalm reader at the village church – and his relatives decided to send him to study Theology and get a high-school training first in the town of Focşani, and next in Bucharest, where he successfully passed his school-leaving examination in 1888 (*Chronological Table – Tufescu, 1994*). That very year, he obtained a scholarship at the Higher Normal School, set up in Bucharest after the Paris School model, and enrolled at the Faculty of Letters, Bucharest University. His BA thesis, presenting *"J.J. Rousseau's ideas on education"*, reflects the close relationship between Bucharest University and the French School, as well as the steady interest shown by Simion Mehedinți in teaching matters.

After having finished his academic studies in Bucharest, a grant offered by the Romanian Geographical Society enabled him to further his scientific preoccupations in Paris, with Prof. Paul Vidal de la Blache. His interest focused on the concept of Regional Geography and the range of man's influence on the environment, with reference to a series of homogeneous structures, the so-called "pays" (lands). Later on, another of de la Blache's students, namely, Emm. De Martonne, was to become one of the best experts on the Romanian Carpathians.

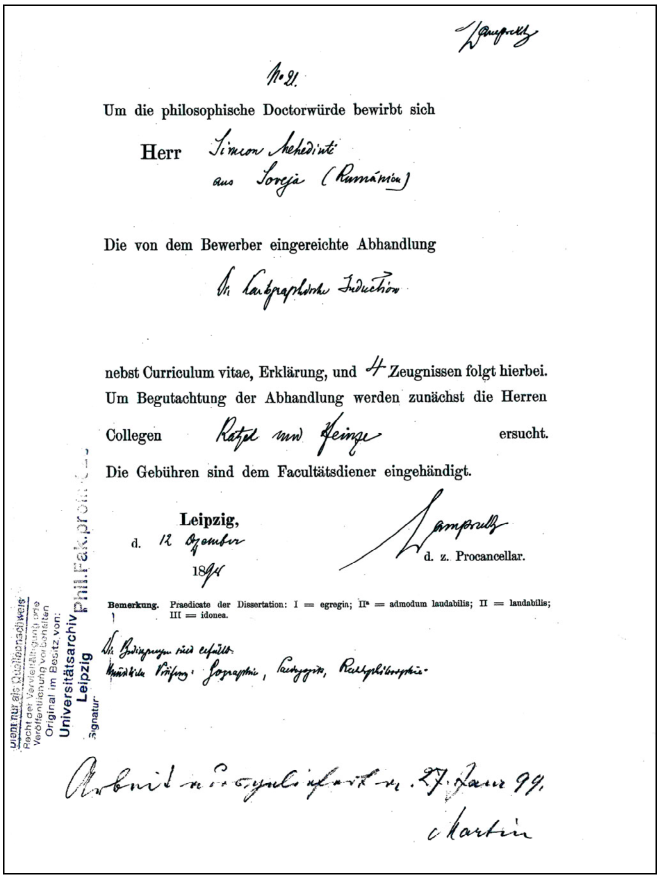
One year later, Mehedinți would continue his studies in Germany. At Berlin University he attended Prof. Ferdinand von Richthofen's courses that gave him a sound knowledge of Physical Geography and, at the same time, opened up new vistas in the object and methods of Geography. Also in Berlin, he attended courses in Ethnography, which made him approach this scientific domain from a geographical perspective.

In 1895 he moved to Leipzig University, an institution that had been promoting German-Romanian relations as early as the 18th century. Leipzig was the town where Dimitrie Cantemir's work *A Historical-Geographical and Political Description of Moldavia*, written in Latin (published in German first in Hamburg, 1769) and D.D. Philipide's *A Geography of Romania* (in Greek) were put out in 1771 and 1816, respectively (Bălteanu, 1998). Simion Mehedinți would advise some of his students, among whom George Vâlsan and Constantin Brătescu, to study at that same University.

While in Lepzig, Mehedinți would attend Prof. Friedrich Ratzel's seminars, the Professor being also the supervisor of his Ph.D. dissertation on "*Uber die Kartographische Induction*", presented in 1899 (Fig. 2). Prof. Ratzel, considered to have initiated some fundamental directions in Human Geography, was also a promoter of *Geopolitics and Political Geography*.

FOUNDER AND ORGANISER OF MODERN ROMANIAN GEOGRAPHY

Back in Romania, the leadership of the Bucharest University assigned Mehedinți the task of setting up the first Geography Chair at the Faculty of Letters. Geography chairs would later be established in Iaşi (1904), Cluj (1919) and Cernautzi (1922) – now the town lies on Ukrainian territory. His opening lecture titled the *"Object and definitions of Geography"* represented a synthesis of ideas circulated worldwide at the time and an integrated systems definition that is still topical today.


Um die philosophische Doctorwürde bewirbt sich

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Bemerkung. Praedicate der Dissertation: I = egregia; IIa = admodum laudabilis; II = laudabilis; III = idonea.

Fig. 2 – Attestation of the Ph.D. title obtained by Simion Mehedinți in 1899
(Source: Archives of the Leipzig University Library).

In early 20th century, the object of geographical study was just going to be defined, but many diverging ideas on the relationships between General Geography and Regional Geography were in the air.

Simion Mehedinți played a decisive role in organising academic geographical education. It was he who introduced the German system of seminars, practical works and applied field investigations for students, new geography courses (Fig. 3), and monthly scientific colloquia that were being held for a 30-year period (Orghidan, 1967; Ielenicz, 2004). This system formed numerous generations of geographers active in higher education, secondary education, and research institutes. Noteworthy among them were George Vâlsan (1885–1935) and Constantin Brătescu (1882–1945) who further developed Physical Geography and Geomorphology; Vintilă Mihăilescu (1890–1978) – Regional Geography, Human Geography and Theoretical Geography; in 1944 Vintilă Mihăilescu founded the Institute of Geographical Research (presently the Institute of Geography of the Romanian Academy); Ion Conea (1902–1974) – Historical Geography and Toponymy; Nicolae Orghidan (1881–1967) – Geormorphology, and Nicolae Gheorghiu (1886–1967) – Cartography.

As regards the necessity for having a national geographical research institute, Mehedinți used to say that Romania needs such an institute. He made an overriding contribution to the development of pre-university education, publishing Geography school-books (*Geography of Romania, Anthropogeography*, etc.) that appeared in numerous editions. These manuals were written in an attractive style, and had a modern scientific content very different from the former simplistic descriptions and endless place-names. With a view to updating Geography teachers' scientific background, the Professor organised annual Congresses held on a regular basis between 1904 and 1937. The high level

of academic education was being maintained by geographical periodicals like the *Year-book of Geography and Anthropogeography* in Romanian (1910–1914). He also co-ordinated and supervised the publication of the newly-structured Bulletin of the Romanian Geographical Society, which was to contain the most important scientific articles written in the inter-war period.

Fig. 3 – One of the courses held by Simion Mehedinți at the University of Bucharest.

Defining the object of Geography is one of the controversial issues of the late 19th and early 20th centuries.

Making an analysis (*Mehedinți, 1901*) of the concepts of differentiation of the solar system formulated by Kant and Laplace, and furthermore on Ritter's definition of Geography as *"science dealing with the relationship between man and the face of the Earth"*, the Romanian scientist advanced his own viewpoint with emphasis on a particular feature of Geography, that is, the Earth Science dealing with *"the static (spatial distribution) and dynamic (temporal transformation) relation existing among the masses of the four planetary covers.*

Subsequently, this definition was further developed in his fundamental work *Terra. An introduction to Geography as Science* (1931), in which he affirms the necessity for geographical studies to focus on three elements: *mass, real complexity and localisation within the concrete space* (Fig. 4). Only a knowledge of these aspects, says Mehedinți, *"can explain the aspect of each planetary cover in each region, and the relations between one cover and the other"*.

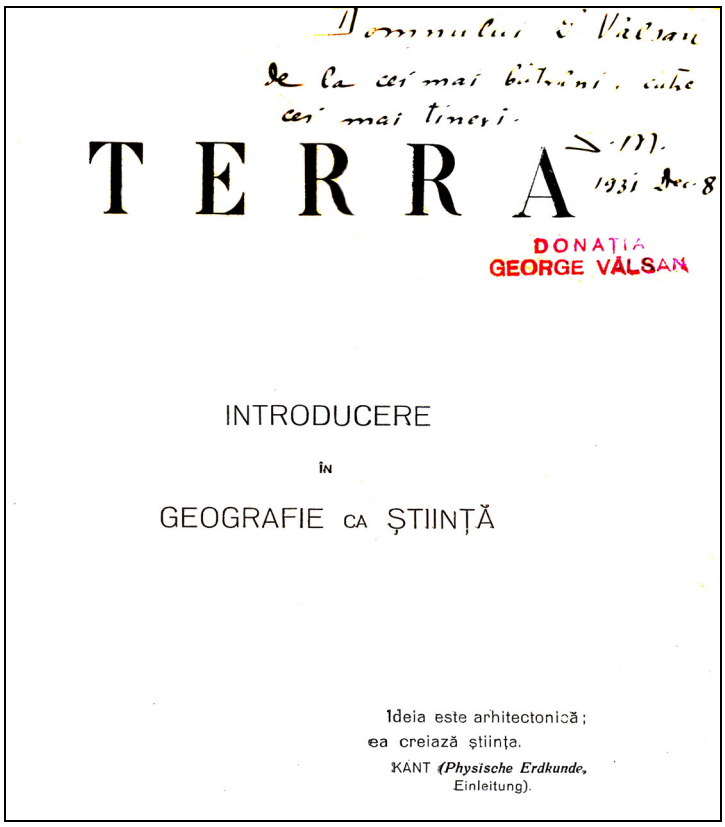

Fig. 4 – *Terra – Introduction to Geography as Science*, published in 1931.

Topicality of Simion Mehedinți and his work.

All in all, the work of Prof. Simion Mehedinți has contributed to *"discovering the philosophical meaning of modern Geography as science of the whole Earth and to finding out the theoretical and practical modalities of disseminating this concept" (Mihăilescu, 1967)*. *Terra. An introduction to Geography as Science* can be considered one of the first works underlain by a global systems outlook (Bălteanu, Şerban, 2005).

In the scholar's view, the Earth is a complex system made up of four planetary spheres, whose relations rely on the following interdependent principles: progressive complexity of spheres; causal subordination of planetary covers and causal subordination (on the horizontal) of geographical zones.

Simion Mehedinți insisted on the complex assessment of phenomena and, to this end, he suggested using some static and dynamic categories. Speaking of geographical phenomena the scientist asserted that *"the order of scientific description should follow the order of causality of natural phenomena"* (Mehedinți, 1931).

The static categories themselves show quantitative (*form, dimension and position*) and qualitative (*composition, density and colour*) differences. The dynamic categories feature direction, intensity and rate of development, highlight motion and interaction between various phenomena. The assessment of these categories underlies the relationships among geospheres, as well as *"action centres"* and *"convergence formulae"*, enabling a coherent statement of inter-geosphere connections (Mihăilescu, 1967).

Obviously, exemples in the *Terra* volume and specific detailings show the level of knowledge reached in the first half of the 20th century.

In his opinion, the complex connections established among the four geospheres reveal the influence of change in one cover on all the other covers and are reflected in such planetary circuits as regular winds and Ocean currents. Moreover, the author used to underline now and again that *"these covers do depend one upon the other, just as body parts do"*. Therefore, it is not by chance that the exemple used refers to the increase or decrease of CO_2 in the atmosphere. Thus, if CO_2 content were doubled, the consequence would be a 4°C temperature rise on the globe, a change in the zoning of the climate, vegetation and fauna that might trigger major transformations in the hydrosphere.

Mehedinți considered that the Earth should be viewed as an organism that has a specific internal organisation and modifications liable to affecting it in the course of time (Mihăilescu, 1967). Initially, following Ratzel, his master, Mehedinți considered that the population belongs to the biosphere and, as such, man-environment relations can be studied under Biogeography (Tufescu*, 1967*). The scholar, also author of *Anthropogeography in Romania*, has often emphasised the essential role played by Man in the global change of the Earth. His preoccupation for the diversity of relations between man and the environment, as well as the constant interest for ethnographic studies gradually led him to approaching economic and social aspects related to the influence of human activity upon the Earth.

Sometime later, Mehedinți would steadily repeat that man should be viewed both as part of the biosphere and as socio-historical structure because societal relations make him interact with the environment in a distinctively different manner, depending on the social-economic development level of each stage.

Speaking of the hydrosphere, Mehedinți contends that building dams and other protection devices turned man into the strongest agent involved in changing stream channels. The Professor also emphasises the human impact on land cover, as a result of expanding farm land, changing land use and causing the extinction of numerous plant and animal species. In works by Simion Mehedinți one finds lots of examples on the role of deforestation in the intensification of present-day geomorphological processes.

Making a detailed analysis of human impact on the atmosphere, hydrosphere, lithosphere and biosphere, the scientist reached a global conclusion on the last sphere, in particular: *"the role man plays is indeed very important; in what regards the status and dynamics of the planetary spheres, perhaps there is no other agent whose influence can be, if not greater, at least neither more diversified than man's"* (Mehedinți 1909, republished in Mehedinți 1967).

In another of his works devoted to Ratzel, Mehedinți (1904) points out the very moment when the global impact upon the Earth began, namely, in early 19th century, once the industrial revolution got momentum.

Man acts upon the geosphere in a special way by the huge force of his intelligence, thereby modifying the global environment as a whole. As one of the most active agents in changing inter-geosphere relations, man "has not as yet reached the ultimate limit" in doing it (Mehedinți, 1904b).

Emphasising the human impact upon the Earth in the 19th and 20th centuries (after the industrial revolution), The Professor wonders "whether man's irresponsible actions do not make the millions-year old evolution of our Planet diverge from its normal course" (Mehedinți, 1904a).

As a conclusion, it can be appreciated that, based on the early 20th century knowledge existing in his time, Mehedinți outlined the following aspects which are significant also for current geographical and environmental research:

- issues specific to the first part of the Anhropocene, a period which international research programmes define as corresponding to the ever stronger global human impact on the Earth in the aftermath of the Industrial Revolution (Syvitski 2012).
- inter-connected inter-geosphere relations and the possibility for certain planetary thresholds to be surpassed, as recently documented (Steffen *et al.* 2004; Gafney 2009).

- outline of the post-1800 period of accelerated decrease of biodiversity.
- the necessity for interdisciplinary research into the natural phenomena causality order related to the complexity of natural and social phenomena, as outlined in State of the Planet Declaration (2012).

Although the work of Professor Mehedinți is relatively little known abroad, yet some praiseworthy references to the two *Terra* volumes have been made. For exemple, the 1934 issue of the Italian *Scientia* Journal pointed out that Terra is "…. a very well-documented work devoted to defining the object and methods of Geography with a view to improving Geography. It is a very elevated scientific synthesis, worth being translated into a language of broader circulation" (Mihăilescu, 1967).

After 1948, when the communist system in Romania was forcibly imposed, despite the fact that Mehedinți was recognised as founder and organiser of Romanian Geography, the school created by him was labelled "a bourgeois school based on geographical determinism and the pseudo-scientific thinking of geopolitics" (Monografia Geografică a Republicii Populare Române, 1960).

Subsequently, the post-1960 period of limited liberalisation made it possible to partially acknowledge the work of some forerunners of the Romanian scientific school, among whom Simion Mehedinți. Some of his works were published and the role he had played in the development of Romanian Geography was being accepted (a special issue of Analele Universității Bucureşti 1969, and other articles in various Romanian journals, occasioned by 100 years from the birth of Simion Mehedinți).

After 1990, all of his work was being reconsidered, a 2nd edition of *Terra*, his fundamental achievement, was put out (1994) and a number of foundations, bearing his name and publishing his works, have been set up. It is the case of "Simion Mehedinți" Association in Focşani Town, which published scores of volumes on the author.

The "Simion Mehedinți" Foundation set up under the aegis of the National Geography Committee and the Institute of Geography organises annually a session for young researchers and an International Summer School at the Station of Natural Hazards Research in the Curvature Carpathians, close to the Professor's birthplace.

In his will, Simion Mehedinți bequeathed the dwelling-house, where he lived and had written his works, to the Institute of Geography of the Romanian Academy. In this place, a symbol of the traditions of the Romanian School of Geography, the National Geographical Committee and "Simion Mehedinți" Foundation are developing their activity.

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THE FUTURE OF "LANDS" IN ROMANIA

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Key-words: "lands", territorial cohesion, mental space, brand.

"Land"-type spatial entities are extremely well-outlined in Romania through a complex of favourable factors (natural, historical, economic, social, and cultural). They form both well-articulated territorial systems and typical mental spaces. Due to these structural and functional attributes, "lands" fall into the category of programme regions endowed with systems features of great authenticity and viability. The present paper analyses the prospects of future evolutions in terms of their characteristic territorial cohesion, national brand attributes and economic and social resilience through conversion from traditional agriculture and wood-processing to rural tourism.

The studies carried out in the last-and-a-half decade have led to the identification of 18 "land"-type territorial formations in Romania, typologically included in the category of "pays" defined by Vidal de la Blache (1908) in France. The Romanian ones, much fewer than those (480) registered by the French geographers, are not the result of the two countries having different surface-areas, but rather of the genetic, structural and functional attributes that contribute to a much stronger individualisation of the Romanian "lands" compared to the French ones. Due to it, they represent *geographical programme regions with systemic features* and *typical mental spaces* (Fremont, 1976, 1999; Cocean, 1997, 2006, 2007, 2008, 2011; Cocean, Ciangă, 2000). From this point of view, they fully correspond to the features of the *functional regions* described by Bradshaw (1997) in the same period.

THE CURRENT EVOLUTIONARY CONTEXT OF "LAND"-TYPE TERRITORIAL SYSTEMS

An analysis of the 18 "lands" existing in Romania has enabled an insight into the current stage of these territorial systems and their evolution, with emphasis on structure and functions, development trends and viability. It should be remembered that we are dealing with systemic entities formed 6–7 centuries ago (Cocean 1997, 2008) against a well-established millenary autochthonous background – always under the pressure of modelling and transformation processes and phenomena. Although in the long interval elapsed from the cystallisation of their mental space to the ethnogenetic space of today (Cocean 2001) many changes have been imposed by political and strategic conditions (leading first to the individualisation of Moldavia, Transylvania, and Wallachia and subsequently to the emergence of other provinces, e.g. Banat, Crişana, Maramureş, Bucovina, Oltenia, Dobrogea, and Basarabia, as well as the gradual limitation of the Romanian ethnogenetic space (by the formation of the Bulgarian, Serbian, and Hungarian states, and the Russian expansion westward), yet the "lands" have preserved their identity (Cocean 2001).

In this case, we have a very original and rare example of the maintenance of certain territorial structures along the centuries, under some of the most adverse conditions. Moreover, these structures did not limit themselves simply to surviving, but have developed materially and spiritually along their own coordinates established since the emergence of the archetypal mental space, whose authentic

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fragments they are (Cocean 2006). These coordinates were the outcome of assumed awareness of the Dacian – Roman origin and of a language, the Romanian Language, singularly rich and melodious.

However, though these territorial aggregates have a coherent ethnical structure (Fig. 1), an obvious spatial individualisation against other units, they do not have political and administrative attributes, being englobed into counties to which, in a few cases, they have lent, partially or totally, their own name (Maramureş, Năsăud, Vrancea), despite the fact that some of these lands, such as Făgăraş, Bârsa, Beiuş, Zărand, Maramureş, Chioar, Haţeg, or Almăj, have a centuries-old tradition. The absence of a political-administrative structure has deprived them of decision-making in matters of development and preservation of their own material and spiritual values and heritage.

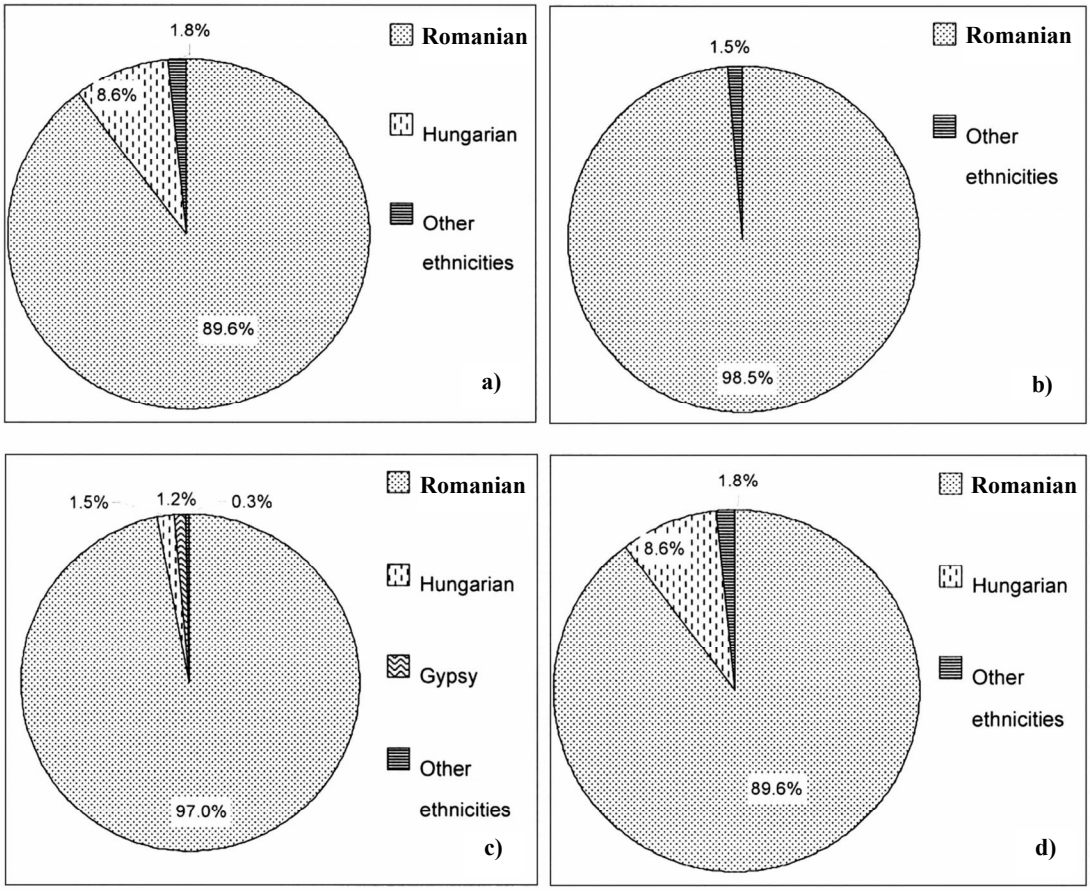

Fig. 1 – Ethnical population structure in Loviştea Land (a), Severin Land (b), Năsăud Land (c), and Lăpuş Land (d).

As a result, in a period of deep political, economic, social, and cultural mutations induced by globalization and the formation of the European Union, within which the circulation of goods and values is borderless, and models of other cultures spread freely through one of the most sophisticated logistics, a natural question arises: what are the perspectives for the perpetuation and affirmation of some territorial systems founded many centuries ago, during the Early Middle Ages, that have evolved in an autarchic manner which the present time can no longer perceive? What are their chances in a competition with "project regions" and "programme regions", nonchalantly divised and established by present-day territorial development strategists? What advantages have the lands, their pillars of

resistance and catalytic principles, in the face of the political will of transformation equipped with an entire arsenal of logistics (interested actors, specialised human resources, financial resources, and advanced technologies)?

The conclusions reached converge along two main lines liable to ensuring indefinite historical resilience of the "land"-type territorial systems, namely, the decisive role played by their mental space in securing *territorial cohesion* and their *many-sided brand* (tourist, cultural, scientific, and educational).

THE "LANDS", MODELS OF TERRITORIAL COHESION

Territorial cohesion, a new concept in the panoply of regional development, is the focal point of many approaches to spatial planning, sectoral and integrated development strategies. It has also focussed the attention of many approaches of the EU bodies specialised in spatial management and, being included in their programmatic documents elaborated in the last decade-and-a half, etc. Achieving cohesion is synonymous to the optimal functioning of the system, the harmonisation of relations and interrelations between its component elements on both horizontal and vertical planes, the attainment of the ultimate goal of political–administrative, economic, infrastructural, or environmental actions meant to increase the living standard of the population within a territory and create social harmony. Among the first three conditions underpinning the Community's sustainable development and mentioned in the strategic EU documents (*The Community Development Scheme,* CDS, Potsdam, 1999; *The European Landscape Convention,* Florence, 2000; *The Territorial Agenda of the European Union,* Leipzig, 2007; *The Green Paper on Territorial Cohesion,* Brussels, 2008; *The Treaty of Lisbon,* 2009) lies the very principle of territorial cohesion, materialised in the efforts of planning out the whole territory afferent to this supra-state structure which Romania belongs to since the 1st of January, 2007.

As Renard emphasises (1995), "lands" are one of the most illustrative examples of territorial cohesion, which after the lapse of over a century from the time of Vidal de la Blache (1908) first tackled the subject, becomes again topical in our pragmatic present. This is not surprising: in search for ideal models of natural or anthropic spatial organisation, of the most adequate criteria for the delimitation of *functional system–regions* (of *organism regions,* as Vallega names them, 1995), geographers, but also other analysts of the regional phenomenon in general, have noticed that "lands" embody these very models, with structures and functions developed and improved in the course of centuries by communities intimately linked to the place, with a spiritual cohesion worthy of an inextricable conglomerate. Communities that identify themselves from a material, spiritual, and behavioural viewpoint with the territory they live on, putting it to optimal account from ancient times, and resisting all political or social metamorphoses of a history, not always friendly to say the least, generating a cultural landscape of great organic originality, whose genuine elements are still omnipresent in the case of the absolute majority of the Romanian "lands".

The driving force behind the territorial cohesion of all these "lands" lies in the multi-secular specificity of an ethnographic mental space, whose structure has been minutely polished, articulated and strengthened along historical times. Built on a sense of property over the land, a constituent element of the natural framework, but also on the social system imprinted in the collective memory as supreme asset, as vital existential resource, has generated numerous and lasting genealogical bondings between the inhabitants, unique traditions they have unconditionally accepted and respected, a mythology of places and elements which the population of the "lands" identifies itself with. Hence, the inextricable attachment of man to his ancestral environment, the dedication to "sanctifying" it, the obstinacy carried to sacrifice in order to protect its status and values.

The territorial cohesion that characterises them structurally and functionally makes of the Romanian "lands" ***project regions with systemic features*** (Marcelpoil 2000; Cocean 2003), clearly delimited in space, in which development policies find an ideal environment for promotion and materialisation.

"LANDS" AS A BRAND

"Lands" as a brand is an attribute acquired due to the great material and spiritual values contained within the intimate structure of their spatial systems. In a period of human society development, when everything relates to competition, the only things capable to ensure the existence and continuity of "lands" is their highly original and peculiar heritage which becomes an important resource capable to secure, by rational, adequate and inspired exploitation, the progress of the human communities who identify themselves with and assume the respective territory.

Depending on their specificity, we distinguish four categories of brands, namely the folklore, the architectural, scientific (historical), and cultural (ethnographic) charcateristics (Cocean 2011) (Fig. 2).

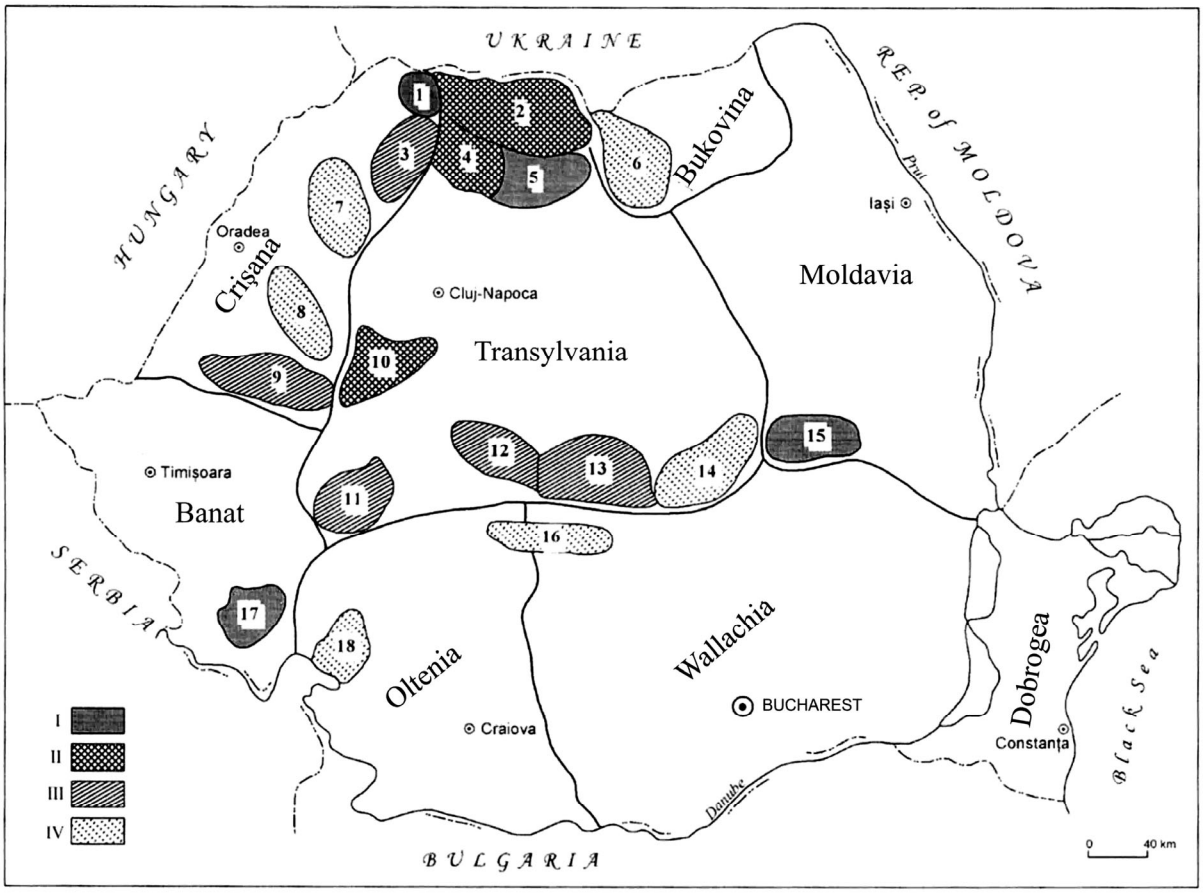

Fig. 2 – The brands of the Romanian "lands".

I. Folklore: 1. Oaş Land; 5. Năsăud Land; 17. Almăj Land; 15. Vrancea Land; **II.** Architecture: 2. Maramureş Land; 4. Lăpuş Land; 10. Moţi Land; **III.** Symbolistic (historical): 3. Chioar Land, 9. Zărand Land; 11. Haţeg Land; 12. Amlaş Land; 13. Făgăraş Land; **IV.** Cultural (ethnographic): 6. Dorna Land; 7. Silvania Land; 8. Beiuş Land; 14. Bârsa Land; 16. Loviştea Land; 18. Severin Land.

I. The folklore is a brand specific to the "lands" of Oaş, Năsăud, Almăj and Vrancea, being represented by extremely original elements of costume, music, and folk dances.

Thus, Oaş Land, located in the north-western extremity of Romania, is famous for its ancient agricultural occupations and handicrafts, the polychrome folk costumes, the tempestuous dance rhythms, and the unrivalled trill of specific witty couplets, called "ţâpurituri"(Ilieş 2006).

Năsăud Land, stands out by its inhabitants' pride of independence, expressed in the heroic myth of the "frontier guards"; it is known for the splendour of the folk costume, especially the male one, whose most valuable piece is the hat adorned with peacock feathers (Ilovan, 2009).

Almăj Lands' regional brand is given by its natural and anthropic landscape, the preservation of a deeply rural area highly authentic and original, of a folklore peculiar to the highland of Banat and traditional occupations, among which the widespread artisan production of plum brandy (Ianăş 2011).

Vrancea Land lasts in the visitors' memory for its historical legends reflecting the inhabitants' spirit of independence, their lyrical creativity (it is the cradle of "Mioriţa", the most striking Romanian ballad), but also for the millenary palaeo-Christian or pagan traditions inherited in the local folklore (Conea 1993).

II. Architecture as a brand is embodied in the landscape of Maramureş, Lăpuş and Moţi lands where wood processing was not only a traditional occupation, generating a genuine civilisation of the "wood", but also a vector for the building of works with a unique physiognomy and line. We refer mainly to the wooden churches, extremely numerous, but also to the slender houses or barns with thatched or shingled-roofs.

Maramureş Land, located in the homonymous depression, is the best example of such a brand. Here, the civilisation of the "wood" is represented by the wooden churches of Ieud, Bârsana, Budeşti, Deseşti, Poienile Izei (UNESCO monuments), Bogdan Vodă, Botiza, Călineşti, Giuleşti, Sat Şugatag, Rozavlea, Moisei, Sârbi, etc., slender structures and more numerous than anywhere else, noteworthy are also the monumental gates, the expression of excusite creative skill and inspiration, singular among the mountain regions of Europe (Man 2005; Ştef 2008). One of the tallest wooden churches on the Continent, over 63 meters high, was built at Săpânţa. This locality also hosts the "Merry Graveyard", a unique cemetery worldwide (Ilieş 2006).

Lăpuş Land, neighbouring Maramureş Land, is sheltered in a peri-Carpathian depression. Each visitor is impressed by the unique lines of its rural architecture (the wooden churches of Şurdeşti, Plopiş, Rogoz – UNESCO monuments), Cupşeni, Dobric, Lăpuş, Larga, Libotin, Stoiceni, etc., and by the "song with knots", an element of absolute originality in the area's folklore (Dezsi 2006).

Moţi Land is an unforgettable place due to its picturesque location in the valleys, on the slopes and summits of the Apuseni Mountains, as well as the distinctive landscape and local spirituality shaped by two millenary occupations: gold-mining and home processing of wood (Boţan 2010). There are wooden churches as well (Ponorel, Vidra, Gârda de Sus), and a unique architecture of scattered villages ("hamlets"), with slender roofs, built in successive layers of twigs and straw.

III. The symbolistic (historical) brand is peculiar to the "lands" that boast an important historical heritage of buildings with symbolic function (fortresses), events or personalities. It is the case of Chioar, Zărand, Haţeg, Făgăraş, Amlaş and Loviştea "lands".

Chioar Land reveals a tumultuous historical evolution, centered arround Chioar Fortress, a peculiar mental space, preserved in its original form despite all hostilities; the area's specific architecture is visible also in the great many wooden churches (Cărpiniş, Culcea, Jugăstreni, Posta, Remetea Chioarului, and Valea Chioarului).

Zărand Land. Besides its distinct spatial configuration (a succession of three depressionary basins created by one and the same river, namely the Crişul Alb) it dows its specificity to the historical myth of Avram Iancu (the leader of the 19th-century "Moţi" people's uprising), buried in the shade of an oak at Ţebea, and to the myth of gold extraction from the mines of Brad and Săcărâmb with huge efforts (David, 2010).

Haţeg Land, located in a classical Carpathian depression, preserves the legacy of some great historical values of the Dacian and Dacian-Roman civilisations (here is the site of Ulpia Traiana Sarmizegetusa, the capital of the Roman province of Dacia, established in the 2nd century A.D., traces of which have been only partially uncartherd so far), some important religious buildings of Early Christianity (e.g. at Densuş), as well as palaeontological remains (numerous bones and nests with eggs belonging to some rare species of small dinosaurs).

Amlaş Land had an unusual destiny, disappearing as "land"-type spatial entity due to some unfavourable historical factors. Its reconstitution is imperative in order to go back in time and understand how relatively well-bound territorial system lost in the competition with adaptation, transformation and change.

Făgăraş Land, associated with the most impressive mountain group of the Romanian Carpathians and with the homonymous depression, stands out by its historical past, with a very well individualised political-administrative structure, traditions and occupations of its inhabitants.

Loviştea Land lies in the heart of the mountains. Its tumultuous history was linked to its age-old position at the borders of the two Romanian sister states, Wallachia and Transylvania (Conea 1935).

IV. The cultural (ethnographic) brand illustrates complex material and spiritual values, the majority of ethnographic origin. Elements of historical or architectural symbolism are also present. The "lands" of Dorna, Silvania, Beiuş, Bârsa, Vrancea and Severin belong to this category.

Dorna Land's symbolic aura is given by the unforgettable memory of the founder of the Moldavian state, but also by a landscape of endless forests in which former buffalos, seen on the Moldavian coat-of-arms, used to roam; Bukovina has also a unique architecture and a folklore extremely rich in spiritual manifestations.

Silvania Land is located in a hilly area, a very accessible pathway for all past invasions into Transylvania. Its brand is the outcome of the ethno-cultural symbioses between Romanians and Hungarians, reflected in occupations, customs and traditions (Josan 2009).

Beiuş Land gathers together the authentic valences of the Bihor folklore, ancient occupations (lime making, bee rearing), distinct customs and traditions;

Bârsa Land is an example of brand derived from multi-culturalism and an extremely well-outlined ethnic mixture, produced by the secular cohabitation of the autochthonous Romanians with the groups of Szeklers and Saxons colonised beginning with the 12th century. Its "central place" geographical position within the Romanian space has for centuries been a cross-roads between the three major Romanian provinces: Transylvania, Muntenia (Wallachia) and Moldavia.

Severin Land, lies at the junction of the Carpathians with the Danube which, together with the Black Sea, are among the fundamental landmarks of the Romanian ethnogenetic space). It is the place where Apollodorus from Damascus built the bridge crossed by the Romans who brought with them their civilisation, north of the River. Noteworthy are also the great many authentic elements of the Mehedinţi traditions and folklore.

The few intrinsic features of the territorial system of "lands" outlined so far represent a complex, scientific, cultural and tourism brand likely to sustain the prospective future development of these territories.

THE "LANDS", GOOD PROSPECTS FOR RURAL TOURISM

The aim of identifying the representative brand of each "land" is to present its specific elements and individualise them against similar territorial systems. At the same time, it has also a pragmatic component, namely, to ensure the resilience of its territorial body, the repository of so many ancient and traditional assets faced with the challenges of the present and future evolution of human society. In the context of the "land's" declining traditional economy, based mainly on agriculture and wood processing (excepting Moți Land and Zărand Land, where mining has been the major occupation for several millennia now – Boțan 2010; David 2010) caused by low productivity (modest fertility and difficulties in using advanced land improvement techniques) and the need to preserve the forest fund, and its ecological and environmental functions, shifting to other occupations and economic branches is an imperative necessity. Such a branch, currently in expansion worldwide, is tourism and especially one of its particular forms, ***rural tourism***.

The natural and cultural heritage of the "lands", their harmonious landscape-related environment, the permanent opportunity for a direct contact between man and nature, as well as the chance to integrate into the local spirituality, to get a first-hand knowledge of occupations, traditions, customs, folklore and gastronomy, represent ideal conditions for the development of rural leisure tourism. Using attractive landscape features, and the products offered by the millenary creativity of the human genius, rural tourism combines the benefits of two major types of tourism, namely, leisure tourism and cultural tourism.

In response to industrial tourism, with its giant locations and infrastructures, already a producer of major dysfunctions (pollution, interspecific stress), rural tourism is the best modality to put to account an authentic, yet fragile environment, that offers privacy and recreational potential. It is also the most adequate form for the tourist to test one's own views on nature and of the becoming of man in the midst of the surrounding landscape.

As technologisation of agriculture and robotisation of industrial processes are progressing at a fast pace, removing part of the workforce from these sectors, tourism in general and rural tourism, in particular may contribute to solving *some social problems,* such as unemployment, by providing new jobs in the most diverse areas. Moreover, the employment of the workforce is indirectly but substantially connected with rural tourism, it maintaining and developing traditional occupations in the settlements of "lands" and promoting artisanal items. The increasing demand for organic products stimulates agriculture and all its sub-branches (crops unmodified genetically, the growth of wine, fruit, vegetables and animal husbandry), small industries (the processing of local agricultural raw materials, of wood, building materials, and handicrafts). If produced in the household of a rural tourist cottage owner is a guarantee of authenticity and quality. The creation of local jobs for the population of the "lands" is a major benefit because it eliminates temporary or permanent migration from one's ancestral environment. The phenomenon of migration has many negative consequences for the individual or collective mentality, being ultimately responsible for the impairment of the social and cultural matrix created within these territorial systems for centuries on end.

Noteworthy, rural tourism permanently combines in the structure of its activities and manifestations the concepts and attributes of other two forms of tourism, namely *ecotourism* and *agrotourism*. The analysed territorial systems have optimal conditions for the practice of both forms, rural tourism clearly dominating urban tourism by creating a balanced relationship between man and the natural environment, between the human community and the components of the landscape, basic ecological attributes of the ecotourism offer. The rural environment, defined in economic terms as the generalisation

of agricultural occupations, provides a wide range of attractions for those keen on agrotourism, from specific activities, many with visible archaic, traditional conotations, to related ones, including crafts peculiar to the former peasant household.

Since rural tourism has become the basic occupation of the population of the "lands", preserving and protecting the characteristic ethnographic values as primary attractive resources, included in the tourist offer and the regional tourism product, is of major importance. In the case of Romania, this amounts to safeguarding the rural civilisation itself, threatened with permanent disappearance over the last two decades by economic and social leeway (a process that has been taking place in many developed European countries since mid-20th century). Therefore, instead of rebuilding traditions and customs from bibliographical sources, as is the case in the above countries, we still have the opportunity to continue them in the form and spirit inherited from our ancestors. The organic interconnection between rural tourism and the ethnographic heritage of the "lands" is already visible in those lands that have started on this line of regional development. In the "lands" of Maramureş, Năsăud, Moţi, Haţeg, Dornelor and Oaş, the dynamics of the accommodation infrastructure and the fluxes of visitors foreshadowing, a boom of this modern form of leisure with definite international echoes. The tourist cottage owners' association had in view to subsidise also cultural tourism, with folk groups being formed to present before tourists with specific regional artistic programmes. The Vadu Izei folk group from Maramureş is a perfect example in this respect.

The deep-going territorial cohesion produced by the characteristic brands and the ongoing economic conversion (from traditional agriculture and wood processing to rural tourism) make the "lands" of Romania viable territorial systems, resilient to the structural and functional metamorphoses imposed by the ever greater globalization and industrialisation of the present civilisation.

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THE CARPATHIAN RIVER SYSTEM IN ROMANIA – GENESIS AND EVOLUTION

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Key-words: landform evolution, stream piracy, antecedence, palaeogeography, superposition, drainage system.

The present Carpathian valley network is the result of a long and complex process synchronous to the evolution of the Carpathian orographic system during the Cretaceous – Quaternary period. Among other issues, this study focuses on the genesis of the great defiles shaped by the rivers that cut across (partially or totally) the mountains (the Danube, Olt, Jiu, Prahova, Crişul Repede, Bistriţa, Trotuş, Buzău, Mureş, Someş, etc.), also explaining lower-order valleys, of limited length (the Bistricioara, Ilva, Tazlău, Teleajen, Cuejd, Strei, etc.). The specialist literature contains a diversity of opinions on two evolutionary concepts – antecedence and stream piracy, but the conclusions have not always been accepted. In establishing the formation stages of different generations of Carpathian valley systems, some general conditions have been taken into consideration (formation of the mountain system by tectonic movements; the evolution of marginal base levels, significantly influencing the intensity of linear and headward erosion; the orographic structure – a relatively ring-like mountain system built of groups of massifs and tectonic basins; the evolution of morpho-climatic systems). At the same time, some regional conditions (partial or total transversal corridors, erosion levels and terraces along the valleys, piedmont glacis, etc.) have been taken into account. The analysis of these elements allowed us to highlight two main evolution stages: Miocene – Middle Pontian (preserving the traces of the oldest valleys) and Dacian – Holocene (when many different generations of valleys were formed, preserving the most numerous morphological evidence), revealing the formation by antecedence and superposition of defiles and gorges, of the four generations of the valley system, and their varied local structure determined by tectonics, volcanism, geological patterns and changing role of the base levels.

1. GENERAL FRAMEWORK

The formation of the drainage network in Romania, and especially in the Carpathians (where at least four generations of important valleys can be identified) has focussed the attention of Romanian and foreign geologists and geomorphologists for over 130 years now. On the basis of field mappings (terraces, erosion surfaces, etc.) and analyses of sedimentary deposits of the inner and outer Carpathian basins (paleogeographic interpretations) arguments were brought in support of the genesis of some Carpathian valley sectors. The most circulated ideas refer to the formation of the great defiles shaped by the rivers (partially or totally) deep cutting across the mountain system (the Dunăre, Olt, Jiu, Prahova, Crişul Repede, Bistriţa, Trotuş, Buzău, Mureş, Someş, Crişuri, etc.), and explain the formation of some limited sectors (the Tisa, Vişeu, Iza, Bistricioara, Ilva, Tazlău, Teleajen, Cuejd, Dâmboviţa, Strei, Timiş, Nera, etc.).

Two evolutionary concepts were constantly sustained, some upholding antecedence, others stream piracy (Table 1), but in almost every case no conclusion was unanimously accepted. Several syntheses of this issue are due to Romanian authors (Orghidan, 1969; Mihăilescu, 1963; Posea, 1967 – for the Carpathians; Donisă, 1981 – for the Eastern Carpathians, and Ielenicz, 1973 – for the Curvature Carpathians).

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Table 1

Valley sectors generated by stream capture, antecedence, superposition, etc.

River	Sector	Formation	Authors
Bistrița	1. Zugreni	- overflow - stream capture - antecedence	S. Athanasiu, A. Nordon, Emm. De Martonne, T. Naum, I. Sîrcu, V. Gîrbacea
	2. Toance	- antecedence	M. David, I. Donisă
Cuejd	3. Piatra Neamț	- antecedence - stream capture	I. Donisă, I. Bojoi
Trotuş–Tazlăul Sărat	4. Moineşti	- antecedence - stream capture	N. Lupu, C. Brînduş
Someşul Mare	5. Rodna – Ilva Mică	- superposition	I. Sîrcu
Mureş	6. Toplița – Deda	- overflow - antecedence	L. Someşan
	7. Deva – Zam	- antecedence - superposition - stream capture	Gh. Pop, E. Vespremeanu, R. Ficheux
Olt	8. Racu, 9. Jigodin 10. Tuşnad, 11. Bod	- antecedence - overflow - stream capture	I. Tovissi, I. Schreiber, M. Iancu
	12. Racu – Augustin	- stream capture - antecedence	N. Orghidan, N. Popescu, N. Mihăilă
	13. Turnu Roşu 14. Cozia	- stream capture - antecedence	Emm. de Martonne, I. Popescu-Voiteşti, L. Mrazec, H. Wachner, N. Popescu, Gr. Posea, I. Rodeanu etc.
Buzău	15. Întorsura Buzăului 16. Harțagu	- beheading - antecedence	G. Schilling, N. Orghidan, A. Nordon, Gr. Posea, V. Gârbacea, M. Ielenicz
Bâsca Mare	17. Comandău	- beheading	M. Ielenicz
Prahova	18. Predeal – Timiş	- beheading	G. Vâlsan, Gh. Neamu, Valeria Velcea
	19. Predeal – Sinaia	- antecedence	Valeria Velcea
	20. Posada	- stream capture - antecedence	G. Vâlsan, Gr. Posea, M. Ielenicz
	21. Jepi and Izvorul Dorului	- stream capture	Valeria Velcea
Dâmbovița	22. Podul Dâmboviței	- superposition	M. Ielenicz
	22. Rucăr	- antecedence	M. Ielenicz
	22. Dragoslavele – Stoeneşti	- stream capture - antecedence	C. Brătescu, N. Muică
	23. Cetățeni	- antecedence - superposition	C. Brătescu, N. Muică
Jiu	24. Bănița 25. Livezeni – Bumbeşti	- beheading - stream capture - antecedence	D. Burileanu, Emm. de Martonne, N. Orghidan, V. Mihăilescu, Gr. Posea, Silvia Lupu, Gr. Murgoci
Danube	26. Defileul Moldova Nouă – Porțile de Fier	- antecedence - stream capture - complex overflowsand stream capture	J. Cvijic, R. Sevastos, Emm. de Martonne, G. Vâlsan, R. Ficheux, G. Verges, P. Coteț, V. Mihăilescu, Gr. Posea *et al*., M. Iancu *et al*., N. Orghidan
CrişulAlb	27. defiles down stream Brad	- superposition	P. Coteț, P. Tudoran
CrişulNegru	28. Şoimi	- antecedence - superposition	I. Berindei
CrişulRepede	29. Huedin – Vadu Crişului	- stream capture - antecedence	R. Ficheux, Aurora Posea

Table 1 (continued)

Nera	30. defile	- superposition - antecedence	Gr. Posea, V. Gârbacea
Mehadia	31. gorges	- antecedence	N. Schmidt
Bistra	32. defile	- antecedence	F. Mateescu
Valleys crossing the Trascău Mts.	33. gorges	- antecedence - superposition	I. Popescu – Argeşel
Arieş	34. defile	- antecedence	R. Ficheux
SomeşulMic	35, 36. defiles, gorges	- antecedence	R. Ficheux
Moldova	37. upstream of Sadova, Vama, Gura Humorului	- defiles	S. Athanasiu, A. Nordon, I. Barbu
Suceava	38. upstream of Putna	- antecedence	I. Barbu, A. Nordon
Vişeu	39. downstream of Petrova	- antecedence	A. Nordon, N. Popescu
Iza	40. Strâmtura	- antecedent gorges	M. Ielenicz
Bicaz	41. Bicaz Gorges, Dămuc Gorges, Bicăjel Gorges	- antecedence	I. Bojoi
Vrancea rivers	42. defiles	- antecedence	M. Ielenicz

2. GENETIC AND EVOLUTIONARY ELEMENTS IN ESTABLISHING THE FORMATION OF THE CARPATHIAN MORPHO-HYDROGRAPHIC SYSTEM

In most situations, the evident and repeatable landforms (erosion levels, terraces) developed on interfluves and along the valleys, as well as some oro-hydrographic (saddles, defiles) or drainage features (direction of valley segments in the adjacent basins) are the elements that led to the development of genetic and evolutionary concepts at least for some partial or total Carpathian valley-crossing sectors). However, correlating them with a correct assessment of palaeogeographical relations between the area of the Carpathians' gradual uplift and completion, and the areas (acting as base levels for the erosion process) is imperative. These details have particular significance not only for explaining the formation of some defiles and gorges, but also for identifying the way in which generations of Carpathian valleys had gradually been built and relate to the valleys of marginal areas.

2.1. General features relevant for the formation of the Carpathian river system

The following events are significant:

The gradual uplift of the Carpathians and the position of the general base levels. The Carpathian Mountains were formed during the Cretaceous – Quaternary period (the Alpine Orogenesis) by the dynamic relations between the Foreland blocks (Moldavian Plate, Moesian Plate) and the blocks formed within the Tethys Basin (Pannonian and Transylvanian plates). First, sediments accumulated and folded; then they were turned into crystalline rocks, crossed by igneous and volcanic material. Gradually, a series of submersed mountains, which rose above sea level and made up the mountain range, acquired a specific structure shaped by their evolution in time and place.

Palaeogeographically speaking three stages can be distinguished:

- *Cretaceous – Palaeogene*, when an initial mountain system of medium altitude, made of crystalline schists caught into giant nappes was formed. Gradually, the weathered pediment-like ground (which finally the Carpathian pediplain resulted from) became rigid, leading (especially in the Neogene period) to intense tectonic movements which generated massifs (horsts) separated by basins (graben). Generally, all the massifs constituted a major circular orographic system, framed both outside and inside by marine basins connected by inner tectonic corridors. The expansion of fragmented land over small areas of medium altitude, surrounded by marine basins, proved favourable to the formation of a short radial valley network.

• *Neogene,* when most of the oro-hydrographic aggregate was gradually formed. Some important processes and events during this phase were:

– *tectonic movements* (in several phases), which folded the sediments accumulated within the marine basins located outside and in the north-west of the Eastern Carpathians and south-east of the Apuseni Mountains, generating the alignments of flysch massifs, which joined the existing (crystalline Mesozoic) land;

– *completion of intra-system tectonic depressions, gradually filling with sediments and their emersions* (differing during the Pliocene Age);

– *volcanic eruptions* in the eastern and south-western Transylvanian Basin led to the emergence of a chain of massifs in the Eastern Carpathians (consisting of dominant volcanic andesite and conglomerate) split from the eastern Mesozoic crystalline massifs by intramontane basins; they also determined the formation of several stratovolcanoes inside the flysch deposits of the south-eastern Apuseni Mountains;

– *abrupt elevation of mountain land* that facilitated the increase in altitude and succession of some new morphogenetic stages, completed by the sculpturing of erosion surfaces and levels (generated as a subtropical climate was being maintained), the individualization of trans-Carpathian valley corridors and significant accumulations of marine and lake deposits in the adjacent basins;

– *differentiation of the morphogenetic role of the base levels into three stages:*

– Badenian – Sarmatian and largely in the Pontian, when a general base level outside the Carpathians was under the control of direct connections between the Pannonian, Getic, Moldavian and Transylvanian lakes (while the Carpathian massifs formed an archipelago);

– Upper Sarmatian (Messinian) – and Upper Pliocene, when a common base level dictated by the plains formed around the Carpathian system, powered by its uplift; as a consequence, the connections between the remote lakes where provided by tributaries;

– Romanian (Levantine) – Pleistocene, with local base levels related to the intramontane tectonic basins.

Therefore, it was a long stage with important changes within the configuration and structure of the Carpathian system (formation of the flysch mountains separated by structural saddles or tectonic contact, which joined the previous land; the development of tectonic basins which gradually filled up with sediments and became land). They determined the special evolution of mountain watersheds during the Miocene and Lower Pliocene (for example, existing valleys were deepened into Palaeogene old massifs, new generations developed into new ones, and disappeared inside tectonic basins which turned into lakes). During the Upper Pliocene, the river system extended over the Carpathian land units as they tectonically emerged. Integration of all the valleys into a single unitary system was achieved in many cases through the trans-Carpathian tectonic corridors.

• *Quaternary,* the stage of Carpathian physiognomy and valley system completion. A significant role was played by: the general uplift of the Carpathians (regionally differentiated by magnitude); some local subsidence processes (in several small tectonic basins), which provided for a rich sedimentation; a 100–250 m abrupt incision of the river network, which created, during alternating climates (periglacial and temperate), a 6-to-8 general terrace system in the Pliocene valley corridors (some local terraces occurring in the actively uplifting sectors); the growing importance of regional and local base levels compared to the general one (the Black Sea through its tributary the Danube River), which remained far from the mountain area. The last important generation of valleys was formed.

The active uplifts on certain alignments have facilitated the formation of antecedent or superposed rivers (which are obvious in the hard rocks sectors– gorges, defiles).

2.2. Tectonic, structural and orographic features of secondary influence upon the formation of the Carpathian valleys system

These features have an important local contribution to controlling the direction and evolution of the Carpathian valleys system (Fig. 1). The most significant ones are:

- The contact between different litho-structural units in which either longitudinal, or transversal valley sectors are cutting into (in the flysch mountains or at the contact between crystalline massifs and sediment fill in some basins);
- Alignments of major faults along which vigorous stream have downcut (Cerna, Bistra, etc.);
- Discordant structures favourable to superposed defiles (in the west of the Western Carpathians);
- Tectonic corridors which functioned as marine (lake) straits especially during the Badenian and the Pontian, and after exhumation they became narrow strips of land in which the Carpathian rivers gathered and convered (Danube, Jiu, Olt, Strei, etc.);

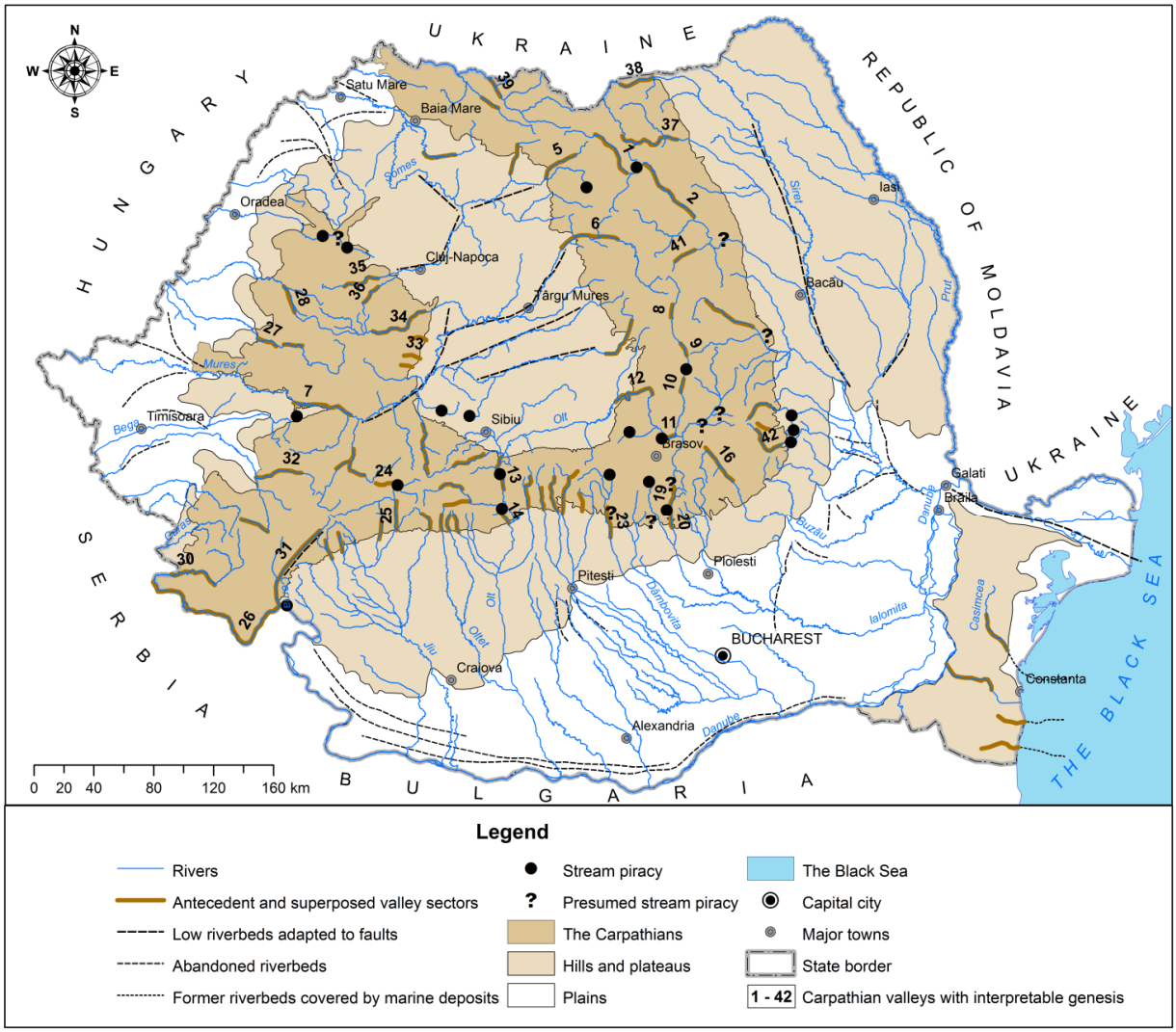

Fig. 1 – Defining features of the river system evolution and the Carpathian valley sectors of interpretable genesis in Romania.

- The contact between the foothills of Neogene volcanoes, which autochthonous rivers were flowing through towards the Transylvanian Basin (the west of the Eastern Carpathians);
- The formation of tectonic basins during the Tertiary, which became sedimentary basins and led to the destruction of some sectors belonging to the previous drainage network (Braşov);
- Active uplifts of some massifs, determining the formation of antecedent defiles and a sort of unconformity between the position of the major drainage divides and the highest ridgeline (Eastern Carpathians);
- Tectonic and volcanic barrier and differential erosion basins, which played a local base level role and determined the convergence of rivers flowing from the neighbouring massifs into a main stream (Ciuc, Gheorghieni, Haţeg) or subsidence areas (Braşov);
- Large folding of the thrust nappes, creating possible access ways for some rivers in the early stage of crystalline area evolution, exemplified by D. Burileanu for the Southern Carpathians (Burileanu, 1941);
- Subsidence areas in some basins or adjacent landforms, as river convergence points (Braşov, Gheorghieni, Someş Plain, Criş Rivers Plain, etc.);
- Formation of piedmonts, extended alluvial fans, and glacis on which the riverbeds of tributaries have repeatedly shifted (Haţeg, Braşov, Beiuş, etc.);
- Evolution of rivers in limestone massifs, often attended by subsurface stream captures and development of hanging dry valleys (Padiş – Cetăţile Ponorului, Pădurea Craiului Mts., Aninei Mts., etc.).

3. STAGES OF CARPATHIAN VALLEY NETWORK FORMATION AND DEVELOPMENT

The Carpathian valley network occupies a distinct place in the Romanian oro-hydrographic system, determined by the following features:

– The largest number of generations of valleys gradually completed in close dependency to stages of mountain units and adjacent base levels evolution;

– It contains the oldest Romanian valley sectors (dating back to the Miocene), and also the most representative ones (Pliocene - Quaternary);

– The most numerous areas in which, frequently based on their morphological features, antecedent, superposed or captured rivers were recognized;

– The mountain valley network has extended its shape and downcut into the adjacent landforms (hills, plateaus, plains), as they were formed after emerging from under the lakes or seas (driven by the Carpathian uplift).

Based on above the ideas, as well as on oro-hydrographic, tectonic and structural evidence stated in the literature, two major stages consisting in complex paleaogeographic events are outlined:

- Upper Miocene – Middle Pliocene;
- Upper Pliocene – Quaternary.

3.1. Upper Miocene – Middle Pliocene stage, with the oldest morphological remnants of the existence of a Carpathian valleys network

Until the Middle Miocene, the Carpathian Mountains formed in a discontinuous stretch of land made up of metamorphic rocks and Cretaceous flysch, some hundreds of meters in height, and drained by a radial valley network which reached the nearby marine basins. The idea that some folding of thrust nappes or the tectonic-structural contacts had probably constituted primary drainage sectors was also advanced (Munteanu-Murgoci and Burileanu for the Getic Nappe).

By emphasizing the tectonic fragmentation during the Badenian, the Carpathians became an archipelago drained by a radial river network, connected to a common base level. Some erosion levels were preserved especially in the crystalline massifs (Godeanu Mts., Făgăraş Mts., Bucegi Mts., Bistriței Mts., etc.), whose extent indicates valley sectors dating back to the stage when the Carpathian middle erosion surface was sculptured (Martonne, 1907; Niculescu, 1965; Micalevich-Velcea, 1961; Donisă, 1968; Posea, 1967; Popescu, 1990; Ielenicz, 1984, etc.).

In the Upper Sarmatian – Meotian, by the structural completion and uplift of the flysch Carpathians, the mountain river system extended over the newly emerged landforms, such as the low hills and plains, to the east of the Eastern Carpathians, Transylvania and the north-east of Moldavia, where it took over a generation of developing valleys.

The Pontian (Pannonian) transgression reduced the Meotian land surface (especially the peri-Carpathian one, but also a few intramontane basins) – most in the Western Carpathians and less so in the other ranges, removing a significant part of the previous river network. Important volcanic eruptions took place during the Pliocene, gradually completing the volcanic mountain system, with local consequences on the extent of developing valleys, divergent on the volcanic cones and convergent to the inner basins (Gheorghieni, Ciuc, etc.), occupied by lakes or marshes drained by tributaries reaching the Transylvanian Lake.

The Pliocene erosion levels in the upper slopes of the valleys are different in number, depending on the generations of valleys formed during this period. They already prove stable drainage directions reflecting a river network emerging from the high mountain area, which frequently converged towards some tectonic corridors and basins at the outer edge of the Carpathians. In the Eastern Carpathians, rivers were collected by main stems following either tectonic alignments inherited along the most important litho-structural contacts, or lower sectors remained between various uplifted land units. The major rivers were transversally (totally or partially) cutting the mountain chain, as the later uplift of the Carpathians determined their antecedence and superposition (Bistrița, Moldova, Moldovița, Trotuş, rivers in the Curvature Carpathians).

3.2. Upper Pliocene – Quaternary stage of completion of the present river system

This stage was defined by several significant events:

- Uplifting of the mountains in several stages, which caused the antecedence of all the valleys formed before the intense uplift took place. The cross profiles of the valleys show an obvious transition from an upper open sector of low energy to gradually smaller sectors dominated by limited erosion levels. The cross profiles also highlight by their V-shaped angle and hardly visible erosion shoulders, a rapid, but abrupt downcutting. In some cases antecedent rivers are also superposed (rivers in the Trascău Mountains, Metaliferi Mts., Codru – Moma Mts., etc.).
- Formation of a generation of Carpathian valleys during the Upper Pliocene which joined the previous system. There are narrow erosion levels along them, correlated with erosion surfaces in the neighbouring outer landforms (at the transition from the Carpathians to the Subcarpathians), then (beneath them) terraces (in varying number) of limited length, relatively hanging longitudinal profiles, comparing to the main stems and many litho-structural steps. The most recent generation of valleys (Quaternary) originates from the lower third of the slopes, but also inside the great tectonic basins, only preserving terraces and meadows.
- The emersion first of the Transylvanian basin and then progressively of the gulf-like basins in the Western Carpathians (during the Dacian Age), the Foreland and some of the intramontane basins (Gheorghieni, Ciuc, Braşov, Comăneşti) during the Romanian – Pleistocene led to different regional evolutions. The alluvial plains created after the Pannonian and Transylvanian lakes had been drained out, were gradually uplifted, then split apart by erosion and turned into plateaus or hills. Piedmonts

(much extended to the south of the Southern Carpathians), glacis and superposed alluvial fans, differently developed depending on the size of the rivers which created them (Haţeg, Petroşani, Făgăraş, etc.), were formed at the contact between these landforms and the mountain areas or in some intramontane basins.

- The tectonic corridors formed at the end of the Pontian when, becoming strips of land, provided a drainage from the low neighbouring mountain areas (Danube, Someş, Olt, Mureş). As a consequence, for the first time since the Romanian and the Lower Upper Pleistocene they became major drainage passages for the Carpathian valley systems which reached the Pannonian, Transylvanian, Getic and Moldavian basins.
- The rivers downcutting during the Quaternary was provided by an abrupt uplift, highlighted by a difference in altitude of 200–250 m between the Pliocene erosion levels and the present thalwegs. They generated in the Carpathians antecedent defiles with narrow sectors shaped into resistant hard rocks (erosion shoulders and terraces were not preserved or they are discontinuous and limited in size) and small basins (terraces were better preserved when younger, and less so when older, because of fragmentation). Through these corridors, the main stems flowing from the Carpathians extended on the Foreland units, gradually joining the hills and plain rivers into a complex system. The major drainage axes of the non-Carpathian rivers followed either lower alignments generated by tectonic impulses from the Carpathians, or resulted from the different movement of the deep underground blocks (in Transylvania or the Subcarpathians the tectonics of salt layers, determining local folding or subsidence, was also significant), or followed litho-structural contact lines, or where Romanian – Pleistocene alluvial sheets had been accumulated.
- During the Dacian – Romanian evolution (in some places also in the Lower Pleistocene), when landforms were low and poorly fragmented, stream piracy and divergent flowing could occur in organizing the river system. Some authors support these opinions and motivate them by bringing into discussion the existence of some wide saddles preserving supposed alluvial remnants, wide valleys comparing to narrow riverbeds of the present valleys, the extent of valley shoulders or the configuration of the valley sections, etc. The importance of this process was in some cases overestimated (especially when analysing the genesis of great defiles).
- The downcutting of rivers into the post-Pannonian lowlands of some basins and corridors made of sedimentary rocks covering magmatic bodies or crystalline blocks at low depths led in Pleistocene to the developing of superposed gorges and defiles by cutting the hard rocks through, more frequently in the Western Carpathians (Tău, Timiş, Crişul Alb, Crişul Negru, Crişul Repede, Barcău, etc.), Eastern Carpathians (Someşul Mare, Ilva, Olt at Racu and Jigodin), Southern Carpathians (Crivadia, Sebeş, Dâmboviţa, etc.), upstream of which alluvial basins developed.
- Formation of the volcano system determined first a rearrangement of divergent rivers (on their side slopes), associated with that of rivers convergent (within the craters), followed by the it led to formation of several stems on the marginal (contact) sectors between the main eruptive massifs (Mureş from Topliţa to Deda; Tur and Talna in Oaş; Săsar, Cavnic, Olt at Tuşnad, partially Târnava Mare, Târnava Mică, etc., and the sedimentary in Transylvania). The last case is also supposed to be determined by the draining of some lakes variable in size, occupying the dam basins either by overflowing, or stream piracy, but arguments are not conclusive.
- Formation within the mountain area of some tectonic basin during the Upper Pleistocene (Comăneşti, Braşov), which functioned as lakes or marshes until early Quaternary, had several consequences for the river network. At first, rivers in the areas which later became sedimentary basins, vanished; some interfluves located downstream of the fault slopes delimiting the basins preserve of the remnants of some wide valleys having low charge riverbeds (Lădăuţele and Popliţa at Întorsura Buzăului and Comandău), shaped by steep slopes and a relief energy exceeding hundreds of meters. During the Quaternary, as the local river system tributary to the Olt, Trotuş, etc. was being completed, the major tributaries caused limited stream piracy (Râşnov, Timiş, Gârcin against the Prahova drainage basin; Boroşneu, and Doboli against Lădăuţele basins; Covasna against Popliţa basin, etc.). The process

was also favoured by some active uplifts occurred in the central Curvarture Carpathian area, where the main stems (Buzău, Bâsca rivers, Teleajen, Prahova, etc. created antecedent defiles).

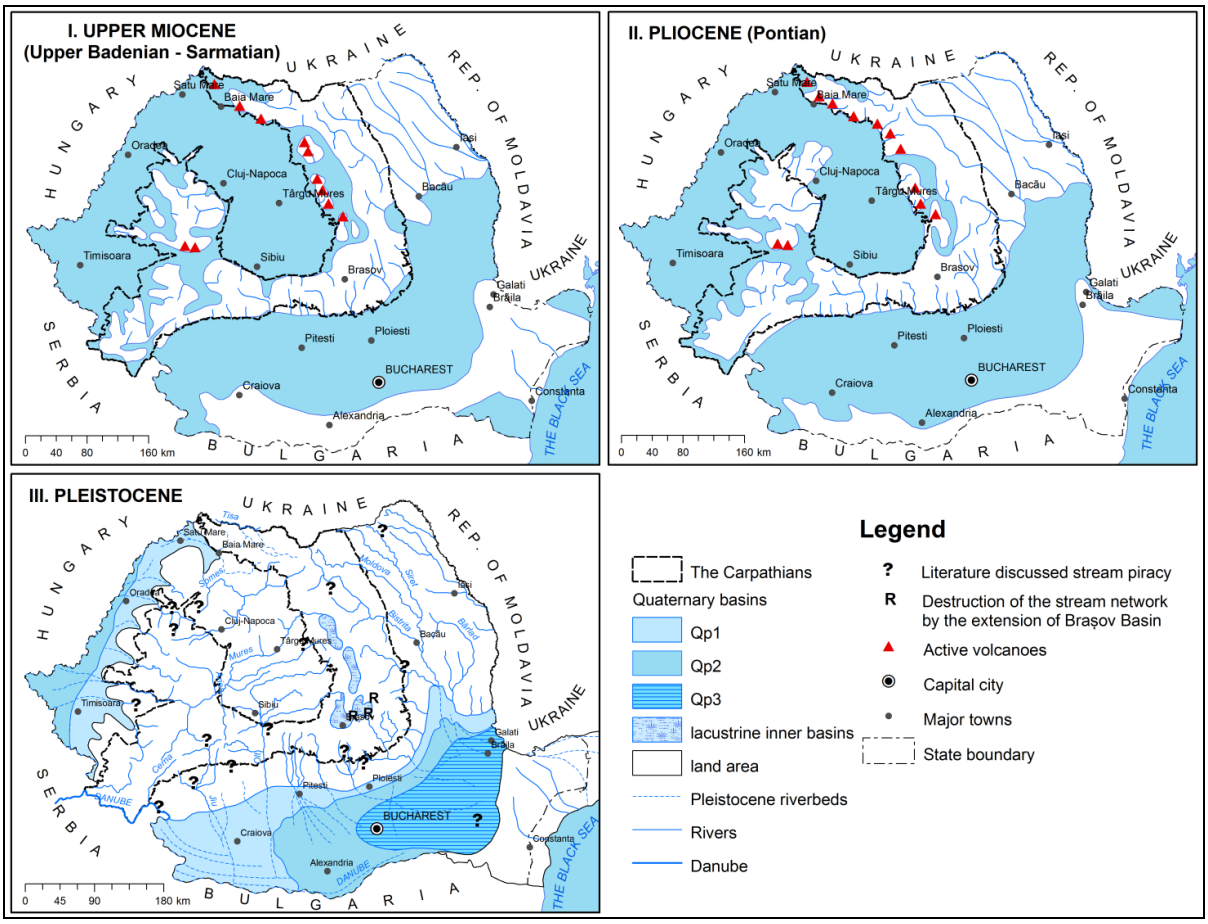

Fig. 2 – The valley system evolution stages and the Carpathian Mountains in Romania.

- Changes of riverbeds by divergence occurred both at the exit of some tectonic corridors (Mureş downstream of Dobra, on the accumulative outwash around the eruptive and crystalline hills), and within basins surrounded by prominent piedmont glacis (Haţeg, Făgăraş, Petroşani, Beiuş, etc.).
- Local lateral stream piracy occurred amidst adjacent basins drained by stems at different elevation (Izvorul Dorului, Jepii, Poarta in the Bucegi Mountains, etc.).

CONCLUSIONS

The Carpathians form a geographic landform unit preserving the most ancient and numerous generations of valleys, resulting from a long evolution as land as far back as the end of the Mesozoic era, and completed by joining the flysch oro-structural system, volcanic mountains and developing the inner basins.

As the oro-structural completion of the Carpathians was developing, on the one hand the river network was created within their area by different tectonic, structural, geomorphic factors, and on the other hand (post-Dacian) extended to areas in the Foreland or to Transylvania, which were differently driven by the uplifting Carpathians.

Many papers (published even since the late 19th century) have analyzed the mechanism of gradual completion of the river network, especially within defile sectors, most arguments pleading for antecedence or stream piracy.

Analyzing them has allowed to establish two major stages in the formation and evolution of the valley system: Miocene – Middle Pontian (it preserves disparately the remnants of the most ancient valley corridors), and Dacian – Holocene (when several generations of valleys preserving many morphological evidence – among which erosion levels and shoulders, terraces, different accumulated sediments, etc. – were formed). The processes conducive to the completion of the valley system configuration had a different regional importance. Among these are:

- The abrupt, but different in intensity, uplift of the mountains, causing antecedent rivers to form, as well as divergent or convergent drainage (especially within tectonic basins and corridors);
- Downcutting into discordant structures (located especially in the peripheral area or around the large basins), determining the formation of superposed defiles and hanging basins;
- Simple or successive stream piracy, either immediately during the phase following the emersion of tectonic corridors inherited by the main stems (Upper Pliocene), or amidst tributaries of differently elevated watersheds;
- Destruction of several sectors in ancient watersheds by the formation of some tectonic basins (especially during the Miocene), which became marine areas or lakes.

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THE EVOLUTION OF THE NATURAL PROTECTED AREAS NETWORK IN ROMANIA

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Key-words: nature protection, protected areas, Natura 2000, Romania.

The paper is aiming to present a historical overview of the Romanian protected areas network starting with the earliest initiatives on nature conservation and the establishment of first natural reserves in 1932. The authors have identified several stages in the dynamics of natural protected areas which, over the last two decades, have doubled in number and grew in surface up to eight times. Currently, Romania natural protected areas totalizes up to 1,798,782 ha, thus representing 7.55% of the national territory. According to UICN they frame into the following categories: national parks (13), natural parks (15), biosphere reserves (3), scientific reserves (79), natural monuments (230) and nature reserves (661). Additionally, in 2007 national network "Natura 2000" was created as part of the European Ecological Network. At present, Natura 2000 in Romania includes 408 Sites of Community Importance and 148 Special Protection Areas, with a total area of 74,494,000 hectares.

INTRODUCTION

The present network of protected natural areas includes numerous and valuable "samples" of various natural ecosystems. In Romania they have started to cluster into a common organized and legalized manner in the Interwar period.

DOCUMENTATION FROM BEFORE WORLD WAR I (WWI)

In the first year of issue of Forests Magazine ("Revista Pădurilor") – 1881 – Petre Antonescu stated that Letea and Caraorman forests were worthy of a "*European significance*." The proposal to put them under protection comes nine years after setting up the first national park in the world: Yellowstone in U.S.A. (1872).

Iuliu Römer is credited with the responsibility of making up a list of protected sites in Ţara Bârsei which was annexed to the "Law regarding the protection of natural and historic monuments" from 1908 in the former Hapsburg Empire (Morariu, 1971). From among these, we would mention: the spring at the foot of the Şpreng Hill, Tâmpa Mountain, the "milk stone" cave in Postăvaru Mountain etc.

In 1909 with the initiative of I. Tuzson the complex fencing and protection of an area rich in *Polygala sibirica* near Cenade (Alba County) was succeeded (Borza, 1924). In 1912, as part of the 26th General Assembly of the Society "Forestry progress" ("Progresul Silvic") in Bucharest, its president Ion Kalinderu mentioned "the need for legal dispositions to the protection of landscapes".

The Tourism Society in Romania [Old Kingdom n.n.] in its Yearbook of 1911 stated that "*in 1912 we will intrude to those entitled to keep some of our mountains, by stopping grazing activities and transforming them slowly into natural parks*" (p. 123). In 1916, Alexandru Borza in the newspaper called "*Unirea*" that was edited in Blaj and then the booklet "*Din lumea Plantelor*" printed

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in Arad in 1917, drew attention to the Retezat Mountains and the valleys of Făgăraş Mountains as "*places destined to be turned into national parks*" (Borza, 1924, page 12).

ACHIEVEMENTS BETWEEN 1919 AND 1944

On August 12, 1919 Professor V. Stanciu from the University of Cluj won, during the Grand National Assembly in Sibiu, the right to render exempt to expropriation of "*any areas of particular scientific interest*".

The Director of the Botanical Garden in Cluj, Professor Borza managed in 1919 to obtain the temporary protection for 15 "*places*" of botanical interest. The following year, with the intervention of the Naturalists' Society of Romania, a sector of the Letea forest in the Danube Delta was placed under protection, a forest ecosystem since then considered "*of extreme interest for geography, botany and geology*", as stated in the First Congress of the Naturalists' Society held in Cluj, Romania between April 18th and April 21st, 1928.

Also in 1920, in a memorandum, the Faculty of Science, University of Cluj put forward to the national fora the establishment of Parâng and Someş Cald Springs National Parks (Borza, 1924).

In 1921 Bosanci, Pohorlăuți, Boianceni reserves were planned in Bucovina (Guşuleac, 1921), and in 1923 the Ministry of Domains decided that 480 ha of forest were to be placed under protection in Slătioara forest (Câmpulung County).

Borza (1924) stated that "*there is a need to interfere quickly to maintain the primitive grandeur of some pieces of nature, protect them from the bad and destructive influence of human society; thus arises the need to create a well-thought program for the preservation of scientific natural treasures, which can now be found in abundance, but are doomed to disappear in the future, or are even destroyed in part*" (p. 8).

Moreover, after the World War I, the scientist Emil Racoviță was concerned about the establishment of protected areas as extensive as possible, with an "eternal" aspect in mind (Popova-Cucu, Muică, 1983). At that time, King Ferdinand I of Romania, who was also a passionate naturalist, proposed the placing under protection of the linden forest area near Niculițel in Northern Dobrogea.

In the 1920's M. Haret, the founder of the Turing-Club of Romania managed "*to obtain from the state a secular spruce forest on Mount Cocora to be turned into the first natural park in Romania*" stated Borza in 1930 (p. 101). The area was 8 ha wide and he hoped to add to it the region of the Ialomicioara cave, as well (Borza, 1924).

The Touristic Society "The Traveler's Inn" ("Hanul Drumeţilor") founded on the 15th of March 1921 carried out an intensive propaganda for the creation of natural parks in Bucegi, Piatra Craiului, Parâng and Retezat Mountains, as well as for the protection of Letea forest.

Therewith, the Royal House of Romania wanted to turn "*the upper part of the Bucegi Mountains, into a huge National Park*" (Borza, 1924, page 16). In 1930 the first law to protect natural monuments was passed (Borza, 1942).

The first natural reserves in Romania were endorsed by the Journals of the Council of Ministers (no. 1148 and 1149) in 1932. These were: Domogled Forest (Severin County), Copârşaie hayfields (Cluj County), Cluj hayfields (Cluj County), Suatu (Cluj County), Moineşti-Zau (Turda County), Băile Episcopeşti Oradea (Bihor County), Pietrele Roşii Tulgheş (Ciuc County), Bâlea valley (Sibiu county), Pietrosu Mare Borşa (Maramureş County), Parâng Mountains (Hunedoara County), Boianceni hayfields (Cernăuți County), Pohorlăuți hayfields (Cernăuți County), Ponoare-Bosanci hayfields (Suceava County), Frumoasa-Bosanci hayfields (Suceava County) Rogojeşti Meadow (Dorohoi County) and Mociar-Gurghiu Forest (Mureş County).

The first Romanian national park, Retezat, was firstly established (with a surface of 100 km^2) by the Journal of the Ministers Council no. 593 of March 22, 1935.

The scientist E. Racoviță was due with the first handbook of principles of classification, organization and regulation of natural resrves (1937) that had to be judiciously chosen, well-guarded and managed. Racoviță considered:

a) reserves of stations when it comes to designating geographical entities, territories, landscapes;

b) geographical and geological formations protected from a scientific and touristic interest;

c) plant and animal species or individuals protected as natural monuments;

d) mineral, paleontological and prehistoric. He believed that "*geographical reserves (or stations) are preferable to the protection of isolated species*."

THE SITUATION IN 1940–1944

During this period, Romania divided into 71 counties of which 28 included protected areas (39.4%), whose entire surface area reached almost 14,000 ha, of which 10,000 ha belonged to the Retezat National Park and 3,996 ha to other reserves.

From the country's area at the time, the share of natural protected areas was only 0.047%. The largest areas were: Căpriana forest (1,220 ha Lăpuşna County), the forest on Mount Domogled (900 ha, Severin County) and Piatra Craiului Mountains (400 ha).

Three of the natural reserves didn't have their surface specified in the official documents: Pietrosu Mare (Rodna Mountains), Parâng Mountains and Detunata Goală (Apuseni Mountains).

It is worth mentioning that the reserves officially recognized in the Interwar period in Bessarabia – then part of Romania – were the first protected areas in the Republic of Moldova's present territory. Thus, in 1937 the following reserves were established: Capriana and Pârjolteni in Lăpuşna County, Cărbuna, Delacheu, Moghilău, and Gârbovăț in Tighina County, Valea Mare in Bălți County, Hârjauca-Palanca and Cocorozeni in Orhei County (Lepşi, 1937).

Other protected natural areas instated in Interwar Romania are in today's Ukraine (3 reservations established in 1932 in Cernăuți County, another one in 1937 in Hotin County, as well as Insula Şerpilor (Snake Island) protected area since in 1934) and Bulgaria (Caliacra and Balcic, legalized in 1934 and 1939, respectively).

We would remind that Insula Şerpilor (now in Ukraine) in the Black Sea was a protected area "*as a whole, except the lighthouse and garden*", its area summing up to 17 hectares (Călinescu, 1931).

Between 1932 and 1943 Retezat National Park and 48 reserves were established (Anonimus, 1943).

Overall, at the beginning of 1944, the total protected natural areas sum up to about 11,500 ha, the situation varying among the following counties:

– Alba, Arad, Bălți, Braşov, Caraş, Câmpulung, Dorohoi, Hotin, Severin, Sibiu, Tecuci and Timiş had one protected area each;

– Constanța, Hunedoara, Lăpuşna, Orhei, Prahova, Suceava had two protected areas each;

– Cernăuți and Tulcea counties had three protected areas each;

– and Tighina and Turda counties had four protected areas each.

THE 1945–1999 PERIOD

In 1945 the present territory of Romania housed only Retezat National Park and 39 nature reserves. After two decades there were 130 nature reserves of a total area of about 75,000 ha (Pop, Sălăgeanu, 1965).

Some protected areas have been declared by the issuing of the Council of Ministers Decisions (no. 458/1954, 1625/1955 and 485/1964).

The Law no. 9/1973 on Environmental Protection classifies protected areas in national parks and nature reservations, the latter belonging to several categories: botany, forestry, zoology, geology, limnology, paleontological, speleology and mixed.

Forest Research Institute in Bucharest developed, by 1977, the necessary studies for the establishment of 13 national parks that the Natural Monuments Committee of the Romanian Academy has used to prepare the draft law on nature protection, law which never came to pass due to decisional factors at the time (Popescu *et al.*, 2004).

At the Fourth International Session of the Man-Biosphere Programme (Paris, 1979), a proposal was made to the effect of having the Retezat National Park and the Pietrosu Mare (Rodna Mountains) and Roşca–Letea (Danube Delta) declared biosphere reserves. The proposal was accepted on January 10, 1980 by UNESCO (Bălteanu *et al.*, 2006).

In 1973 Soran noted that "*the most effective method to preserve the genetic funds of ecosystems is at the moment, and especially in the future, the creation of large complex reserves*" (p. 44). In 1989, protected areas made up barely 0.36% of the country (Stoiculescu, Bândiu, 1991, page 194).

By the Order of the Minister of Waters, Forestry and Environment no. 7 of 27 January 1990, 13 national parks were established: Rodna, Călimani, Ceahlău, Bicaz-Hăşmaş, Bucegi, Piatra Craiului, Cozia, Retezat Domogled-Cerna Valley, Semenic-Caraş Gorge, Nera-Beuşniţa Gorge, Apuseni Mountains and the Danube Delta (Buza *et al.*, 2005).

In the year 1991, in Romania there were 586 protected natural areas established through different normative acts as follows: 42 by the Journals of the Council of Ministers, 41 by Decisions of the Council of Ministers, 8 by Government Decisions, 5 by Minister's Orders and 490 by local decisions (Toniuc *et al.*, 1992). Among them there were 15 parks, to the ones established in 1990, Grădiştea Muncelului-Cioclovina and Porţile de Fier were added.

In 1991, some counties had numerous protected areas and others only some. In the first case Bihor with 55, Gorj with 42, Mehedinţi with 31, Hunedoara with 30, Harghita with 30 were included, and in the latter case the counties of: Dâmboviţa – three protected areas, and Buzău, Covasna, Ialomiţa and Ilfov with 2 protected areas each.

The Environmental Protection Law of 1995 stated in Article 54 that "*for the conservation of natural habitats, of biodiversity which defines the country's biogeographic pattern as well as the natural structures and of an environmental, scientific and picturesque value, the maintenance and development of the national network of protected areas is to be maintained and developed"*, while the following article includes a paragraph specifying that "*the central authority for environmental protection following the proposal of the Romanian Academy declares new areas for the expansion of the national network of protected areas* ".

THE SITUATION IN 2000

Law no. 5 of March 6th 2000 regarding the national territory planning, section III – protected areas, has given this status to 17 biosphere reserves, natural and national parks, namely to those that already existed in 1991 and two more: Măcin Mountains and Small Wetland of Brăila. Therewith, there were also 827 nature reserves spread according to national provinces as follows: in Transylvania-275 (33.2%), 137 in Moldova (16.6%), 121 in Oltenia (14.6%), 75 in Crişana (9,1%), 68 in Wallachia (8.2%), 61 in Banat (7.4%), 51 in Dobrogea (6.2%) and 39 in Maramureş (4.7%). Divided by counties, the situation was as follows (Fig. 1):

– The majority of natural protected areas were found in the counties: Alba (83), Bihor (60), Caraş-Severin (47), Hunedoara (42), Gorj (36), Harghita (36), Maramureş (33) and Mehedinţi (32);

– The fewest were located in the counties: Olt (6), Prahova (6), Satu Mare (6), Giurgiu (4), Brăila (2), Ilfov (2), Călăraşi (1) and Covasna (1);

– The counties with no natural protected areas were: Ialomiţa and Teleorman counties.

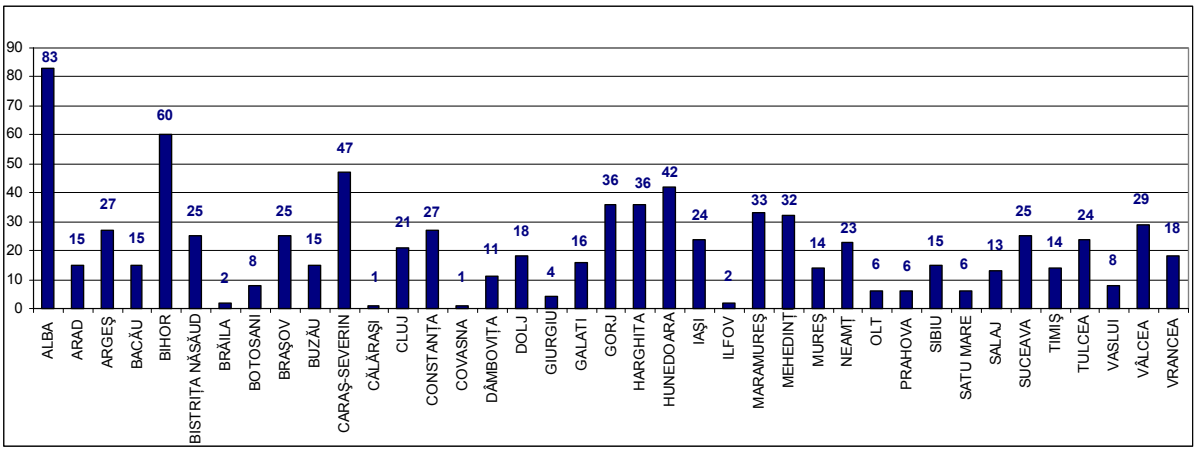

Fig. 1 – The number of natural protected areas
by county according to Law no. 5/2000.

The largest nature reserves were the following: The Mureş Gorge (the Bradului-Răstolița Meadow and Toplița-Deda making up a total 13 733 ha, Mureş County), Vânători-Neamț (11,500 ha, Neamş County) and Vâlsan Valley (10,000 ha, Argeş County).

The smallest natural heritage protected areas were located in four counties: Călăraşi (75.2 ha), Sălaj (86.3 ha), Ilfov (110 ha) and Bacău (201 ha).

DEVELOPMENTS AFTER THE YEAR 2000

An increased surface of protected areas was a priority of Romania's over the accession to the European Union. Thus, a series of decisions were taken by the Romanian Government during 2004–2010 (No. 2151/2004, 1581/2005, 1143/2007, 1066/2010 and 1217/2010) that led to the extension of the number of protected areas (Fig. 2, 3). Thus, up to now, Romania has:

– 998 protected areas of national interest:

– 79 scientific reserves – I;

– 13 national parks – II;

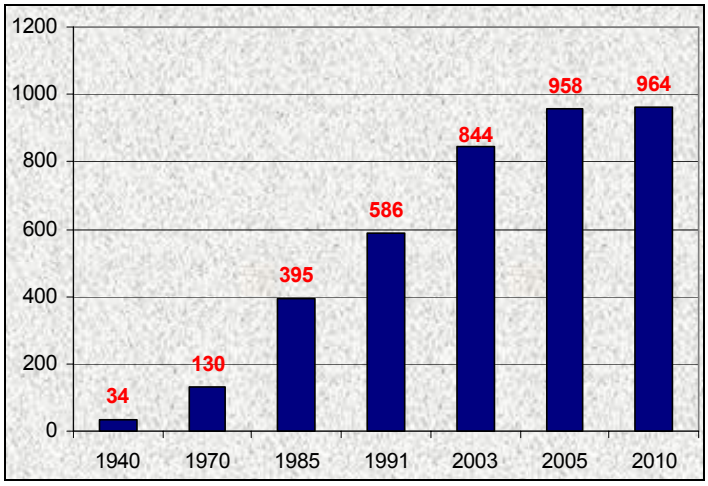

Fig. 2 – The dynamics of natural protected areas number.

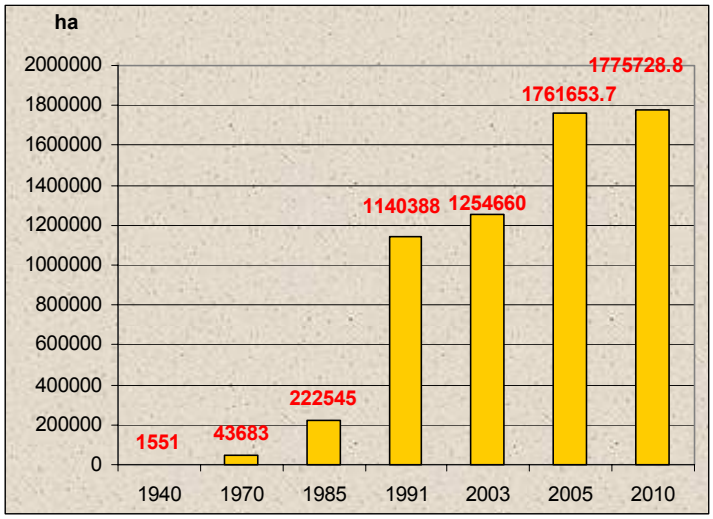

Fig. 3 – The dynamics of natural protected areas surface.

– 230 natural monuments – III;
– 661 natural reserves – IV;
– 15 parks – V.

At the international level Romania has:

– 3 Biosphere Reserves: Danube Delta (1991), Retezat Mountains (1979), Pietrosul Rodnei (1979);

– 5 Ramsar sites: Danube Delta (1991), Small Wetland of Brăila (2001), The Mureş Meadow (2006), Dumbrăvița Fishery Complex (2006), Techirghiol Lake (2006);

– a World Heritage Site: Danube Delta.

NATURA 2000

Natura 2000 is an ecological network of protected areas in the European Union that aims to maintain a favorable conservation status a selection of the most important habitat types and species in Europe.

It is the main instrument of European Union for nature conservation in the Member States. Natura 2000 network consists of: *Special Areas of Conservation*, established under the Habitats Directive (Directive 92/43 of 1992 on the conservation of Natural Habitats and of Wild Fauna and Flora) and *Special Protection Areas* – established under the Birds Directive (Directive 79/409 of 1979 on the Conservation of Wild Birds).

In the Romanian legislation the two Directives have been transposed by Law no. 462/2001 (approving the Government Emergency Ordinance no. 236/2000 on the regime of protected natural habitats, wild flora and fauna). Through its high biodiversity value, Romania brings a significant contribution to the European Ecological Network. The declaration and recognition of European Natura 2000 areas in Romania is still an ongoing process having its deadline in 2016.

The establishment of Natura 2000 network in Romania underwent two stages, so far. In the first stage 273 Sites of Community Importance (by Order of Ministry no. 1964/2007) and 108 Special Protection Areas (by Government no. 1284/2007) were declared. In 2011 the network was extended to 408 SCI (39,952 km^2) (Fig. 4) and 148 SPAs (35,542 km^2) (Fig. 5) through the Order of Ministry Environment and Forests no. 2.387/2011 and the Government Decision no. 971/2011, respectively.

Through these regulations the total area of Natura 2000 areas in Romania reached the 54,067 km^2, which represents 22.68% of the national territory.

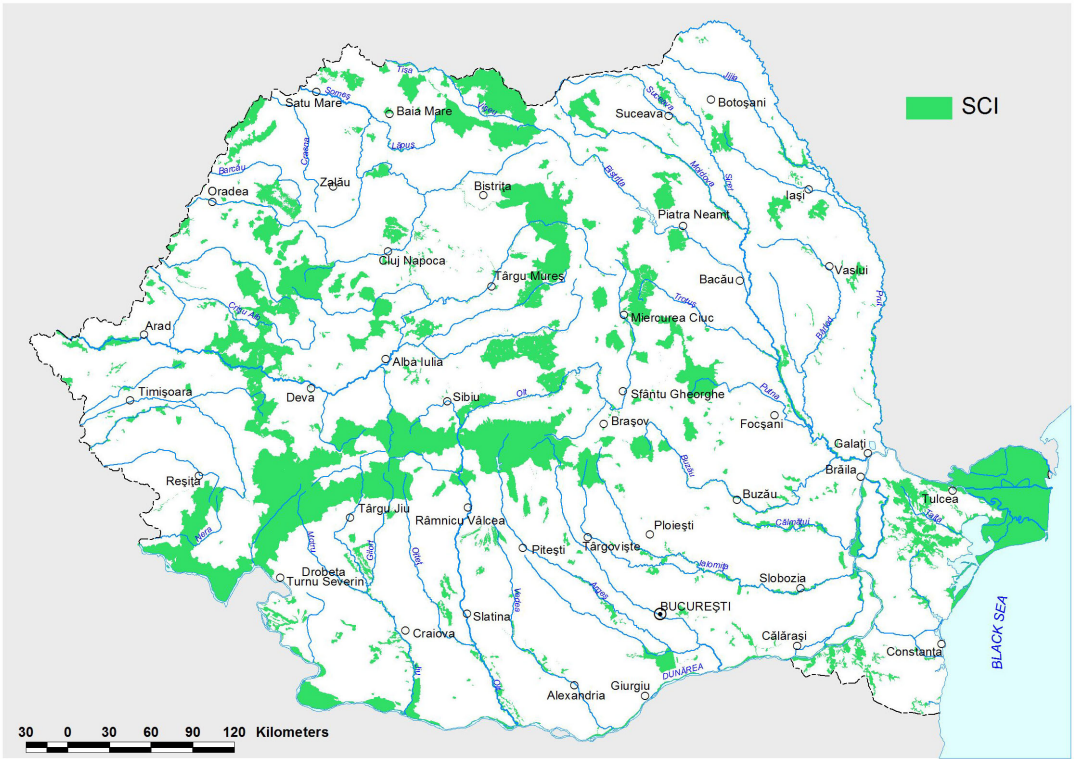

Fig. 4 – Sites of Community Importance.

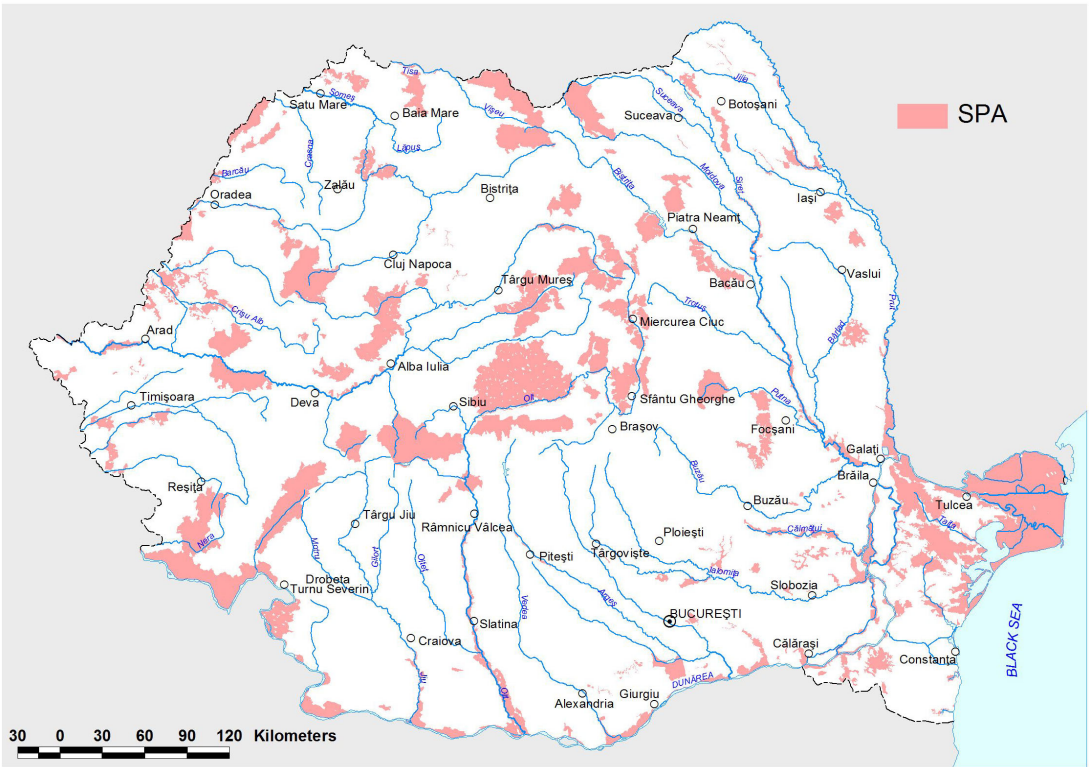

Fig. 5 – Special Protection Areas.

CONCLUSIONS

Under the global environmental changes and climate change, the role of protected areas in conserving biodiversity and landscape becomes increasingly important. Under the given circumstances, the growing surface of protected areas, creating corridors link between them and reducing human impact are just some of the needs for ensuring an adequate management.

Therefore, the environmental policies must be made in connection with the agricultural, energy, transport policies having as starting point the principles of sustainability restated by the Rio +20 Summit. In addition to the involvement in the decision-making process by creating an adequate legal protection of biodiversity can not be achieved without the support of the private sector and local communities.

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URBAN SPRAWL AND RESIDENTIAL DEVELOPMENT IN THE ROMANIAN METROPOLITAN AREAS

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Key-words: suburbanization, residential patterns, urban sprawl, metropolitan areas, Romania.

In Romania nearly 7,500,000 (34%) inhabitants are living in metropolitan areas. The socio-economic and political changes brought about by the post-communist period have reshaped the metropolitan landscape together with its functional and socio-spatial pattern triggering a wide range of transformations mainly related to urban sprawl process (suburbanization). As one of its major consequences, residential development had caused the deconcentration and the spatial redistribution of the population within metropolitan areas. The paper attempts to analyse the main suburbanization-related residential patterns in connection with their key driving forces (socio-political, demographic, economic, housing) and the associated environmental consequences in the Romanian metropolitan areas in terms of: urban (residential) sprawl, real-estate market dynamics, changes in spatial pattern of population, living floor dynamics, etc., with a special focus on the most significant metropolitan systems: Bucharest, Oradea, Iaşi and Constanța. The present study will combine GIS computer mapping techniques with housing and demographic data and field surveys to identify the main urban-sprawl-related current residential patterns in the Romanian metropolitan areas and understand causes of change in order to predict how alternative policies will influence future spatial development.

INTRODUCTION

Over the past years most of European countries have faced the growing challenges of transformations in urban form and development patterns (Patacchini *et al.* 2009) through suburbanisation and densification processes (ESPON FOCI 2010). The conversion of agricultural and natural ecosystems as well as urban land-use changes have grown to be critical components of global change (Pouyt *et al.* 2007) providing a dispersed urban growth (urban sprawl) pattern especially in the major cities' outskirts. Urban sprawl can be referred to as land-use change and conversion of natural or semi-natural surfaces into urban uses with a high share of artificial surfaces, usually affecting the core areas of metropolitan regions and their surroundings (spatial dimension), thus ultimately, leading to a change of land-use patterns (pattern dimension) (Fina and Siedentop 2008). As a result, urban sprawl is usually defined as the spreading of a city and its suburbs over rural land (agricultural and forested) at the fringe of an urban area (Pouyt *et al.* 2007; Patacchini *et al.* 2009).

When discussing urban sprawl, at the metropolitan level several phases of evolution have been identified (van den Berg *et al.* 1982; Petsimeris 2003; Antrop 2004 etc.): urbanization, suburbanization, deurbanization (counterurbanisation), and reurbanization, defined as the relationship between growth and decline of the urban center and the urban fringe. The suburbanization phase is characterized by a strong process of deconcentration of both population and economic activities from the core areas towards the periphery. This phase sometimes turns into counterurbanization, a process mainly observed in the most urbanized and dense parts of Europe based on population shifts from the urban periphery towards the small and medium-sized towns of less urbanized metropolitan surroundings, while the core areas loose more people and jobs than the suburbs gain. The reurbanisation is driven by

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the revitalisation of inner cities, mainly specific to western European urban areas. During the current period, suburbanisation processes are leading trends in southern and Eastern Europe (ESPON FOCI 2010). This process characterised the territorial expansion of towns in several Southern European (Petsimeris 2003) or former communist countries (Turnok 1998; Soós and Ignits 2003; Degorska 2004; Ourednicek 2007; Sykora and Ourednicek 2007; Hirt 2008; Leetmaa 2008, Tammaru *et al.* 2009; etc.) describing a general model of development by linear tendencies of urban development along the main transportation axes as well as the appearance of residential areas outside the towns.

In many of the post-communist metropolitan areas from Central and Eastern Europe urban sprawl has been perceived as a dominant process of urban development causing population deconcentration and changing the spatial organisation in terms of restructuring physical morphology, functional land-use patterns and socio-spatial structure (Sykora and Ourednicek 2007; Leetmaa 2008). Moreover, urban sprawl, especially suburbanization become a major issue due to rapid changes related to unregulated commercial and residential sprawl experienced by the former compact socialist city. Therefore, non-contiguous, leap-frog suburban sprawl has more negative economic, social and environmental consequences than more concentrated forms of suburbanization (Sykora and Ourednicek 2007). Generally speaking, some scientists from western and post-communist countries stress out that largest number of researchers dealing with suburbanisation and suburbanisation-related (environmental) issues consider this process as having a negative impact on urban systems (Ourednicek 2007).

Urban sprawl, mainly through the suburbanisation process, has become present in the Romanian towns over the past twenty years. Consequently, the spatial pattern of their metropolitan areas has been increasingly changing like in most of post-communist societies. Therefore, when discussing suburbanization-related residential patterns in the Romanian metropolitan areas, linking them to the environmental, socio-economic and political triggering factors is required. The investigations carried out so far in Romania at national, regional and local level pointed to a strong connection between these key drivers of change and their environmental consequences (Nicolae 2002; Bălteanu and Grigorescu 2006; Grigorescu 2008; Ianoş *et al.* 2010; Grigorescu and Dumitrescu 2010 etc.). Additionally, complex studies on urban sprawl-related issues were undertaken, mainly dealing with its main characteristics and typologies (Suditu *et al.* 2010), legal tools and territorial planning (Suditu 2012) residential development and real-estate market dynamics (Conway *et al.* 1995; Niculită *et al.* 2011; Zilişteanu 2011), land cover/land use changes and related environmental impacts (Pătroescu *et al.* 2011; Grigorescu *et al.* 2012; Iojă *et al.* 2011), urban regeneration (Mocanu *et al.* 2004; Luca 2009) etc., mainly referring to the Bucharest Metropolitan Area or to other Romanian metropolitan systems.

Although, the projected aging and decline of population coupled with the impact of the economic crisis might affect urban sprawl-related processes in Central and Eastern Europe states due to their attempt to catch up with the other European states in terms of de-urbanisation and suburbanisation (ESPON FOCI 2010), changing residential patterns remains a cross-cutting issue.

METHODS AND DATA

The present research is dealing with the specific patterns of residential sprawl (mainly suburbanization) over the last twenty years (post-communist period) which has determined radical changes, especially at the urban-rural interface. The paper is trying to relate physical and socio-economical patterns of suburbanization-related changes in the Romanian metropolitan areas in order to identify the main key drivers of change and stress their environmental consequences.

The authors used different spatial and statistical data, essential in assessing the suburbanization patterns experienced by the Romanian metropolitan areas in general and by some selected relevant case-studies in particular (Bucharest, Oradea, Iaşi and Constanţa), Therefore, spatial data (GIS processing and investigating cartographical documents at various spatial and temporal scales especially after the fall of the communist regime when the suburbanisation process come into force), statistical data

(supplied by the National Institute of Statistics and Romanian Statistics Yearbooks) and field surveys were undertaken. The processed spatial data (topographic maps, 1990; EEA Corine Land Cover, 1990, 2000 and 2006 and orthophotoplans) helped us understand and visualise the territorial dynamics of suburbanisation as well as the linkages between the natural drivers and the main patterns of change. Additionally, a wide range of statistical data were processed (population density, population growth, employment, migration, construction certificates etc.) in order to improve our understanding with respect to the dynamics of residential sprawl in the Romanian Metropolitan Areas with a special focus on the selected case-studies.

This complex approach combined and integrated both quantitative (GIS processing of various cartographic elements and statistical data) with qualitative analysis based on field surveys and interviews. This subjective approach allowed us to identify the patterns of residential sprawl in terms of spatial distribution, structure, functionality, local knowledge, people's perception etc. with a special focus on housing-related issues.

URBAN SPRAWL AND METROPOLITAN DEVELOPMENT IN ROMANIA

In 2011, in Romania 11,778,195 inhabitants are living in urban areas (55.0% of total population), out of which 7,500,000 (34%) in metropolitan structures. Urban population dynamics had marked, together with the political context of the post-communist period, the emergence of the urban sprawl phenomenon in Romania.

According to the Romanian geographical literature which defines metropolitan areas as "spaces under the influence of urban centres that have macro-regional functions and whose population exceeds 1 million people" (Erdeli *et al.* 1999), only one metropolitan area (Bucharest) falls into this category. The other Romanian towns reach less than 400,000 inhabitants each and polarise spaces that have fewer than 1 million inhabitants. Therefore, the metropolitan development in Romanian was encouraged by some provisions introduced in the legislation, according to which a metropolitan area could be established based on the joint character of administrative-territorial structures *through association, by voluntary partnership between the main urban centres (the capital city of Romania and the first-rank municipalities) and adjoining the urban and rural settlements situated at distances up to 30 km, that established cooperation relations at different levels* (Law no. 351/ 2001, National Territory Management Plan, Section IV – Settlements*)*. Additionally, these provisions were completed by other papers able to grant metropolitan organization and management with new privileges (Law no. 350/2001, Ordinance no. 53/2002 and Law no. 286/2006*)*.

Among the 21 towns which have intended to develop metropolitan areas in Romania only one – Bucharest – (*very large city*, according to the classification of towns in Romania) meets the requirements of both international and Romanian legislation in this respect. The other 20 towns have developed such urban systems based on the legislative context which supports metropolitan development rather by the joint character of the administrative units under the influence of a city than on the size of the polarization city: *17 large cities* (Iaşi, Constanţa, Cluj-Napoca, Timişoara, Braşov, Craiova, Sibiu, Galaţi, Brăila, Baia Mare, Suceava, Târgu Mureş, Arad, Bacău, Piteşti, Ploieşti and Oradea) and *3 medium-sized towns* (Simeria, Hunedoara, Deva) (Fig. 1). The *small towns*, even though they cover the largest part of the urban network, couldn't develop metropolitan areas (Grigorescu and Dumitrescu 2010).

Although Bucharest is the only town which meets the requirements of developing metropolitan area, it does not function as independent metropolitan administrative unit as well as Oradea, Iaşi and Constanţa. It exists as an urban structure made up of a core city and a quite large number of administrative units ranging from villages, communes to small towns. Since the post-communist urban restructuring has been more dynamic in the capital-city and the three functional metropolitan areas (Oradea, Iaşi and Constanţa) the present study will focus more on their particular features in terms of suburbanization-related issues.

Over the last years, the Romanian towns have registered significant dynamics, facing a built-up area expansion of up to 200% (e.g. Arad 60%, Iaşi 73,7%, Suceava 76%, Mihaileşti 106,3%, Bragadiru 114,6%, Buftea 106% etc.) or even more (e.g. Măgurele 872,4% in the Bucharest Metropolitan Area) due to their position in the proximity of important urban centers (Suditu *et al.* 2010). Under the new socio-demographic conditions, the need to find new housing and services alternatives inside and even outside the urban area had led to the emergence of new motilities.

Urban residential sprawl has always been related to the natural factors in terms of favourable or unfavourable drivers. When discussing Romanian metropolitan areas, their position mostly in plain and low hills/plateaus relief units had an important role in the emergence and development of the residential sprawl, especially in some of the most urbanized metropolitan systems: Bucharest, Oradea, Iaşi and Constanța.

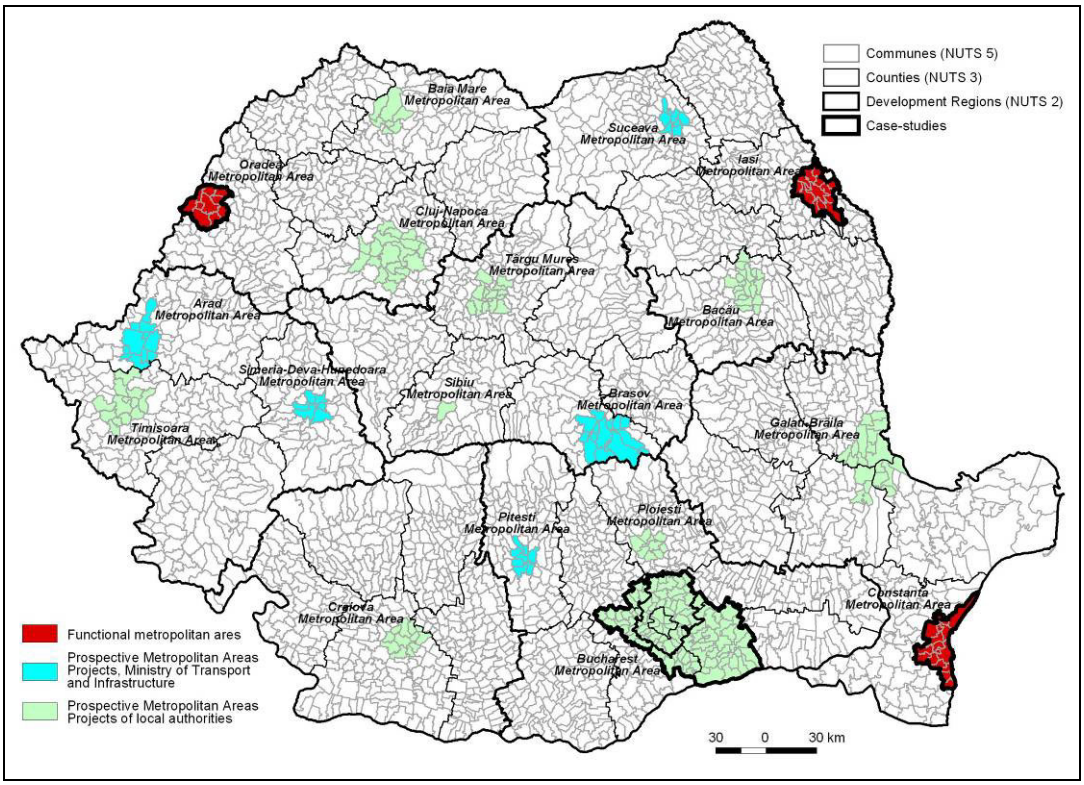


Fig. 1 – Metropolitan development in Romania.

By its position in the south-eastern part of the Romanian Plain also called Lower Danube Plain (Bălteanu *et al.* 2006), ***Bucharest Metropolitan Area*** has always been an agricultural rural space (mainly arable with over 70%) as a consequence of its favourable geographic, social and historic conditions attributed to the space situated between the Carpathian Mountains and the Danube River (Geografia României, vol. V, 2005). These particular features coupled with other political and socio-economic drivers had favoured the smooth conversion from arable to residential land use categories. Additionally, other physical peculiarities such as water bodies (lakes, rivers), vegetation covered areas (forests patches, parks and gardens) had led to an increased development of residential areas.

The development of ***Oradea Metropolitan Area*** at the border between the Crişana Hills and Crişana Plain had let to certain disparities with respect to residential development, namely the plain landscape from the western half together with the lakes, rivers (Crişul Repede, Peţea) being much more preferred than the hilly relief from the eastern part in spite of its vegetation coverage.

In the north-eastern part of the territory, ***Iaşi Metropolitan Area*** is developed in a hill-like unit having a lower elevation in the north – Jijia-Bahlui Plain (100–150 m altitude) and rising up to 300-350 m altitude in the Central Moldavian Plateau separated by a monocline structure characterized by cuesta alignments (Coasta Iaşiului with nearly 100 km long) (Bălteanu *et al.* 2006). Therefore, the reduced altitudes, the high density of rivers and lakes (Bahlui, Nicolina Rivers; Veneția, Rediu Lakes etc.) as well as a large spread of vegetation covered areas had favored residential development mainly in the northern and north-eastern parts.

The most important urban system in the Romanian Black Sea area, ***Constanța Metropolitan Area,*** is overlapping the eastern part of the South-Dobrogea Plateau (150–200 m altitude) corresponding to flat plateau-like interfluves and the Romanian Black Sea Coast, with cliffs elevated at some 10–35 m dominating the strips of beach, sometimes fragmented into narrow valleys with fluvial limans at their mouths (Bălteanu *et al.* 2006). Once more, the predominant agricultural land use of this metropolitan area territory together with the tourist development on the sea shore had lead to residential development related to the bare agricultural land's conversion on one hand and the proximity of Black Sea or Siutghiol Lake on the other.

KEY DRIVING FORCES OF URBAN RESIDENTIAL SPRAWL

When analysing suburbanisation-related residential sprawl in the Romanian Metropolitan Areas, putting them in relation with their governing factors, is a fundamental action. Therefore, suburbanization can be connected to a great number of driving forces, among which the most important are political, demographic, economic, housing and social.

Political. When analysing the suburbanisation process in the Romanian metropolitan areas one must consider as main drivers the political factors that were subsequent to the communist era. During the *communist period* the forced industrialization, which ultimately lead to an increased urbanisation, had brought about the development of large residential areas (between 1950 and 1989) inside the city limits and in the suburbs closely related to the industrial areas.

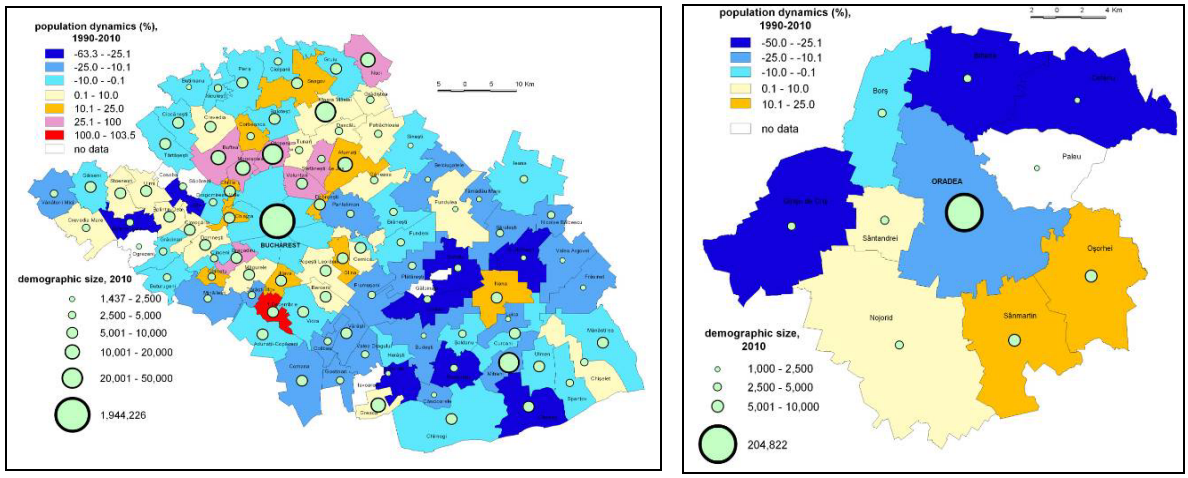
After the fall of the communist regime, the Romanian territory has been strongly affected by a wide range of political transformations which were mainly experienced at social and economic level in terms of the transition from a centralised economic system to the market economy. These changes had triggered restructuring processes in all fields of activity leading to new characteristics and dimensions to the urban phenomenon (Bălteanu *et al.* 2004; Bălteanu *et al.* 2005; Bălteanu and Popovici 2010). On its first interval, the so-called *transition period* (1990–2003) the leading process was the transition from state and collective property to private ownership through the decollectivisation and privatisation of agriculture by means of "land lows". This complex process brought about a wide range of structural relocations of the different land use categories (especially from arable to residential or commercial) which lead to land abandonment and subsequently to property speculations in terms of land acquisition at lower prices by investors in order to convert them into real-estates and trade them at higher prices.

Regarding the transitions and post-transition periods, the European economic literature is very rich in approaches in terms of definition, durations and main features. In Romania, the beginning of the post-transition period is underlined by the prevalence of private ownership, descentralization of the business management and the reinforcement of the free-market economy system (Scarlat 1999; Scarlat, Scarlat 2007). At the end of 2003, the European Commission stated that ″Romania can be considered as a functional market economy once the good progress made has continued decisively″ (CCE 2004).

The second stage – the so-called *post-transition period* (2003–2010) – deepens the territorial changes and transformations of the former period. During this time span, the integration into the European Union structures couplet with the economic boom experienced by the largest part of the Romanian towns had led to significant spatial dynamics with respect to residential suburbanisation in almost all the metropolitan territories.

Demographic. Over the 20th century the population growth process in Romania had reached discontinued variations, while the most important towns and their surrounding territories had faced a quite rapid and constant increase trend which reflected the economic, political and social conditions characteristic of each stage. Therefore, Romania's economic and social development recorded significant changes associated with two major periods (1950–1960/1962 and 1989). The first marked the transition from the capitalist economy to the centralised-based socialist system, and the second from the socialist economy to the market system. Similar to other former socialist countries between 1950 and 1989, Romania underwent extensive industrialisation associated with explosive urbanisation aimed at reinforcing the national urban system (Urucu *et al.* 2006).

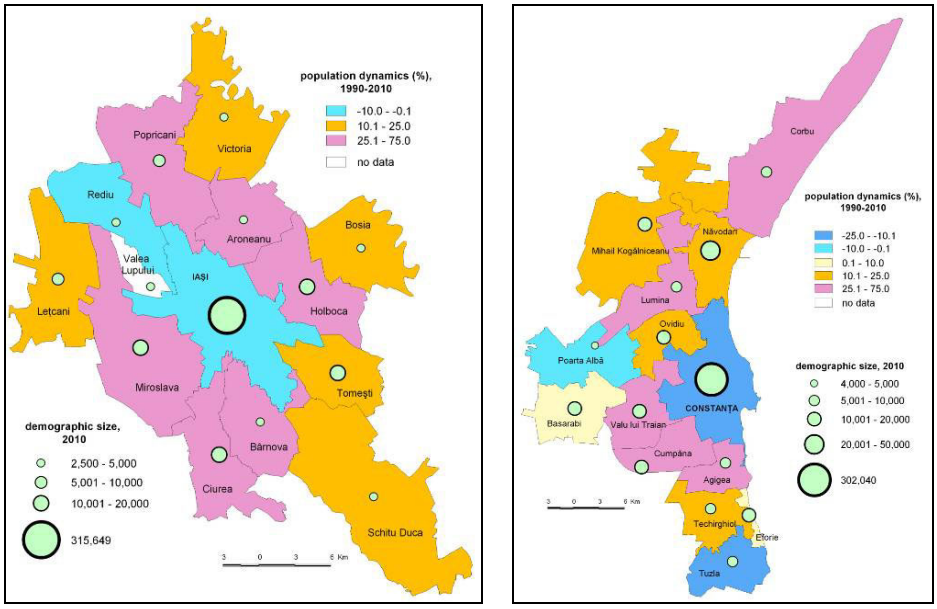
After the fall of the communist regime, the Romanian urban system underwent a restructuring process imprinting new features and dimensions to the urban phenomenon. Under the new socio-political context, the suburbanization process emerged, thus being characterized by a strong of deconcentration of both population and economic activities from the centre towards the hinterland triggering the so-called urban diffusion (Grigorescu 2008). Therefore, the population growth which unfolded during the communist period registered important variations after 1990. This process had evolved concurrently with the urbanisation and suburbanization processes. This dynamics was mainly related to the huge disparity in size and potential between the core cities of the analysed metropolitan areas and the other components of the metropolitan system (Figs. 2 a, b and 3 a, b).



a **b**

Fig. 2 – Population growth and demographic size of settlements in the Bucharest Metropolitan Area (a) and Oradea Metropolitan Area (b).

In the Romanian Metropolitan Areas, a higher population dynamics is registered in surrounding area of the capital-city determined by the preference of people for the suburbs, seen as the most desired residential areas (Buftea, Mogoşoaia, Corbeanca, Voluntari, Bragadiru etc. for the Bucharest Metropolitan Area; Sânmartin, Osorhei for Oradea Metropolitan Area; the north-eastern and north-western localities for Iaşi Metropolitan Area; northern and southern areas for Constanța Metropolitan Area etc.).



a **b**

Fig. 3 – Population growth and demographic size of settlements in the Iaşi Metropolitan Area (a) and Constanța Metropolitan Area (b).

This process also stimulated the conversion of some rural settlements from their metropolitan area into urban settlements in order to attenuate the hypertrophic tendency of some of the towns. Out of all the Romanian metropolitan areas, the case of Bucharest is by far the most noteworthy. Over the last twenty years, out of the total of 14 towns, more than half were declared urban (4 in 1989 and 6 in and 2005). A quite comparable development was registered by other metropolitan areas but not as dynamic (Braşov, Baia Mare etc.).

Economic. The new socio-political conditions of the post-communist period entailed deep-going restructuring processes which ultimately lead to suburbanization. The new stage of transition from industrial-to-services towns was line with the general economic and socio-political transition experienced by the whole country. Industrial functions retained their importance (becoming even more important than in the developed economies of Western Europe), modern industry and technology being called to facilitate the future development of the system in accordance with European urban exigencies.

The impact of economic restructuring in Romania was more or less felt by all the branches and sub-branches of the national economy, whether located in town or in the countryside. The geographical areas afferent to them registered negative socio-economic phenomena, such as poverty, unemployment, etc.

The post-1990 economic evolution was marked by industrial restructuring and privatisation within a new legislative context. The processing industry would decline, a new competitional framework was created, internal demand dropped, the COMECON market was dismantled, and financial deadlock set in (Dumitrescu 2008).

Housing preferences and development. Over the last period, demographic factors (mainly population growth) are no longer the most significant drivers triggering urban sprawl; cultural and housing preferences coupled with several economic factors (real estate market, transport costs etc.) becoming essential in urban development (Christiansen and Loftsgarden 2011).

The foremost development structures in the post-communist metropolitan areas are concentrated in the suburban area, primarily by relocating households from the central city to its scenic outskirts (Hirt 2008). On the other hand, while offering private benefits to new suburbanites, some environmental

consequences and landscape degradation in terms of social costs such as lowering local quality of life (Kahn 2000; Degorska 2004), a higher impact on local natural assets etc. can turn up.

After 1990 Romania's housing sector has undergone a dramatic transformation marked by rapid privatization and a reduced government role in the production and allocation of housing (Conway *et al.* 1995). As a result, the transition from state and collective property to private ownership had lead to a high fragmentation and abandonment of property. Subsequently, developers carried out a "strategy" able to turn these abandoned land into residential or other uses, so they purchased large surfaces of land, assembled it and built infrastructure in order to develop new residential projects. Ultimately these projects were sold creating new residential areas for wealthy population.

During the 1990s the development of residential areas has been very slow being limited by a lower population income able to purchasing land or other residential outcomes. However, beginning with the 2000s, the increasing wealth especially of Bucharest, Oradea, Iaşi and Constanţa metropolitan areas population had lead to a more dynamic development of suburban housing.

After the fall of the communist regime, governments have set free access to public houses and subsequently encouraged the construction of new buildings developed by private entities. In some European post-communist countries (Czech Republic, Poland etc.), various incentives have been applied, including subsidies and preferential tax treatments. In Romania the first measure was to sale the houses to their occupants for a low price mainly to ease the state and local budgets with the burden of maintenance, especially in the case of apartment blocks. However, under a less coherent system of housing, some efforts to build a market-oriented system of housing finance through the purchase of houses through market transactions were accomplished (Zilişteanu 2011). Therefore, providing free trading of properties coupled with an increased financial crediting provided by banks had encouraged the real-estate booming in terms of transactions and prices until 2008, when the financial crises stroked.

Under the given circumstances, if before 1990 most of the recent developed residential areas had a dominant agricultural use, after this year the prices grow from few eurocents/sq.m to more then 100 euros/sqm on an average. The highest dynamics was registered in the Bucharest Metropolitan Area, where, in the Pipera-Tunari area, for instance, the most expensive land could reach in 2008 up to 1,100 euros/sq.m., followed by the town of Otopeni where, near the airport and the Bucharest-Ploieşti Highway could value even 600–800 euros/sq.m etc. After the economic crisis the real-estate market collapsed, in most of the cases the price dropped at more than half of its previous value (Fig. 4). This phenomenon is outlined by the increased number of construction certificates which, particularly in the case of Bucharest, Constanţa, Iaşi and Oradea Metropolitan Areas, registered significant increases, especially in the 2004–2008 time span related to and improvement of living standards.

Out of the analysed data, among all the construction functions, the certificates granted for residential individual buildings range first reaching significant high values (up to more than 9,000 in the Bucharest Metropolitan Area in 2008). After the economic crisis (2008), the available data point to dramatic shrink which went hand in hand with the fall of the real-estate market (Fig. 5).

Generally speaking, residential suburbanisation is changing spatial distribution of population according to its socio-economic status, thus inducing a reversal of the traditional socio-spatial pattern of the socialist city, characterised by the socio-economic status of population declining with distance from the centre (Sykora and Ourednicek 2007).

Consequently, the suburban zones are attaining a better-educated population with high incomes (Ouředníček 2003 quoted by Sykora and Ourednicek 2007) and on the other, social tensions, residential segregation and exclusion are encouraged (Soós and Ignits 2003). The suburban residential areas lead to the incursion of rich newcomers into the sometimes lower income, less educated indigenous inhabitants of the former rural settlements.

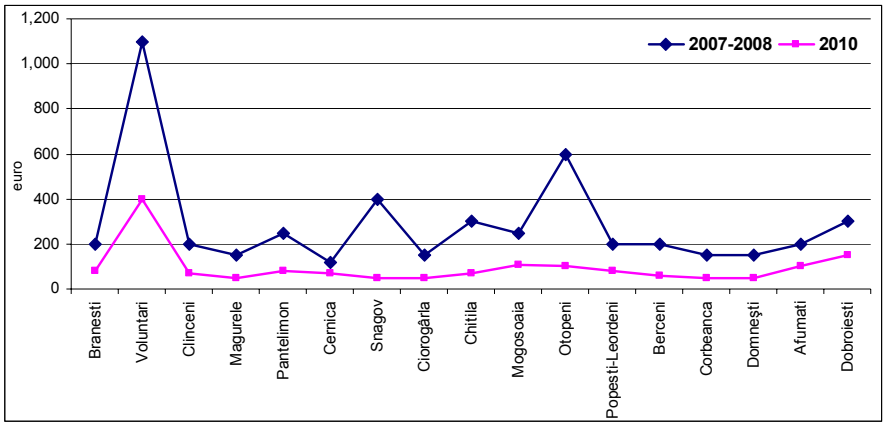


Fig. 4 – Land prices dynamics in the Bucharest Metropolitan Area.
Source: Real-estate agencies and field surveys.

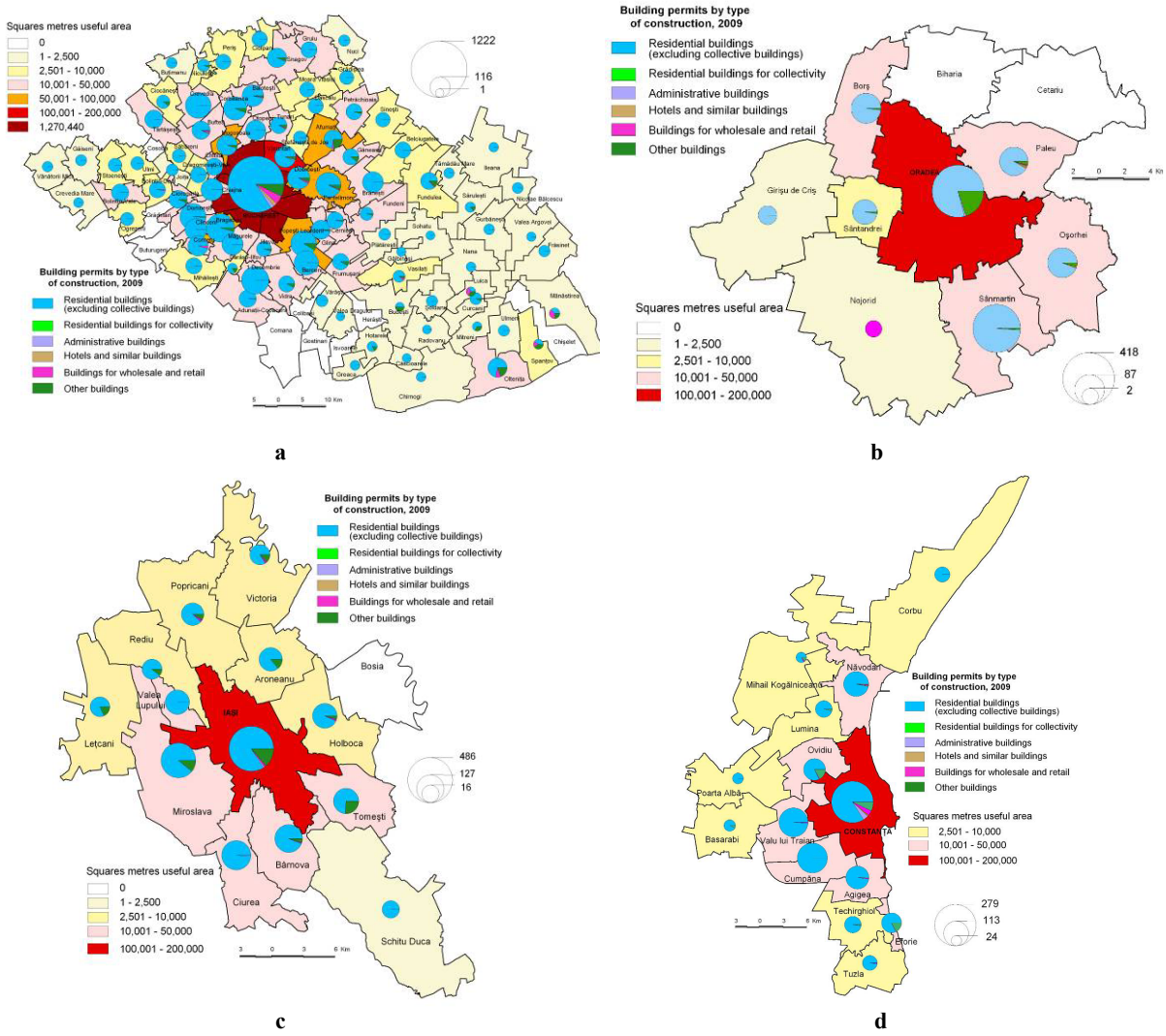


Fig. 5 – The dynamics of building certificates in Bucharest (a), Oradea (b), Iaşi (c) and Constanța (d) Metropolitan Areas.

Social. In Romania, unequal incomes and low public commitment following the communist era have widened the residential gaps in the metropolitan areas, and hence the uneven spatial distribution of social groups in terms of poor urban areas with almost rural type houses, old central zones, low-comfort blocks-of-flats, etc. on one hand and luxury house, gated communities etc. on the other. Therefore, in some once-modest city environs better-off groups were in a position to have residential preferences while the poorer ones, subject to income constraints, could not choose their residential neighbourhood. Some areas now exhibit a peculiar mixture of two distinct social strata in terms of wealthy affluent newcomers and poor long-time residents (Hirt 2008).

An obvious phenomenon of the Romanian large cities is the migration from the centre to the outskirts and from blocks-of-flats to one-family dwellings, or the new residential districts (Stănculescu and Berevoiescu 2004). Thus, the many cases, urban environment in Romania is subject to poverty and social residential exclusions in terms of: higher utilities costs leading to disconnections from the heating network; degraded blocks-of-flats, green areas and access streets; eviction of poor families who, unable to pay their debts, lose their properties; overcrowded dwellings with several generations living together, because young people are unable to buy or rent a house; housing crisis (diminishing public funding for building new residences and the absence of social dwellings (Vîrdol 2008).

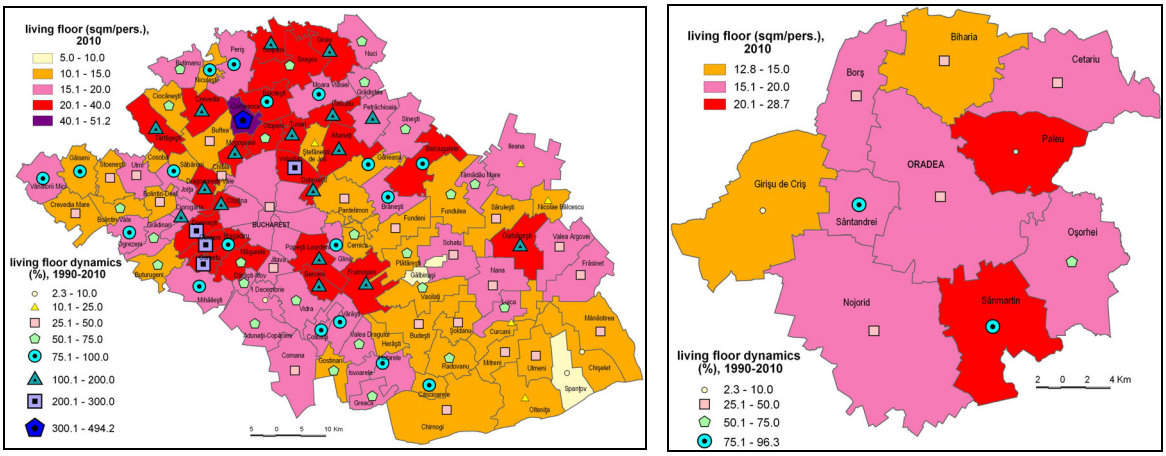
SUBURBANIZATION-RELATED RESIDENTIAL PATTERNS IN THE ROMANIAN METROPOLITAN AREAS

Just like other Central and Eastern European countries (e.g. Hungary, Poland, the Czech Republic etc.), economic and residential suburbanization experienced after 1990 occurred concurrently. This was supported by a broad spectrum of processes related to mass privatizations of apartment buildings, the emergence of an affluent entrepreneurial class, the boom of real estate market and the availability of cheaper properties in the suburbs accompanied by huge shopping centres, hypermarkets, warehouses and industrial properties (logistic parks) (Sykora 1999; Soós and Ignits 2003; Sykora and Ourednicek 2007; Sykora 2006; Hirt 2008).

The housing sector has witnessed increasing affordability problems, a marginalisation of communal housing stock, an increase of segregation and a decrease in the old housing stock. The growth experienced in some parts of the metropolitan areas had led to the decline in other parts; therefore, booming suburbanization contributes to the decline in inner city (Sykora 1999).

Bucharest Metropolitan Area. Usually, the new districts of suburban housing emerge in areas with good physical environment and transport connection to city centres (Sykora and Ourednicek 2007). Other aspects are related to their attractiveness is the quality of the residential project (uniqueness, design) and the access to different services (guarding facilities, parking places, swimming pools, green areas, super-markets, kindergartens, medical centres, leisure places), thus turning these residential projects into real luxury neighbourhoods. These new residential investments made the transition from the individual resident houses (secondary, for the week-end or holyday), some with no proper environmental facilities, to compact residential areas such as "gated communities" with all the necessary environmental facilities (Grigorescu 2008). The prices of these residential areas are mainly influenced by their geographical location (near green areas or waters) and by the proximity of main transport network with direct and rapid access to the core cities.

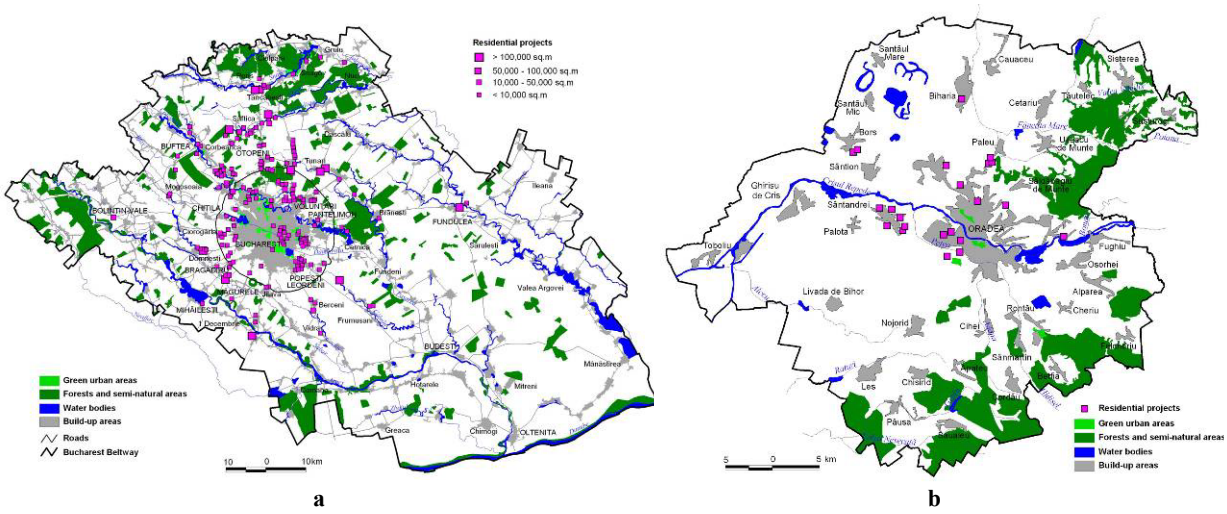
In 2010, the interior living space per capita in the Bucharest Metropolitan Area varied between 8.8 sqm in Gălbinaşi Commune (Călăraşi County) and 51.2 sqm in Corbeanca Commune (Ilfov County). Bucharest City values were of 16.1 sqm, basically a 26.1% growth rate versus 1990 the average value through the Metropolitan area was of 16.8 sqm. Over the 1990–2010 period the most dynamic settlements at thus indicator were Corbeanca (494.2%), Clinceni, Domneşti, Voluntari, Cornetu, Tunari, Dascălu, Mogoşoaia, Berceni (150–300%) (Fig. 6 a).



a b

Fig. 6 – Living floor in Bucharest Metropolitan Area (a) and Oradea Metropolitan Area (b), 1990-2010.

Under the given circumstance, in the Bucharest Metropolitan Area 6 compact residential areas (*Pipera-Tunari, Ştefăneşti, Mogoşoaia-Chitila, Corbenca-Otopeni-Baloteşti, Snagov-Periş, Pantelimon-Cernica-Brăneşti*) and 6 residential nuclei (*Dascălu, Buftea-Crevedia*, *Tărtăşeşti*, *Domneşti, Berceni, Comana*) were developed (Figs. 7 and 8).



a b

Fig. 7 – Residential projects in the Bucharest Metropolitan Area (a) and Oradea Metropolitan Area (b).

The last category aimed at relocating the spreading out of the suburbanization front from the traditional residential areas (north and north-west) to new developed residential areas (south and north-west) based on low land prices, attractive environmental features and good transport infrastructure (Grigorescu 2008).

Oradea Metropolitan Area. As in all major cities of Romania, there are large numbers of apartment buildings which were developed during the communist period by the state, especially during the 70s and 80s. After 1990, the rapid privatization of public housing in Oradea has been accompanied by a significant increase in the number of residential property transactions.

In the Oradea Metropolitan Area the living floor variations were of 12.8 sqm in Girişu de Criş Commune and 28.7 sqm in Paleu Commune; Oradea City values averaged 15.9 sqm, and 16.2 sqm its

metropolitan area, pointing to an increased tendency of suburbanization. The smallest interior living space was registered in the communes of Sântandrei (96.3%), Sânmartin (80.0%) and Oşorhei (64.7%) (Fig. 6 b).

Fig. 8 – Residential development in the Bucharest Metropolitan Area (A – gated community in Corbeanca; B and C – residential projects in Voluntari).

As compared to Bucharest, Constanța or Iaşi, residential projects in the Oradea Metropolitan Area are quite scattered, however one being able to identify some clusters in areas which can be perceived as development nuclei. One of the areas is located in the south-western part of the city where some of the main residential projects can be found (Europa, Luceafărul, Henry Ibsen, Ioşia etc.). Other hosing projects are located in the metropolitan localities Sântion (Royal and Astra), Paleu (Golden Residence, Tineret and Orizont Paleu) or in Sântandrei where several other real-estate projects are to be completed.

Constanța Metropolitan Area. Some 15–20% of the housing stocks existing in the rural area and in the centre of Constanța City are more than 50 years old. A special problem poses the blocks-of-flats, the majority were built between the late 1960s and the 1980s. In the rural areas and in the small towns (Techirghiol, Ovidiu, etc), the housing stock is very heterogeneous, e.g. individual dwellings, basically small subsistence households rather than modern residential habitats, sometimes without basic utilities (water supply, sewerage system, gas network, and even electricity) (Constanța Metropolitan Zone, 2010).

Over the last years the extension of individual dwellings to the periphery of the core city and in the neighbouring localities (Lazu – Agigea, Cumpăna, Poiana – Ovidiu, Valu lui Traian and Sat Mamaia – Năvodari) was noticed as it is a expected development triggered by the tendency to concentrate residential quarters at the periphery or in the adjoining country-side (Fig. 9).

When discussing the living floor in Constanța Metropolitan Area one may notice variations between 12.1 sqm at Poarta Albă and 23.1 sqm in Eforie town. In 2010, the metropolitan area averaged 15.4 sqm; Constanța City 15.2 sqm, that is a 41.0% growth rate compared to 1990, with major growth rates in the communes adjoining Constanța City Valul lui Traian (168.5%) and Agigea (128.8%) and the towns of Eforie, Techirghiol and Ovidiu (Fig. 10 a).

Therefore, the metropolitan area of Constanța stands under the pressure of the expanding city aiming to meet the requirements of the polarizing town in terms of developing new residential districts, commercial, services units etc. At first glance, this development brought about progress to the country-side and its population. However new problems emerged because the legal framework was much too permissive with respect to land use conversion and relocation, and coupled with high land prices (especially before 2008) lead to the marginalization of the rural population.

Iaşi Metropolitan Area. Just like in the rest of the Romanian Metropolitan Areas, the housing stock in the town of Iaşi and three surrounding communes (Ciurea, Holboca, Tomeşti) is more than 30–40 years old. Over the last decade, significant investments in infrastructure and real-estate projects had determined the growing of housing stock, thus leading to the development of large residential areas (individual dwellings or housing projects) in the core-city and in the surrounding communes (e.g. Bârnova, Holboca, Miroslava, Ciurea, Valea Lupului, Tomeşti etc.) (Figs. 11 and 12).

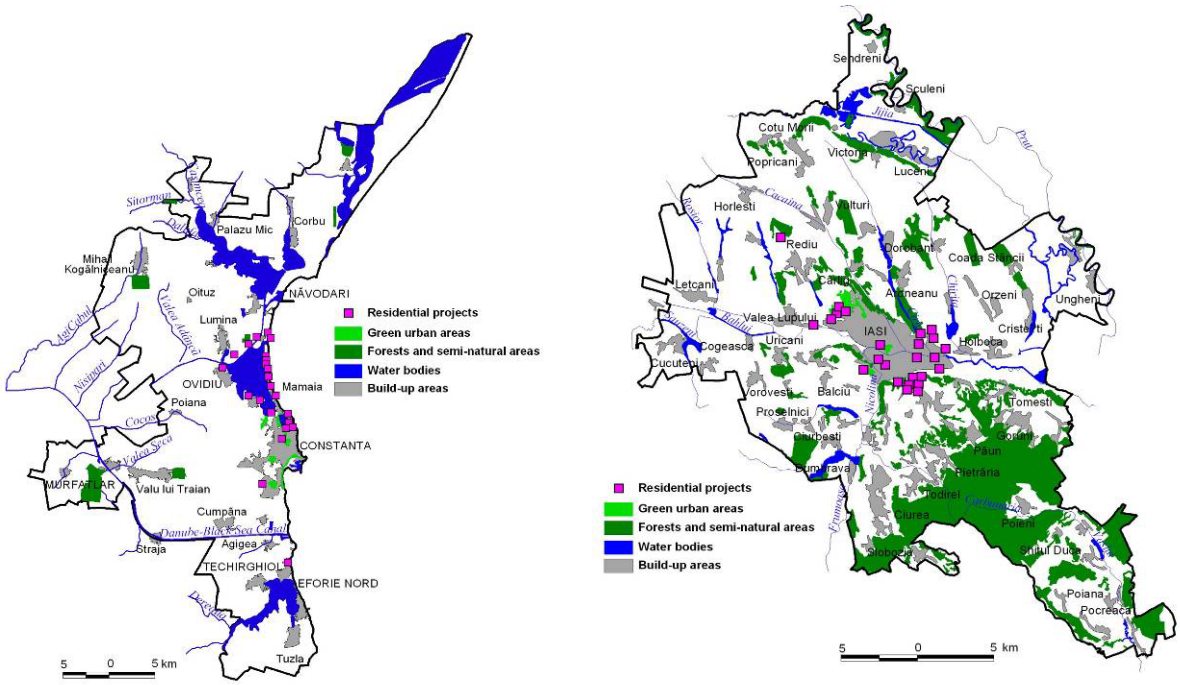


Fig. 9 – Residential projects in the Constanța Metropolitan Area (a) and Iaşi Metropolitan Area (b).

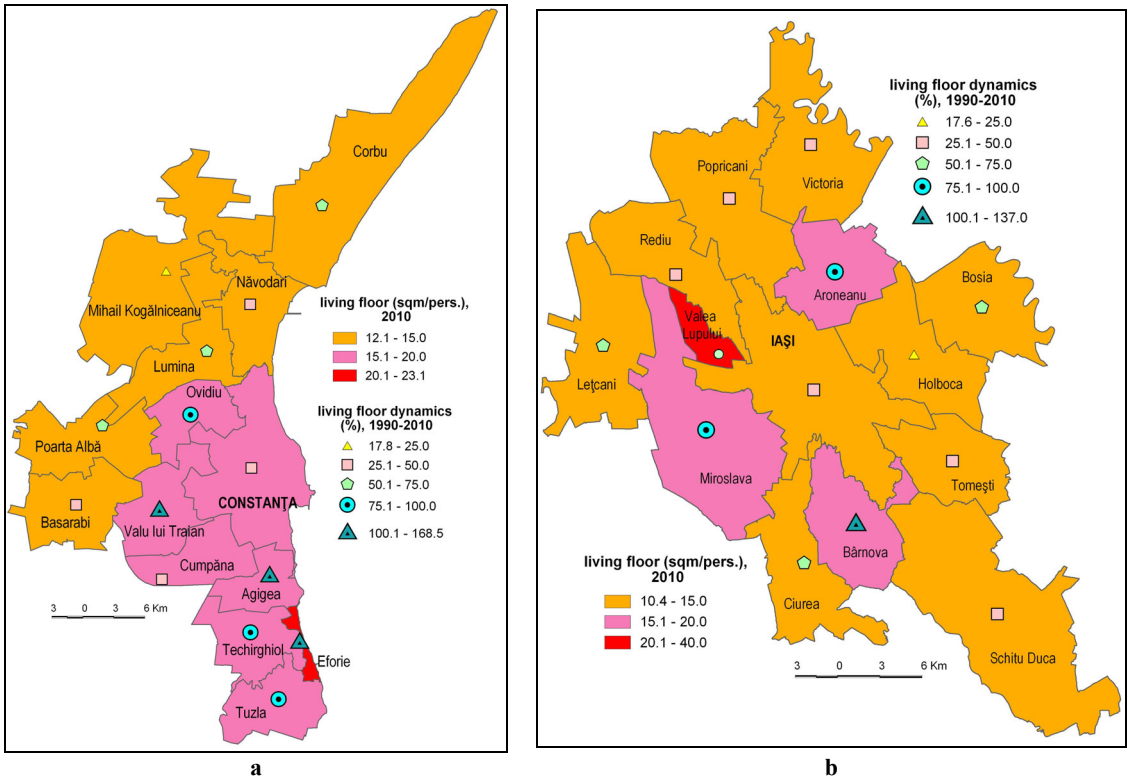


Fig. 10 – Living floor in the Constanța Metropolitan Area (a) and Iaşi Metropolitan Area (b), 1990–2010.

The situation of Iaşi Metropolitan Area looks as follows: 10.9 sqm in Victoria Commune and 13.5 sqm in the City of Iaşi, the metropolitan area having 13.5 sqm on average. Values over the 1990–2010 period used to increase in Bârnova (137.0%), Miroslava (96.0%), Aroneanu (95.7%) communes.

Figs. 11 and 12 – Dancu (Holboca Commune). Building with possible retail and office functions (150 m^2, built in 2008), located near the blocks-of-flats, and new villa (137 m^2, built in 2009) (Source: http://www.immo-land.ro).

The need to develop new districts (e.g. Apărătorii Patriei) which had lead to the construction of large commercial centres, and reconstruct/construct new residential quarters called for a unitary, integrated approach capable to provide accessibility and mobility in the city and in its surrounding territory. Simultaneously, creating a sustainable public transport system and taking reliable traffic management measures is compulsory (Iaşi Metropolitan Zone, 2009).

When considering the housing projects, at least two residential-prone areas can be distinguished in the Iaşi Metropolitan Area: *Bucium* located in the southern part of Iaşi town, lying on a hilly-like relief form which grants it with a beautiful view, thus leading to the development of several residential projects such as Collina Bucium, La Pini-Crisco, Panoramic Village, Decorama etc. and *Copou* situated in the north-western part of the core-city, near the Botanical Garden and Sorogari Forest, favouring the development of Copou Bellevue, Reveria, Royal Tower etc. housing estates (Fig. 12). The prices of these residential projects vary between 70,000 and 150,000 euros per estate dependent on the surface, location, utilities etc.

The relationship between population's socio-economic power and the environmental features of a city hinterland has shaped residential preferences for most of the metropolitan areas' citizens. According to the particularities of these relationships, several suburbanisation-related residential patterns in terms of both individual and planned residential spread have been developed. The new residential patterns embody the most visible spatial changes of suburbanisation in the Romanian Metropolitan Areas, among which the most significant are the following:

Irregular residential development often located in the cities outskirts and characterized by individual houses which vary in size and architecture according to plot's availability and affordability. They take place on abandoned agricultural land or on existing villages either by constructing new houses on the bare plots or instead of demolished old buildings. In most of the situations they have negative impact on the environment in terms of lack/insufficient environmental facilities (sewage system, water supply, roads, waste collecting etc.) (Fig. 13).

Small-size residential projects. Usually developed within the city limits but also in their surrounding areas, these new residential areas are made up of high buildings or villas sometimes providing luxury apartments (e.g. Agora 1 in Iaşi Metropolitan Area; Solaris Tower in Constanţa Metropolitan Area; Planorama, West Park, Topaz etc. in Bucharest Metropolitan Area etc.).

Fig. 13. Irregular residential development in the Bucharest Metropolitan Area
(A – Măgurele, along the ring of Bucharest; B and C - Pantelimon).

Residential complexes/projects characterised by a booming development, especially between 2000 and 2008, was mainly encouraged by cheaper land, especially to higher distances to the core city or on agricultural land which was subsequently turned into build-up. This practice enabled the developers to buy huge surfaces of land at lower prices. According to their affordability and accessibility these residential projects could be divided into: ***open residential projects*** – residential areas with access to all the necessary environmental facilities and other services (security, parking, green areas, commercial areas, kindergartens, medical centres, leisure etc.). Even though, as compared to the gated communities, the public access is permitted they are affordable only for high income groups; and ***gated residential projects (gated communities)*** – walled or fenced housing development to which public access is restricted and enclosed by physical protective elements (Blakely and Snyder 1997; Blandy 2006) providing increased security. Some of the first such residential areas built in Romania after 1990 were the so-called "French Village", "Green Pardise" etc. This type of residential area is extremely expensive in Bucharest and in his proximity. Only the middle upper class and upper class can afford it, thus being one of the main causes of both social and residential isolation which ultimately lead to voluntary segregation (Raposo 2006).

The high land price in some residential-prone areas or in already build residential projects makes single family housing a presence only in the small residential areas located at the city peripheries in the so-called "irregular residential development" pattern. The other two residential patterns are bestowed to medium-high or high income groups.

DISCUSSIONS AND CONCLUSIONS

The current suburbanization-related residential development in the Romanian Metropolitan Areas stands for a new approach in understanding the relationships between urban sprawl and its driving forces (political, demographic, housing and social) in a context of global environmental change.

Under the current socio-economic conditions and the changing demands of society the identified suburbanization-related residential patterns are favoured by the large population migration to metropolitan areas and fast expansion of homes to cities hinterland, thus evolving from subsistence to recreation and aesthetics-related patterns.

The raised land prices and the inadequate housing programs have made many people move out to cheaper areas where there are no urban planning systems. This uncontrolled development has been followed by severe abuse and land speculation, sometimes accompanied by inadequate land use. These practices have been widely facilitated by laws that allowed land fragmentation into small plots without any previous zoning of the territory or control of the architecture of the new buildings. As a consequence, the suburbanisation phenomenon has not been always associated with a set of coherent urban development policies to attenuate possible negative impacts on cities' surrounding territories. Therefore, a coherent territorial planning scheme should have in view the optimisation of spatial development in order to prevent the uncontrolled expansion of settlements.

The variety build-up structures (transport systems, buildings, etc.) triggered by the urban sprawl phenomenon and the related residential development had led to new urban patterns which have affected metropolitan areas' landscape. Under the given circumstances, territorial governance's involvement in the local policy to control urban sprawl is becoming of increasingly important.

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FOREIGN DIRECT INVESTMENTS AND REGIONAL DEVELOPMENT IN ROMANIA

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Key-words: FDI, manufacturing, regional development, Romania.

After the year 2000, as business was improving and the flat tax was introduced, the positive perception of Romania by partners has attracted major capital flows in the national economy. Although industry is unanimously considered to be a major source of economic and social imbalance, yet in time it has proved to be by far more attractive to foreign investors than agriculture and tourism, which have a remarkable potential in this country. Major foreign investments are located in the main urban centres, because they are more easily accessible and more open to establishing relations and have a more dynamic economic milieu. Bucharest continues to hold a dominant position, either by hosting foreign companies, or simply their headquarters. Next come the regional capitals, basically cities with more than 300,000 inhabitants, with a large sphere of influence and capacity of coordinating the regional economic space. Moreover, present evolutions have shown that Romania is likely to loose its cheap labour advantage, a situation that makes its further attractiveness for international investment flows really questionable.

MACRO-ECONOMIC BACKGROUND

Like many East European countries, formerly in the Soviet sphere of influence, Romania has been striving to change the command economy for the market system. Successive governments found it difficult to transform the economy because of a shortage of hard currency and failure to ensure foreign funding given the significant budget deficits generated largely by money-losing state industries. The old economic and financial structures, just as the bureaucratic culture inherited by many institutions were slow in changing. It is only within recent years that the general business climate has been improving and economic indicators look better.

In the 1990s, classifications of the hierarchy of former socialist countries in terms of foreign direct investments, placed Romania close to the bottom of the table. The national strategy of short-term economic development published in 2000, estimated (p. 42) that "the volume of foreign investment flows is rather limited", "Romania being one of the states in transition with the poorest performances" in this domain (calculated per capita, the bulk of foreign direct investment at the end of 1999 was about 240 Euros versus 1,900 in Hungary and 1,500 in the Czech Republic). In the beginning, this foreign investment was an issue as sensitive as privatization, having in view legislative instability, a very developed bureaucratic system, a less attractive business milieu, and fewer facilities offered to investors than in other Central and East-European countries. Privatisation of large-scale industry led as a rule to the reduction in the number of jobs and increase of unemployment, while the new sector of SMEs generated the majority of the new jobs (Isaic-Maniu, 2008). Fuelled by large privatisation programmes, foreign investors were attracted by Romania's relatively low unit labour cost, proximity to the euro area, sound macroeconomic fundamentals and its already increasing domestic market potential (Pauwels and Ioniță, 2008). However, the boom of privatisation-led FDI, which represented about half of the FDI inflows in the 1990s, is now largely over.

From the early 2000 onward, Romania relaxed its FDI policies by treating equally domestic and foreign firms in respect to free the transfer of income abroad. Consequently, the past few years

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witnessed an improvement of the business climate, as beneficial effects of the flat tax and of a positive attitude of foreign investors towards Romania have drawn major capital flows in the economy. The investors' perception has also changed as the US State Department assigned Romania the market economy status in 2003, and Fitch Agency upgraded its rating to "investment grade"; similarly, Standard and Poor's and Moody's scores were improved. Therefore, FDI flows have increased, placing Romania on the second place in 2006 between the countries of Central and Eastern Europe. This catching-up process accelerated from 2004 with net inward FDI flows as a share of GDP exceeding the inflows recorded in both the eight Central and Eastern European countries which joined the EU in 2004 and the EU-15 (Pauwels and Ioniță 2008). The largest single beneficiary in terms of FDI stocks remains the manufacturing sector, which held more than 1/3 of the inward investments in 2006. While FDI stocks in this sector, as a share of GDP, increased overall between 2003 and 2006, they have also undergone major reallocations within the sector (Pauwels and Ioniță 2008). FDI has decreased in the lower-end of the value chain (textiles and leather), while it has increased in higher value-added sectors (transport equipment – motor vehicles and shipping). Obviously, there is a positive correlation between FDI and economic growth, in general (Pauna and Dumitrescu 2005; Pelinescu and Rădulescu 2009) and manufacturing increase, in particular. Besides many TNCs location, the country has witnessed lately a high birth rate of domestic manufacturing firms which, together with the relatively stable employment and increasing shares at total exports, shows significant gains of productivity and competitiveness. Industrial production growth rate has recorded positive values all along the 2000s, culminating with a two-digit figure in 2008 (10.6%) (CIA World Factbook).

FDI IN THE ROMANIAN ECONOMY. EVOLUTIONS

The year 2006 represented an absolute record for foreign direct investment (9.1 billion Euros) in this country, the FDI volume increasing by 75% compared to 2005. A recent study made by Ernst and Young Consultancy Company listed Romania as the most attractive investment destination in South-Eastern Europe. And indeed, that same year (2006) Romania ranked second in Central and Eastern Europe, after Poland, but by far before Hungary, the Czech Republic, Bulgaria, Slovakia and Slovenia. This upsurge reflects in the significant numerical growth of joint ventures (nearly 10% in 2006 versus 2005) and moreover in the 165% growth rate of social capital subscribed in 2006 compared with the preceding year. A favourable and stable macro-economic context and attractive business milieu account for the accelerated FDI growth rate of 35% in the first semester of 2008 as against the same period in 2005. The volume of vested capital over January-June 2008 was by 4.75 billion Euros bigger than the 3.5 billion Euros placed in the first semester of 2007. Referring to the 1.2 billion invested in the first six months of 2004, 2008 figures are four-times higher. In view of it, Romania's position of leader in attracting FDI in South-Eastern Europe is being maintained and strengthened, since investment flows forecast for this region exceed 8 billion Euros. In the first semester of 2008, Romania succeeded in attracting two-thirds of the annual regional estimates.

The difference between the numerical growth of companies and the capital they possessed suggests the areas that benefitted from major investments. Thus, in the 1990s, foreign direct investments promoted a prudent policy, therefore trading companies became a preferential option, because they required little capital and developed activities which secured fast recovery rates of vested capital. Thus, in the structure of foreign investment, commercial activity proved more attractive and less risky. The investments made over the past few years had a major impact on the economy, given the comparative advantages offered by the financial banking and industrial sectors. Industry was indeed a choice sector for foreign investors, Romania having important energy resources and good agricultural lands. But for all their development potential they are still little exploited, for example agriculture and tourism. The technological sector has a well-trained, relatively cheap labour force which makes it economically attractive. Good opportunities for progress had also the housing sector. Foreign investors showed an

overriding interest in oil, natural gas, the car industry, iron and steel industry, banks and financial sector, food industry, telecommunications, constructions and consumer goods. In 2007, interests focused on car-making, electronics, electrotechnics, constructions, farm products and bio-diesel production. It should be remembered that Romania has an old car-making tradition and electronics and electrotechnics have a skilled available labour force. Constructions profited from the housing market boom, while bio-diesel crops are grown on large areas. A qualified workforce in information technology and communication was an important asset for directing big investment fluxes to these sectors. Speaking of spatial FDI locations the option is for large cities boasting economic diversity, easy access, potentially developing relations and an attractive and dynamic economic milieu. No wonder that Bucharest holds two thirds of the total vested capital and one third of greenfield investments. Next to Bucharest stand other three counties: Timiş – SolPlus from Japan plastics; Umeltechnic from Austria building materials; and Willy Kreutz from Germany electronic parts. Argeş and Galaţi have each a major investment in industry: Renault Group Dacia (car-making) and ArcelorMittal (metallurgy), respectively. Foreign Direct Investment follows the south-east north-west axis of leading industrialized counties, running from Prahova and Braşov to Mureş, Cluj and Bihor and further to Bacău, the outstanding industrial county in Moldova and Constanţa, easily accessible to maritime transport.

FOREIGN DIRECT INVESTMENT IN INDUSTRY

Investment fluxes in the Romanian industry followed the same pattern, from hesitant to consolidated. Although unanimously perceived as a major source of economic and social imbalance, industry has long proved to be more attractive to foreign investors than agriculture and tourism which have a remarkable development potential in Romania. The process of deindustrialization is visible in the 24.6% of the overall population employed in this sector and 24.2% contribution to GDP. In the early 1990s, Romania held position 20 worldwide in respect to industrial added value according to UNIDO (United Nations Industrial Development Organisation). In mid-1990s industry still employed one third of the labour force and generated 40% of GDP. And, yet, in 1996, only 0.5% of all joint ventures are active in this sector and with modest capital amounts too, mainly in electronics and electrotechnics, chemical products, machine-building, food industry and wood processing, while textiles and ready-mades had hardly any interest to foreign investors (Fig. 1a, 1b).

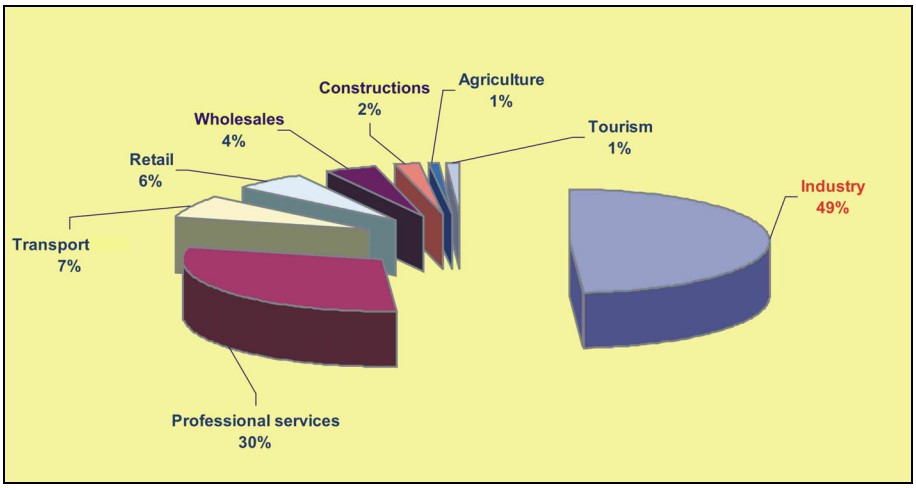

Fig. 1a – FDI by number of companies and economic sectors, 1991–2007.

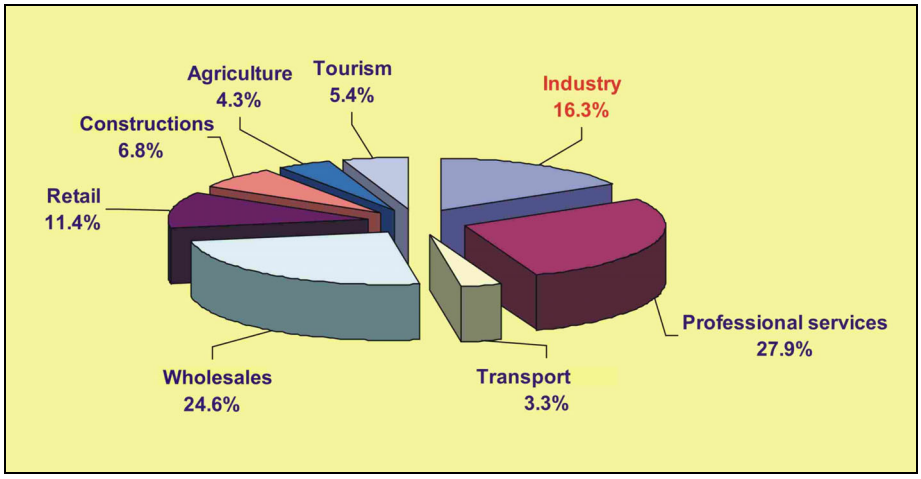

Fig. 1b – FDI by the amount of subscribed capital an economic sectors, 1991–2007.

Structural difficulties, outdated production infrastructure, loss of the traditional COMECOM market, low productivity, high raw material and energy consumption were drawbacks that made foreign investors cautious. Most industrial investments were brownfields which, according to the National Bank of Romania, represent money invested in enterprises taken over fully or partly by investors, over 50% of corporative and non-corporative assets occurring after the take over. Two characteristics can be distinguished. In the first place, excepting Bucharest, no important investments in the industry of other large cities were made despite their having a complex and diversified economy. The main reason for investing being the industrial specialization level, it was small and middle towns that were the beneficiaries, e.g. Salonta and Hațeg (food industry), Vaşcău and Măcin (building materials), Oneşti and Mărăşeşti (chemical industry), Oțelu Rosu (metallurgy), Orăştie and Negreşti Oaş (ready-mades), Găeşti and Fieni (electrotechnics), Beiuş and Comăneşti (wood processing). A second characteristic besides spatial location was the impact of joint ventures on the functionality of and potential effects for the other components of the industrial system. As a matter of fact, few of the new ventures had a significant impact on the organization, functionality and performance of Romanian partners because of limited cooperation relations and little vertical integration into the industrial production system and, besides, more often than not, these companies employed a cheap labour force and used mainly the existing facilities. However, over the past few years, it appears that industry has become more investment-attractive, representing around 50% in all, the evolution of foreign direct participation acquiring new characteristics versus the 1990s.

Firstly, a change in the sectoral structure of these investments in that two of the branches, metallurgy and chemical products, considered totally unattractive in previous years, proved to be most profitable for investors. Another eligible investment was the food industry, rich in resources and with a large consumption market. Other two sectors, transport means and building materials, outran the former promising textiles and ready-mades industries, and even wood-processing.

Secondly, a new location pattern emerged, namely the large urban centres which offered better access, relations and a more dynamic economic milieu. Bucharest continued to be a dominant investment location, hosting either foreign companies or their headquarters. Next in line came the regional capitals with over 300,000 inhabitants, spheres of influence and capacity to co-ordinate the regional economic space.

Thirdly, greenfield investments were ever more numerous, that is investments in enterprises set up and developed by foreign investors or jointly with Romanian partners starting from nought. This investment type represents some 15% of total, brownfield ones and take over being still the dominant

type. Major greenfield investments went to the food industry, textiles and garments, transport means, crude oil and wood processing.

LOCATION FACTORS OF INDUSTRIAL FOREIGN INVESTMENTS

Location factors proved relatively constant in time. For example, the labour force laid off from the state sector is cheaper than in the investor's country of origin, but skilled and moreover not so much syndicalised as in other parts of the world. Cheap labour has initially been a determinant factor for localizing and directing capital flows. Illustrative in this respect is the ready-mades industry, investments made in the early 1990s promoting the lohn system. Perceived as short-term development opportunity, the lohn system was later criticized for using exclusively cheap labour and failing to have positive effects on the economic growth. Currently, although lohn production companies are still important, supplying 24% of exported items, their contribution to depleting open account deficit tends to decrease. This is explainable by the negative export dynamics of these companies over the past years (by 23.1% in 2005 and 9.6% in the first half of 2006, versus increases in the economy, generally. Cheap labour is still a basic factor for multi-national companies to invest, however, qualification and specialization are becoming ever more important. EMEA Microsoft set up in Bucharest an administrative centre for technical support which provides 750 new jobs for specialists in engineering, electronics, computer science, physics, management and fluent knowledge of English, French and German. The Centre is destined to serve corporative clients from Germany, France and Great Britain. General Electric has opened up a centre of technological solutions and business services for companies in banking-financing-accountancy, IT management, insurance, logistics and engineering. Hewlett-Packard's centre addresses the businesses of partners from Europe, Middle East and Africa.

Another attractive investment location factor is a more permissive industrial and environmental policy, because legal regulations which are indeed in line with EU provisions, are more loosely applied. An example would be the building materials industry in which three firms have monopolized the cement market. In 2005, the Agency for Consummers' Protection accused them of overlooking free competition by agreeing jointly to set selling prices. Lafarge Group (French capital), bought the cement factories at Medgidia, Hoghiz and Târgu Jiu; CarpatCement Holding (Dutch capital) those at Fieni, Bicaz and Deva (Chiscadaga); and Holcim (Swiss capital) bought cement factories in Aleşd, Turda and Câmpulung. Another example is the tobacco industry which has an important market, yet setting regulations in conformity with EU standards is still being postponed. The main foreign investor, Galaxy Tobacco, (Italian capital) holds the majority of factories in Arad, Râmnicu Sarat, Sfântu Gheorghe, Craiova, Târgu Jiu, Timişoara and Bârlad. There are three more multinational companies in this branch: Philip Morris, British-American Tobacco and JT Romania. The same lack of regulations explains the attractiveness of FDI for iron and steel and aluminum industries, ArcelorMittal Steel Galaţi and Alro Slatina which have become the biggest steel and aluminum producers in Central and Eastern Europe.

Also an interesting location factor over the past few years have been the industrial parks which have succeeded in drawing investment fluxes. The industrial park concept was legally defined by regulations issued between 2001–2003, stipulating fiscal facilities to support the revitalization of abandoned or underused brownfield industrial spaces in partly or fully developed urban areas. In 2000, the Ministry of Environment reported 900 thousand hectares classified as brownfields, yet without any detail on the number or geographical location of those areas. An empiric approach suggests that most brownfield sites exist in several of Romania's industrial towns, irrespective of their demographic size or present functionality. So far now, Ploieşti Industrial Park has proved attractive to Japanese company Yazaki (electric wiring for vehicles) and Kansei (air-conditioned units and cooling systems), as well as the American firm Johnson Central (car interiors). Sibiu Industrial Park benefits at least from three major investments: the Austrian Wienerberger tile producer, the Spanish Caucho Metal Productos (antivibration parts for the car industry) and the German firm Marquardt Schaltsysteme (electronic parts for vehicles).

Many foreign investments are located in urban agglomerations that influence inter-company relations and transaction costs offering interdependence advantages, such as flexibility, minimization of risk and specialization. Unless geographical proximity exists, advantages would be nill, because of higher costs and transactioning difficulties. The advantages of agglomerations materialize in external savings since flexibility depletes input costs and increases output ones, so that the more numerous input-output connections, the greater the probability for successful sales. Once established, agglomerations constitute industrial communities producing endogenous dynamics for know-how and technology to develop. That explains why investments are concentrated in certain places, many of them in industrial parks or in the proximity of major investors. Another factor worth considering by FDI spatial strategy is the business milieu, represented by a system of regional institutions, rules and practices conducive to innovations. The input-output network is rooted in a setting supplying network members with everything necessary for successful coordination, adaptation or innovation. The setting emerges as a socio-economic creation that generates economic growth, it is the framework that pushes dynamics into motion. The local setting appears to be the determinant element in the companies' choice of large towns, or of Bucharest capital-city.

There are numerous examples of the multi-nationals' stagewise spatial strategy in Romania. The complex organizational structures peculiar to these companies are beginning to take shape, some companies having concluded licencing agreements with a local firm to have access to the local market, others opening up commercial representation addressed to foreign markets. Other multi-national firms are in a more advanced stage, acquiring a native firm that has a privileged position in the domestic market or is engaged in important export activities. Some others strengthen internationalized production by setting up fresh production units in new sites, or by taking control of the firm with which they had had initially signed a licencing agreement. And last, but not least, there are multi-nationals in the final stage, that of reorganization or rationalization of the production network. Rationalisation means closing down some production units, dislodgings and relocations, eventually pooling some production facilities to supply domestic or international markets. The result of reorganizing the production system is enhanced by vertical integration by specializing production units from various countries in terms of specific stages of the manufacturing process and shifting assembling operations only to one of these countries. There are multinationals that promote a strategy of spatial functional disassociation separating coordination and control in the headquarters, situated in or close to a major urban centre, assigning distribution, retail and marketing to easily accessible regional poles that have a positive influence on regional markets placing production activities in the proximity of resources and labour. It is the case of multinationals with social offices in Bucharest and manufacturing networks in small and middle towns. Two types of industrialization are being promoted by the foreign companies: diffuse industrialization, including activities in which labour costs hold an important share in total production costs. Reducing labour costs by technological change is not a priority. This type of industrialization targets the countryside which is an attractive setting of cheaper workforce, local resources, lower planting costs and taxes, less syndicalism and good access: wood processing at Buchin, machine building at Cristian and Brăneşti, and building materials at Gura Ocniței. Subsidiary-based industrialization requires significant inputs of technology, skilled labour force and centrality to procure and distribute raw materials and assemble finished products. This is the preferred form of industry located in towns of various demographic size and development potential.

The Romanian Agency for Foreign Investment (ARIS) classified foreign investments in terms of the social capital subscribed in 2006 (data supplied by the National Office of Trade Register). Out of the 100 firms, 55 operate in the industrial sector. Between 2004 and 2006, ARIS monitored 62 investment projects totaling 2.9 billion Euro, scheduled to create 33,105 jobs by the end of that year, 46 of them in industry. Foreign investments in the car industry are of consequence both by the number and volume of vested capital and by their impact on regional manufacturing systems. Japanese and American firms located in the above mentioned industrial parks, together with an Italian investor in Turda, a German one in Satu Mare, or the car envelop producers Michelin in Zalău and Pirelli in

Slatina. A more recent investment from the Spanish group Bamesa and the multinational Arcelor has materialized in a services centre for car steel items opened at Topoloveni in the proximity of Renault, the main car producer in this country.

FOREIGN DIRECT INVESTMENTS AND REGIONAL DEVELOPMENT

The FDI location patterns contributes to a new geography of the Romanian industry, also developing various methods of industrialization, engendering sectors and locations along diverging growth trajectories, changing all established contexts. Concentrated in certain places, FDI resorts to various modalities for the development of industry which, spatially speaking, are connected to the regions' industrial history, the present being but a reflection of the past. Therefore, past choices, technologies visible in production infrastructure and product design, the companies' capital basically licences and specific competences, or training-related labour specialization do influence further selection of methods, products and practices. This type of evolution is by no means a rigid one relying simply on technology and past developments but rather a road map depicting the agreed direction capable to lead onto the right way at a faster pace where radical changes are difficult to make. This rationale works also in the case of industrial location and FDI geographical strategy makes no exception either, which explains why better industrialized regions are the chosen ones. Foreign companies are beginning to be increasingly closer to the local and regional economies, developing relations with competitors, customers, suppliers, regional business organizations and public forums. It is essential for these companies to have interests and goals in common with other industrial or regional actors, such as trade unions, suppliers of business services, commercial associations and officials in regional development problems. The companies' geographical strategies have been assessed empirically in order to outline the character and strength of the regional economies hosting them. A good example in this respect is the vertical integration of the car industry. Renault Dacia, the main car producer in Romania, went beyond developing up and downstream production relations and forming some manufacturing networks for car parts, components and equipments. The location of the firm induced also companies from Germany, US, Japan, Spain and Italy to invest in urban centres like Ploieşti, Sibiu, Turda, Satu Mare, Zalău, Slatina and Topoloveni. Besides, Renault Dacia Group opened a technological centre at Titu for testing vehicles and mechanical parts designed in the Groups' offices. The project, estimated at 450 million Euro, will employ over 3,000 engineers to develop new products. In Bucharest, the company set up Renault Design Central Europe, the first car design centre in this country conceived to have a say in car-making projects from beginning to end; the aim is to integrate Romania in every phase, from design and conception to engineering and manufacturing a vehicle. Regional performance often depends on the behavior and the dynamics of firms and of key industries; regional dynamics is tributary to the export-oriented companies. One of the factors which make regional development a success is the deep-going implication of the multinational firm in the respective regions. Many companies are certainly attracted by regions that have specialized and renowned industries and products. No wonder therefore that major investments are missing from the north-east and south regions classified among the poorest in Romania (Fig. 2).

THE ECONOMIC CRISIS AND FOREIGN DIRECT INVESTMENT

In periods of economic growth, the positive impact of foreign companies is obvious, but the economic crisis that set by the end of 2008 had a negative effect on these companies. People use to talk already about the difficulties facing the banking sector in Romania, or the foreign firms engaged in industrial activities. Even Renault Dacia, the national producer, closed down some production sectors during the late 2008 and 2010. As a matter of fact, forecasts for 2010 drew an alarm bell, warning

that around 100,000 people would lose their jobs, one fifth of them working with major companies which until the end of 2010 were to lay off some 7% of their employees. According to estimates the first 20 private companies have been most severely hit. The majority of employees (3,000) were made redundant by Petrom Company, thus raising the number of lay-offs after privatization to 10,370 out of the 13,700 working on the iron and steel platform after 2008. The German group Draxlmaier, the main employer in the local car industry, dismissed 800 people from three of its factories, that is less than 5%of all its employees. Other big companies that have announced personnel cuts are Kraft Foods, Alro Slatina, Otelinox Târgovişte, and Oltchim Râmnicu Vâlcea. A similar situation has been facing the large state companies, where almost 2,500 employees are to be made redundant, many from Electrica, supplier and distributor of state-owned electric power. The wave of redundancies affected primarily the counties of Cluj, Braşov, Galaţi, and Prahova, which are some of the most industrialized counties. Moreover, Nokia Company located in Cluj County, decided to close down and leave so that about 2,000 people remained jobless. This decision suggests that Romania is expected to lose its comparative advantage of cheap labour, a reality that questions further attractiveness of the Romanian economy for foreign investments.

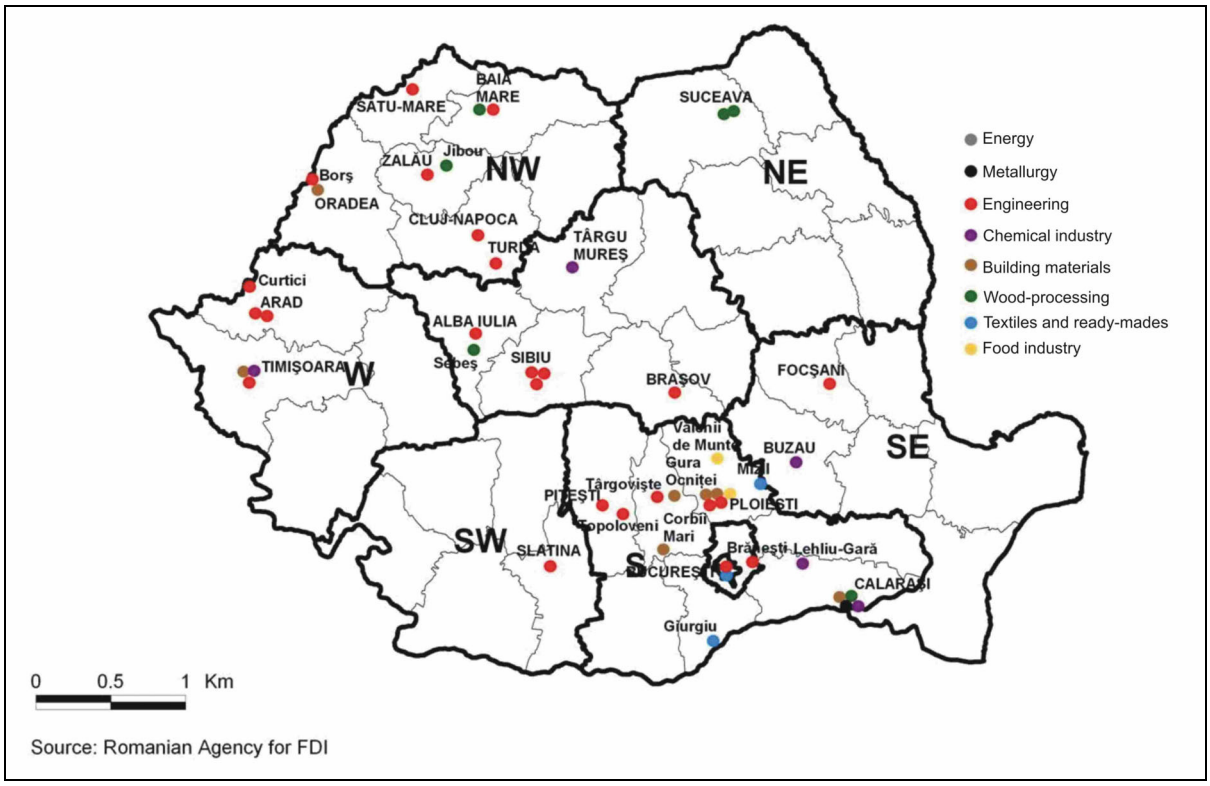

Fig. 2 – Foreign Direct Investments in industry (Major Projects) (2004–2006).

Manufacturing is the major attraction for FDI: the total shares have varied from more than half in the early 2000s (50.9% in 2003) to about one third at the end of the decade (31.3% in 2008). FDI played a significant role in changing industry concentration patterns inherited from the centrally-planned period. These changes seem to go in the direction of a less concentration, as indicated by the negative sign of the initial share variable (Resmini 2000). Although the capital city remains the major recipient of FDI during the 1990s, the concentration of FDI has increased in all locations, thus indicating patterns of dispersion of foreign firms across regions in recent years.

Increasing specialisation is predicted as a result of trade liberalisation and economic integration. It has been claimed that the processes of internationalisation and structural change in transition economies tend to favour metropolitan and western regions, as well as regions with strong industrial base (Trăistaru *et al.* 2002; Petrakos 1996). The analysis of the foreign trade of Romania especially with the EU, revealed a long term „specialisation" as a supplier of labor and energy-intensive-low-value-added products, although the technology-intensive products gained higher shares in recent years (Chilian 2009). Consequently, Romania's patterns of FDI and foreign trade clearly show a transition from a competitive advantage in the lower-end of the value chain (in particular textiles and leather) towards a higher value-added manufacturing sub-sectors (Pauwels and Ioniță 2008). All along the 2000s, the country has experienced the largest FDI inflows and has also witnessed the largest increase in skilled-labor and capital-intensive exports. More recently, Romania's low-cost advantage is gradually eroded in certain sectors, facing increasing competition from Asian economies in clothing and leather, and, recently, in IT industries

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APERÇU SUR LE CLIMAT DES SIÈCLES PASSÉS SUR LE TERRITOIRE DE LA ROUMANIE

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Mots-clés: hivers rigoureux, sécheresses, inondations, désastres, Roumanie.

Overview on the climate of past centuries on the territory of Romania. After consulting various sources of historical information, we try to take a note of the most important climatic events in the three Romanian countries (Wallachia, Moldavia and Transylvania) during the past two millennia (hard winters, droughts, water flood, etc.) and their effects on people's lives (disease, famine, death) in connection with historical events (migration, wars, invasions). It can detect known periods in Western Europe: the Little Climatic Optimum and Little Ice Age and at the end a very limited period of warming during the twentieth century.

INTRODUCTION

Après le retrait de l'administration romaine du territoire de la Dacie (271 apr. J.-C), les conditions historiques dans cette partie de l'Europe ont été très dures. A partir du quatrième siècle, commencent les invasions massives des peuples migrateurs: les Goths, les Huns (de 376), les Gépides, les Slaves (VI–VII^{e} siècle), les Hongrois, les Coumans, les Petchenègues (X et XI siècle) et surtout les grandes invasions des Tatares en 1241–1242, qui ont dévasté le territoire roumain.

Compte tenu de ces conditions historiques, les trois provinces roumaines du Moyen Age (la Valachie, la Moldavie et la Transylvanie) se sont constituées tardivement (au XIV^{e} siècle). Mais ces provinces historiques seront toujours le théâtre de combats des pays et des empires voisins: tout d'abord par la Pologne, qui espérait intégrer la Moldavie; puis par l'Empire Ottoman, qui occupait toute la péninsule balkanique et effectuait des incursions fréquentes au Nord, du Danube jusqu'en Moldavie et la Transylvanie; puis par la Russie, qui a occupé plusieurs fois la Moldavie et la Valachie, ainsi que la moitié orientale de la Moldavie (la Bessarabie) devenant, pendant plus d'un siècle, une province russe. La Russie, qui avait pour but un accès au détroit du Bosphore et des Dardanelles, n'a jamais renoncé à cette province roumaine, même au XX^{e} siècle; puis par l'État hongrois et plus tard par l'Empire Austro-Hongrois, qui a fait de la Transylvanie, une province subordonnée pendant plusieurs siècles, qui s'est étendu, au fil du temps, au-delà des Carpates, à l'est en Moldavie et au sud en Valachie et qui a occupé, pendant plus de 150 ans, la partie nord de la Moldavie (Bucovine) et plus de 20 ans, une partie de la Valachie (Olténie) (Fig. 1).

Le chroniqueur moldave Grigore Ureche a écrit que les terres roumaines se trouvaient «à la croisée de tous les méfaits». L'historien et homme politique français, Lucien Romier, a utilisé l'expression «au carrefour des empires morts», au sujet de la position géographique de la Roumanie; et le géographe français, Emm. de Martonne, auteur du volume *La Valachie* (1902), et de la thèse de doctorat *Evolution morphologique des Alpes de Transylvanie* (1907), a justifié ses recherches en Roumanie: «Parce que, de nos sœurs latines, elle est la plus chère à notre cœur en raison de son triste destin, entre les nations hongroises, slaves et turques, qui l'ont encerclée, l'ont désirée, l'ont mise en pièces et l'ont dominé sans pitié».

La conséquence d'une histoire si tourmentée a fait que les provinces roumaines n'ont été capables de s'unir qu'au XIX–XX^{e} siècle (la Moldavie avec la Valachie le 24 janvier 1859, la Bessarabie le 27 mars 1918, la Bucovine le 28 novembre 1918 et la Transylvanie, la dernière province, le 1 décembre 1918).

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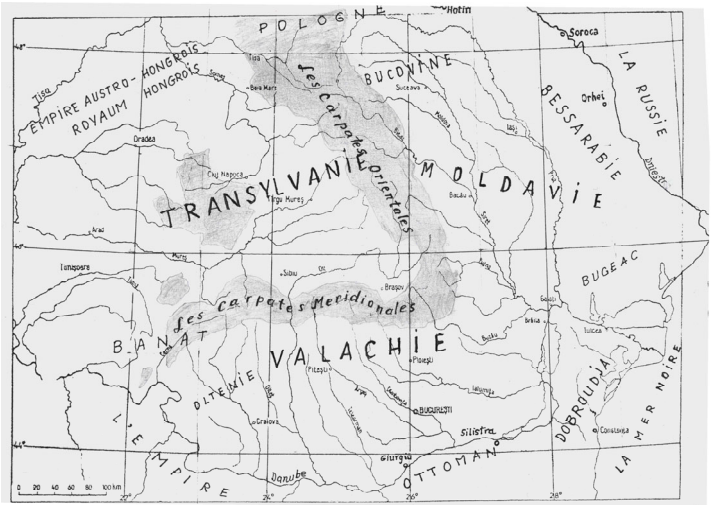

Fig. 1 – Les pays roumains pendant le Moyen Age.

De par ces raisons, les documents sur les conditions de vie et, ce qui nous intéresse spécialement, les informations sur le climat des siècles passés, en Roumanie, sont relativement peu nombreuses et manquent de continuité. Ils proviennent principalement de chroniques moldaves et valaques, de chroniques hongroises, de notes sur de livres religieux ou laïcs, livres divinatoires, calendriers, de dossiers de comptes, de correspondances et des témoignages de voyageurs étrangers dans ces régions: de diplomates italiens, polonais, hongrois, autrichiens, de missionnaires catholiques, de pèlerins russes, de chroniqueurs turcs qui accompagnaient les troupes ottomanes, celles-ci ayant souvent attaqué ces régions. Dans toutes ces sources ont été enregistrés les phénomènes particulièrement exceptionnels, les anomalies climatiques et leurs conséquences: la famine, les épidémies, les décès, etc. Les descriptions des passagers sont surtout liées aux difficultés du voyage, dans des conditions météorologiques défavorables. Certaines descriptions sont évocatrices, pittoresques et peuvent indiquer l'ampleur des phénomènes (p. ex. l'épaisseur de la neige).

Le météorologue Nicolae Topor (1964) a étudie les années pluvieuses et de sècheresse sur le territoire actuel de la Roumanie, et il a divisé les informations en trois catégories: les dates possibles (1000 av. J.- C – 1460 apr. J.-C), dans le centre et le sud de l'Europe, peut-être sur le territoire de notre pays, certaines données subjectives (1461–1850), tirées de notre histoire, et certaines données objectives (1851–1961), obtenues par des mesures instrumentales.

Les historiens roumains n'étaient pas très préoccupés par les questions climatiques du passé. Parmi les exceptions on remarque Paul Cernovodeanu et Paul Binder (1993) qui ont étudié les calamités climatiques et leurs conséquences, en particulier des XVI–XVIII siècles, et Lucian Boia (2004), dans un aperçu sur les liaisons entre le climat et l'imaginaire de l'homme.

LES DONNEES CLIMATIQUES DE L'ANTIQUITE À TRAVERS LE PREMIER MILLENAIRE DE NOTRE ERE

Les informations sur le climat sont presque inexistantes, avant et pendant le premier millénaire, ainsi que fragmentaires, aléatoires, subjectives; ceci, même dans la première moitié du deuxième millénaire. Peu à peu les données s'accumulent, mais sans permettre une caractérisation ou entrevoir une cyclicité du climat.

Hérodote parle du roi perse Darius I qui en 514 avant J.-C, dans son expédition contre les Scythes, rencontre en route, vers l'embouchure du Danube, des champs de blé de la hauteur d'un

homme à cheval, montrant l'existence d'étés chauds et longs, favorables à de bonnes récoltes. De même, les soldats d'Alexandre le Grand, sur le chemin de l'Inde, en 335 avant J.-C., lors d'une expédition contre les tribus du nord du Danube, traversaient les champs du blé avec leurs lances

Certaines des plus anciennes informations sur les questions climatiques de la région se trouvent dans le recueil de poèmes du poète latin Publius Ovidius Naso, exilé par l'empereur Octavian près du Pont Euxin (La mer Noire), à Tomis (aujourd'hui Constanța), l'aneée 8 après J.-C , et qui y a vécu jusqu'à sa mort, en 17, cette région ayant beaucoup de cités grecques occupées par des «barbares» géto-daces, menant une lutte permanente contre les Romains. Au cours de cette période, il a écrit son célèbre cycle *Epîtres d'exil* (*Les Tristes* et *Les Pontiques*) où on trouve des descriptions détaillées sur le climat; il y signale particulièrement les hivers froids, les vents de l'est et du nord (l'Aquilon et le "terrible" Borée), le gel du fleuve Istres (le Danube) et de la mer, ce froid qui faisait geler le vin et l'huile dans les vases, etc. Les vers sont dramatiques et indiquent des hivers terribles que le poète a vécus au bord de la mer. Pourtant, l'une des informations «*la neige…avant que la première ne soit fondue, est déjà recouverte par une nouvelle…il est assez commun d'en voir, à, différents endroits, de deux années différentes*» (trad. M. Nisard 1892, cf. Teodoreanu 2005), pourrait nous faire croire que, deux mille ans auparavant, le climat au bord de la mer Noire a été semblable à celui d'aujourd'hui sur les sommets des Carpates (presque sans été). C'est un exemple évident d'exagération, dans l'espoir d'attendrir le cœur de ses persécuteurs. Mais, au contraire, nous pouvons croire qu'Ovide a vu de la glace jusqu'à l'horizon, (*«j'ai foule cette mer solide et marché à pied sec sur la surface des ondes…»)* parce que nous trouvons des informations semblables parfois au fil des siècles, y compris au XX^{e} siècle (par exemple, en février 1929 ou janvier 1942, lorsque la station météorologique de Constanța a enregistré un minimum de température de -25ºC.)

Autres informations sommaires: la bataille de Tapae (près des Portes de Fer, de la Transylvanie) entre les Daces et les Romains, en mars 101, a eu lieu pendant une tempête exceptionnelle qui a causé de graves dommages aux Daces (d'après l'historien roumain Al. Xenopol, cf. Teodoreanu 2007). En 590, en septembre, octobre et novembre, ont été enregistré de fortes pluies et des inondations, puis, de janvier en septembre 591, une très forte chaleur et de la sécheresse (Topor 1964).

Au Moyen Age, est signalé la période d'octobre 763 en février 764, lorsque au Pont Euxin la mer a gelé sur une profondeur de 15 m, sur 15 km de rives, de sorte que l'on pouvait se déplacer à pied ou en charrettes d'Anatolie en Scythie Mineure, et ceci pendant quatre mois (Ch. Lebeau, cf. Caillaud 1819). Cet hiver avait été suivi par une sécheresse dévastatrice.

INFORMATIONS SUR LE CLIMAT DANS LA PREMIÈRE MOITIE DU DEUXIÈME MILLENAIRE

N. Topor (1964) mentionne les années 999 et 1000 où chaleur et sécheresse ont asséché toutes les eaux et cours d'eau, puis, après un hiver rigoureux en 1035, l'été qui a suivi a été très chaud et sec; il semble que, à cette période, en Europe orientale, il n'ait pas plu pendant environ six mois.

En 1136 on a enregistré un été chaud avec des rives asséchées dans la plaine occidentale, puis, en 1186, les arbres ont fleuri en janvier, les poules ont pondu, et, à la fin du mois, les pommes ont poussé ainsi que les noix car, du fait de la chaleur, toutes les cultures se sont développées rapidement. On mentionne aussi l'été chaud et sec de 1142, qui a causé la famine et la mort de beaucoup de gens (Antal Rethly, cf. Cernovodeanu, Binder 1993). L'année 1150 est mentionnée avec de grandes pluies et des inondations, en particulier dans la région du Danube, où le temps était très mauvais. En 1151, du 24 juin à la mi-août, il y a eu énormément de pluie, suivi, en 1152, d'un été chaud et sec.

Le XIII^{e} siècle. Selon les mêmes auteurs, les hivers rudes apparaissent en 1209–1210, lorsque, dans toute la péninsule balkanique, en janvier et février, le froid était si fort que la mer Noire a gelé. En 1234, le vin a gelé dans les caves. En 1236, le Danube a été couvert par les glaces. Mais en 1225–1226, l'hiver a été doux et, le 6 décembre, les pâturages ont fleuri. L'hiver de 1288–1289 a été également doux car, à Noël, les arbres étaient en fleur, les enfants se baignaient dans les rivières, et la

moisson a été récoltée deux mois plutôt que d'habitude. En 1234–1235, on a enregistré une inondation du bassin du Danube, et en 1267–1268, entre Noël et l'Épiphanie, une grande inondation également.

Une période dramatique a eu lieu au cours de la grande invasion tatare de 1241–1242 (d'après le moine Rogerius d'Oradea, cf. Cernovodeanu, Binder, 1993) L'hiver a été très froid, neigeux. À Noël, le Danube a gelé, le froid s'est propagé dans le sud de l'Europe et, à la suite des les déprédations horribles des Tatares, s'est installé la famine et une épidémie microbienne, probablement la peste. Ces catastrophes se sont prolongées jusqu'en 1245, cause d'un dépeuplement important en Valachie.

Mais la vie continuait, de sorte que, au treizième et quatorzième siècles, ont été bâti quelques-unes des plus anciennes cathédrales et châteaux sur le territoire roumain: en Transylvanie (Cisnădioara, 1228, Sântamaria-Orlea, 1270, église de Densuş construite de blocs de pierre de Sarmizegetusa, la capitale des daces, Château de Bran 1378), en Valachie (Curtea de Argeş, 1351), en Moldavie (Rădăuți, 1359) etc.

Le XIV^e^ siècle commence avec la sécheresse et la canicule – en 1304, on pouvait traverser le Danube à pied, mais en 1312 et 1315, ce sont de grandes inondations dans tout le bassin du Danube. Au XIV^e^ siècle, le record de froid a été atteint pendant l'hiver de 1322–1323, lorsque les rivages de la mer Noire ont gelé de nouveau. En 1327, la floraison des arbres a commencé en mai et la récolte, dans les premiers jours du mois d'août. Puis vient l'hiver de 1330–1331. Le célèbre voyageur arabe Ibn Battûtah a traversé la Dobroudja d'aujourd'hui, par un froid terrible, notant que, lorsqu'il voulait se laver le visage, l'eau gelait sur la barbe instantanément, et parce qu'il portait de nombreux vêtements chauds, c'était nécessaire d'être aidé par les compagnons pour monter à cheval (Brătescu 1923).

Pendant ces événements climatiques particuliers, on enregistre la peste en 1317, qui s'est répandu vers l'Europe occidentale, puis la famine, pendant la période de sécheresse, ainsi qu'une invasion de criquets en 1338–1340, suivi d'une autre période de sécheresse et de famine en 1363.

En 1396, pendant la bataille de Nicopolis, entre le peuple turc d'une part et les peuples balkaniques et hongrois d'autre part, la situation était difficile pour l'armée, à cause d'une pluie terrible, avec vents et tempêtes, qui a fait beaucoup de morts par le froid et la famine. Un autre hiver rigoureux, en 1399, a été ressenti dans tout le bassin du Danube.

Tous les événements de ce siècle ont conduit à une diminution significative de la population des pays romains, qui n'a recommencé à croître qu'à la fin du siècle, grâce à un accroissement naturel élevé, associé à la population de réfugiés venus des Balkans, du fait des privations infligées par le régime turc. Probablement la population a atteint le chiffre de 1 800 000–1 900 000 habitants dans les trois pays roumains (plus de 500 000 en Valachie) pendant le règne du grand prince Mircea le Vieux (1386–1418).

Le XV^e^ siècle est caractérisé par plusieurs hivers froids: 1407–1408, quand le Danube a gelé jusqu'à la mer Noire, 1428–1429, un hiver dur spécialement dans la plaine occidentale, suivie par un été froid, de sorte que les récoltes de grain et de raisin ont été mauvaises; puis 1440–1441–1442, quand un chroniqueur note que, pendant l'incursion turque dans les pays roumains, les soldats ont eu les mains et les pieds gelés. En 1443–1444 suit un autre hiver rigoureux en Transylvanie et en Valachie. En 1456, le Danube gèle, ainsi qu'en 1457–1458 et en 1461–1462, lorsque les turcs franchissent le Danube sur la glace, et sont vaincus par le prince Vlad Țepeş (connu par la légende sous le nom de Dracula). En 1463, le Danube a gelé de nouveau et la neige a atteint la hauteur des chevaux. Autres hivers rigoureux: 1473–1474 et aussi 1474–1475, pendant la bataille de Vaslui, entre Ştefan cel Mare (Etienne le Grand) et les turcs et 1478, quand les turcs ont traversé le Danube gelé et ont pillé toutes les localités sur la rive gauche de la rivière; puis 1491, avec une grosse couche de neige, où beaucoup de personnes meurent de froid. On enregistre un hiver doux en 1420, suivi d'un printemps précoce, avec des fleurs de roses sauvages en avril, des cerises, céréales, raisins précoces et des vergers fleuris à deux reprises donnant deux récoltes de fruits.

Des étés anormaux très secs ont été signalés en 1456, avec famine; également en 1460, 1463, 1473, avec l'invasion de criquets, en 1474, où l'eau de source a tari; également au printemps 1476, quand les ottomans ont souffert de soif, de sécheresse et de famine en Valachie; en 1478, 1479, 1480, quand les ruisseaux autrefois riches en eau pouvaient alors être passés à gué, quand les forêts brûlaient

et la région était dévastée par la peste; en 1491,1493 et 1494, avec une famine causée par une grave sécheresse. Il y avait aussi des étés frais: en 1449, où des vignobles et de vergers ont gelé, en 1453, avec du vin aigre, en 1462, quand il a neigé en septembre, en 1488, quand la neige est tombée en juin. Evénements hydrologiques: inondations du Danube en 1433 et en janvier 1490. Les anomalies climatiques, les guerres, les famines, les invasions de criquets, les épidémies, en particulier la peste, en 1476 et 1495, ont réduit la population dans tous les pays roumains et l'âge moyen de la population a diminue à moins de 30 ans.

En dépit de telles circonstances, le peuple voulait vivre normalement. Par exemple, en Moldavie, Etienne le Grand, qui a régné pendant 47 années (1457–1504) et a mené 36 guerres avec les turcs, les polonais, les tatars et les hongrois et n'en a perdu que deux, a élevé de nombreux édifices, dont sept ont été inscrits au Patrimoine de l'UNESCO pour leurs peintures extérieures (par exemple le monastère de Voroneţ, 1488, avec des scènes bibliques et des portraits de personnages importants préchrétiens, des philosophes comme Platon et Aristote, et surtout avec la fresque du Jugement dernier sur le mur Ouest extérieur, appelée «la chapelle Sixtine de l'Orient»).

XVI^{e} SIÈCLE

Les historiens roumains ont enregistré, tout au long du siècle, environ 22 années avec des hivers rudes et prolongés, beaucoup de neige et des gelées importantes; des pluies excessives pendant 19 années, parfois accompagnées de grêle, et des inondations locales, dont 7 années de crues importantes, et 27 années d'étés chauds et ensoleillés, parfois secs, ainsi que cinq années de grande sécheresse.

La chaîne des catastrophes de ce siècle s'ouvre avec la grande inondation de 1508, dans toute la Transylvanie, entre le 29 mai et 24 août, qui a causé une famine, ressentie jusqu'à l'année 1509, suivie d'une épidémie de peste, de 1510 à 1511, sur tout le territoire roumain. En 1529, les inondations ont été suivies de nouveau par la famine et la peste. Puis est arrivée l'année pluvieuse 1533, avec des inondations et la grêle, suivie par une famine prolongée en 1534–1536 qui a conduit à l'augmentation des prix des denrées alimentaires, à des migrations, et à un grand nombre de décès. «*Il y avait des personnes folles de faim... elles mangeaient des herbes, des écorces d'arbres, des cadavres d'animaux et, dans les rues des villes et des villages, il y avait des cadavres squelettiques avec des restes d'herbe dans la bouche*» (Miles, cf. Cernovodeanu, Binder 1993, p. 48).

Les années 1539–1544, sont caractérisées par des étés trop chauds et secs, dévastées par le fléau des sauterelles, venues par vagues successives de l'est, avec les invasions des armées destructrices des tatares et turques, celles du Sultan Soliman le Magnifique qui, au cours de l'expédition, à partir de 1538, ont tout dévoré sur leur passage. Le Prince moldave Etienne, intronisé par les turcs (1538–1540), est resté dans l'histoire avec le surnom de Ştefan Lăcustă (Etienne La Sauterelle). La famine a été si grande et longue, que beaucoup de paysans ont été forcés de vendre leurs enfants aux turcs, pour ne pas mourir de faim.

La peste de 1552–1554, facilitée par les mauvaises récoltes, et causée par la malnutrition, liée aux années précédentes des pluies, a entraîné une réduction de plus de la moitié de la population dans toutes les provinces. Après une période de calme relatif, en 1572, l'épidémie a éclaté de nouveau dans les années suivantes, 1574–1577, combinée avec des étés chauds et secs, avec des hordes de déprédations ottomanes et tatares, de famine, et, de ce fait, la mortalité a augmenté à nouveau. Le messager polonais Andrei Taranovski, écrit: «*La fête de la Pâque (3 avril 1575) je suis arrivé au Palatine de la Valachie, où nous avons beaucoup souffert de faim et de disette. En effet, dans ces régions c'est une faim et un manque de nourriture si élevé que les gens s'entre-tuent pour un morceau de pain. Le bétail meurt partout, j'ai perdu huit animaux... Le 26 mars est tombé tant de neige qu'elle atteignait les épaules des gens*...».

En 1578, des inondations se produisent en hiver et au printemps, les graines plantées dans les champs et les jardins n'ont pas germé et les souris ont envahi et démantelé ce qui restait. En 1580,

l'hiver a été dur, comme dit le jésuite hongrois Stephen Szántó: *«Quand je suis arrivé à la frontière de la Transylvanie, j'étais tellement embourbé par des congères de neige, que je ne pouvais voir la route et j'ai tant souffert de froid... que nous ne pouvions pas décider quoi faire, où aller... Je ne pouvais pas marcher à cause de la violence du vent qui poussait les congères de neige contre nous...».*

Entre 1584 et 1588, on a consigné une des plus grandes catastrophes écologiques de ce siècle, à savoir une sécheresse prolongée, une famine terrible, combiné avec une peste dévastatrice, cette fois en provenance de Hongrie et qui s'est propagé, en dehors des trois pays roumains, sur toute la péninsule des Balkans; elle a conduit à des migrations massives et d'innombrables morts parmi les paysans et même parmi les nobles, dont le prince de Transylvanie, Sigismond Bathory et celui de Moldavie, Petru Șchiopul (Pierre Le Boiteux). La famine a fait des ravages pendant les années 1595–1598, en particulier après les dévastations turco-tatares, dirigées par Sinan Pacha, qui avait acheté des esclaves parmi les habitants, mais qui a été battu, finalement, par Mihai Viteazul (Michel le Brave), à la bataille de Călugareni. Quant à Michel le Brave, il sera tué en 1601, après avoir réussi à réunir, pour une courte durée, les trois pays roumains. Le militaire espagnol en captivité chez les Turcs, Diego Galan, un participant à cette lutte de 1595, à dit que «*les Turcs restés dans la Valachie pendant deux mois, ont détruit et ont pilé tout*». En octobre 1595, il a noté le début d'un hiver précoce: «*l'hiver est arrivé... le froid était si grand que nos douleurs et maladies ont augmenté... En bref, il neigeait chaque jour et les maladies ont redoublé. Beaucoup des hommes en captivité sont morts»*. Les même observations sont notées par l'historien militaire et architecte de cette période Filippo Pigafetta.

En 1597 de nouveau un hiver rigoureux. Joris van der Does, ambassadeur de la reine Elizabeth à la Sublime Porte écrit: «*Boreu a commencé ce jour-là le 12 décembre, si violent et orageux, mélangé avec de la pluie et les Turcs, nos compagnons, auraient préféré mourir que de retourner à la ville. Et cette tempête a été si dure et il était si froid qu'il semblait que nous tous, nos chevaux et chars, ont été transformé en statues de glace... Dès que le Danube a été recouvert d'une grosse couche de glace nous sommes passés sur la surface glacée, même le dimanche de la Circoncision...*».

La dernière calamité du siècle a été en 1598, lorsque, en janvier, les rivières de Transylvanie ont débordé à cause de fortes pluies et de la fonte des neiges dans les montagnes, les champs ont été dévastés, les bâtiments des villes ont été endommagés. Cependant, à cette occasion, l'armée ottomane-tatare, qui assiégeaient la ville d'Oradea, dans l'ouest de la Transylvanie, a dû se retirer en toute hâte, parce que l'un des plus grands fleuves de la région (Crișul) menaçait d'inonder leur camp.

Dans ces conditions, les historiens estiment que, dans les Pays roumains, au seizième siècle, il y a eu de grandes fluctuations de la population, pertes dues aux catastrophes naturelles du climat, accompagnées par des épidémies, émeutes en liaison avec des guerres prolongées, en particulier dans la première moitié du siècle; avec les tendances de recouvrement vers la fin et grâce à certaines mesures prises par les dirigeants: pour encourager la colonisation, la réduction des taxes, l'octroi de la liberté des étrangers des environs: ruthènes, polonais, allemands, serbes, arméniens, bulgares, tatares, albanais ou pour les roumains, emmenés en captivité, pour leur permettre de retourner dans leurs foyers, etc.

XVII SIÈCLE

La situation en Europe de l'Est souffre encore des épreuves et des tribulations, avec des interruptions par de brèves périodes de paix, mais dans laquelle le climat se refroidit progressivement, ce qui crée des périodes difficiles pour la vie des habitants.

Les historiens Cernovodeanu et Binder enregistrent environ 30 ans avec des hivers rudes, 41 avec une humidité élevée (24 avec des pluies excessives, 16 avec des inondations et 7 avec de la grêle destructrice), seulement 22 ans chauds, 10 avec des chaleurs excessives, 12 avec de la sécheresse. Les mauvaises récoltes ont prévalu pendant 24 années et ont été bonnes durant 20 ans seulement; beaucoup de mauvaises récoltes, disettes, invasions de sauterelles, famines, épidémies de peste.

Au début du siècle (1602–1603), en raison des années successives avec des hivers longs, froids, de mauvaises récoltes, et surtout des guerres incessantes et dévastatrices (en Transylvanie, contre l'Empire Ottoman ou les armés impériales, en Moldavie et Valachie, contre les Turcs et Tatars ou contre les Polonais) ont commencé la famine et la peste, avec de nombreux décès et des cas de cannibalisme. On a enregistré 70 décès chaque jour, parfois jusqu'à 125. Les Tatars ont emmené en captivité environ 100 000 personnes provenant de trois principautés et ils ont enlevé aussi du bétail et des objets. Aloisio Radibrat, l'ambassadeur et courrier diplomatique à Dubrovnik en février 1603 note que le Danube a gelé et «*... les nôtres ont donné un assaut si féroce contre la ville (Silistra, sur la rive droite du Danube), que les turcs et les tatars ont pris la fuite par une autre porte donnant sur le Danube. Mais la glace était assez pauvre et la plupart d'entre eux se sont noyés…».*

En 1605, une autre catastrophe: inondations, en raison de fortes pluies, au cours de juillet, suivies par un été sec en 1609, qui a favorisé l'invasion de criquets en Valachie, traversant les Carpates jusqu'en Transylvanie; et de même en 1611 et 1612 en Moldavie. Au cours de 1613–1614, des précipitations prolongées suivies d'inondations, jusqu'en 1619 ont détruit toutes les récoltes. En février 1616, de très basses températures ont provoqué la mort de beaucoup de gens sur le chemin de Hotin (dans le nord de la Moldavie) nous informe l'aristocrate français Charles Jappencourt.

1620 a été une année de sécheresse, en particulier en Moldavie. Dans un journal de campagne d'un anonyme polonais est noté, le 4 octobre: *«Il était temps de déjeuner quand nous nous sommes arrêtés sur le fleuve Răut dans les champs secs, pleins de criquets, c'était très difficile à cause de la marche sous un grand soleil et parce les païens nous étouffaient avec de la fumée. D'autant plus qu'on ne pouvait obtenir de l'eau pour boire seulement dans des étangs. Beaucoup de chevaux sont morts de soif*». Un été sec a suivi en 1621, un hiver rigoureux en 1622–1623, la famine, une épidémie de peste venue de Hongrie, avec 125 décès par jour.

1627–1628 furent des années très froides et pluvieuses, suivies par la famine en 1629. En 1633–1637 les perturbations climatiques ont continué, accompagnées par de mauvaises récoltes, famine, peste, en particulier en 1633; on suppose qu'à Braşov près de 11 000 personnes sont mortes dans la seconde moitié de l'année. En 1634–1635–1636, ont été des hivers rigoureux, des étés pluvieux, des inondations, en 1637 est arrivé un hiver presque glaciaire suivi d'une autre vague de peste qui a vidé les villages et on ne pouvait pas percevoir les impôts (d'après Monumenta Comitalia Regni Transylvanie, cf. Binder, Cernovodeanu, 1993).

En 1638, on a enregistré l'invasion de criquets dans tous les pays roumains suivie de famine. En 1640, l'hiver a été dur jusqu'au cours du printemps. L'envoyé polonais Wojcieh Miaskowski écrivait le 18 mars: *«Le dimanche de mi-carême, la neige est tombée pendant la nuit, la terre est complètement couverte. Le 19 mars. Au Râmnic, c'était un vent très froid qui nous a retenus sur place, parce que je faisais un traitement pour une sciatique... Aussi il y a eu un tremblement de terre, la douzième heure...*». Egalement, le messager polonais à la porte Jerzy Krasinski, a noté le blizzard pendant le mois de mars et beaucoup de neige «*un froid si grand que les serviteurs ont trouvé des oiseaux gelés dans la forêt».* Mêmes informations nous avons d'Achacy Taszycki, qui a accompagné Miaskowski, ajoutant que *«la neige a atteint le genou du cheval*».

Autres événements: en 1641, la peste, en 1644 les inondations provoquées par des pluies continues, en janvier 1645 un grand gel, les gens ont eu les pieds, les oreilles et le nez gelés, et en été, des sauterelles. En 1646–1647, une nouvelle vague de peste. En 1649, l'hiver froid, il a neigé de décembre en avril. Dans ses dernières années, pendant le règne de Vasile Lupu, en 1651–1652, a éclaté en Moldavie une famine due aux criquets, aux dévastations des Tatars et des Cosaques, tandis qu'en Transylvanie, il y a eu des inondations, à la suite de pluies sans arrêt.

En 1654, de fortes gelées en janvier, suivies par des pluies et des inondations au mois de mai, nous informe un célèbre écrivain Paul d'Alep, l'archidiacre de Damas, compagnon du patriarche Macarie III de Syrie, dans un voyage d'environ sept ans (1652–1659) sur les terres roumaines. A propos de l'hiver 1656–1657, il note: «*En hiver, cela a été terrible et difficile pour les paysans et le bétail. La neige a continué jusqu'à la première journée du Carême qui était le février 9 et beaucoup de bétail a*

péri par manque de fourrage... alors blizzards et froid, humidité et froid, je n'ai jamais vu cela avant, même l'huile de tournesol et le vin ont gelé dans des pots... Le Danube a gelé trois fois, la première fois la glace avait une épaisseur de trois palmes (environ 75 cm,).... puis une deuxième fois et puis... la troisième fois, jusqu'à ce que la glace ait atteint une épaisseur de neuf main (2,25 m). Pour être en mesure de prendre de l'eau de la rivière, les habitants ont dû creuser des puits à travers la glace. On a dit qu'une telle chose n'est pas arrivée depuis trente ans».

En janvier 1657, de nouveau un hiver rigoureux, de nombreuses personnes sont mortes de froid. En outre, «*sont morts beaucoup de moutons et de bœufs et de bétail, à cause d'un gel si fort et inattendu*», note aussi Paul d'Alep. Le baron suédois Clas Ralamb Brorsson, administrateur apostolique en Moldavie écrit qu'il est passé avec difficulté de Transylvanie (Braşov) en Valachie en avril 1657 en raison de grandes accumulations de neige, et de grandes eaux de Dâmbovița. «*Les charrettes ont été prises par l'eau et un fonctionnaire de l'ambassadeur hongrois s'est noyé avec son cheval. Nous avons traversé la rivière s'accrochant aux rochers, en nous aidant avec les mains et les pieds …la rivière avait atteint dans la soirée de telles dimensions que personne ne pouvait y passer pour 14 jours*».

La période 1658–1664 a été, disent les historiens, l'une des plus affreuses dans cette région, où, aux adversités de la nature s'est ajoutée l'invasion ottomane-tatare, suite à la levée des pays roumains contre la Sublime Porte, invasion qui a dévasté tout ce qui restait après les années froides et pluvieuses précédentes. Dans la Chronique de Cantacuzin est enregistré: «*Dieu a fauché toutes sortes de gens... surtout dans les deux villes, Târgovişte et Bucureşti, impossible à dire. Les gens ont vendu leurs terres, mais pas pour l'argent, mais pour la nourriture …*». Le chroniqueur Miron Costin écrit: «*C'était une si grande famine dans cette année (1659), que les gens mangeaient du pain sec préparé avec des joncs. Les hommes ont surnommé Etienne, le Prince régnant, Papură Vodă* (le Prince Jonc)». Comme d'habitude, la famine était accompagnée par la peste qui a fait beaucoup de morts, et il semble que le Prince Etienne aussi est mort de la peste.

A propos de l'hiver 1659–1660, Evlia Celebi, voyageur ottoman, historien, géographe et écrivain bien connu, écrit: «*Mais quand le Danube, juste en faisant glisser les glaces d'Allemagne les agglomère près des murs de la cité (Silistra, sur la rive droite), les glaces ayant une hauteur d'environ un demi-mètre arrivent à détruire de nombreuses maisons…».* Le 25 novembre 1659, il note*: «Par la volonté d'Allah, le gel se durcit, le Danube a gelé en une nuit. Alors les grandes armées permanentes ont saisi l'occasion... les mahométans ont traversé le Danube à Giurgiu sur la glace... ils ont dévasté les villages ils n'ont laissé ni l'herbe ni animal».*

En 1668–1670 il y a eu des inondations dévastatrices. Pierre Parcevic, archevêque de Marcianopol, vicaire apostolique en Moldavie écrivait en juillet 1670: «*Dans ces provinces, en particulier en Moldavie, il y a un grand débordement d'eau pendant trois mois en raison des averses fréquentes et pluies incessantes, jour et nuit qui détruisent semis de blé du meilleur, de l'orge, l'avoine et ils sont endommagés par une trop grande humidité et ne peuvent pas mûrir. Aussi l'herbe et les plantes herbacées dans la prairie ne peuvent pas croître à cause du froid et de l'eau ou ne peuvent pas être fauchées à cause du manque de soleil et parce que les rivières sortent de leurs lits, inondent les plaines et prennent avec l'eau les herbes et la terre avec toutes les plantes et les mélangent avec du sable. Aussi, chose surprenante, sur le territoire de Bacău, on a vu si multitude de souris, qui non seulement elles mangeaient tout dans les jardins potagers avec de grandes pertes, mais elles ont escaladé les arbres, ont attaqué et ont tout détruit avec leurs dents, et, ce qui est pis, elles sont sorties et ont dévoré le blé de champs, l'orge etc. Les habitants, alarmés par ce malheur prédisent, qu'il y aura des famines et la peste. Et l'année dernière il y a eu tant de guêpes…qu'on ne pouvait vivre qu'avec les fenêtres fermées …*».

Entre 1672–1677, les ottomans et les tatars, en lutte contre les polonais, ont traversé les pays roumains se livrant au pillage, et ils ont propagé la peste en 1675–1678. Le chroniqueur Ion Neculce fait remarquer que «*il y avait tant de gens morts qu'on ne pouvait pas les enterrer et les mettre dans de fosses. A Iaşi, les corps des pauvres et des étrangers résidaient dans les rues parmi les ordures».*

Un hiver très dur 1683–1684, des sécheresses prolongées en 1683–1686 et les inondations en 1684 ont accompagné le conflit entre les Ottomans et les puissances chrétiennes, l'Empire Habsbourg et la Pologne, conflit qui a eu lieu en grande partie sur le territoire roumain. La grande famine de 1684–1686, accompagnée par une invasion de souris est enregistrée dans de nombreux documents avec des décès, des ventes de terres, des assassinats, de l'esclavage. Philippe Le Masson du Pont, ingénieur français au service de Jean Sobieski notait en 1686: «*Pendant trois ans, pas une seule goutte de pluie tomba à travers la Valachie, ou en Moldavie, dont le climat est excessivement chaud, au moment où je parle, il y a eu d'extrêmement fortes chaleurs, tous les lacs et les marais ont été asséchées, mais la chose la plus étonnante est que la rivière Bahlui, sur laquelle est située la capitale et qui est de la taille de la Marne, n'avait plus d'eau, seulement dans les endroits les plus profonds. Dans les terres boueuses il y avait des fissures si profondes qu'on ne voyait pas un homme debout. Je le répète, je doute qu'il n'existe aucun exemple d'une sécheresse si grande et si longue, et pourtant la terre était si bonne, grasse et fertile, que le champ était recouvert d'une herbe très épaisse … bonne pour les chevaux, mais qui prenait feu, au plus faible souffle de vent... J'ai toujours souffert de la chaleur accablante surtout la nui t... Et le plus grand malheur c'est que les Tatars, remarquant que l'herbe s'enflammait facilement, nous avons vu soudain toute la plaine enveloppée par le feu. La chaleur est devenue plus terrible …*».

Une nouvelle invasion en vagues de sauterelles en 1690–1691, en provenance d'Asie, a ravagé l'Ukraine, la Podolie, la Moldavie, la Valachie et la Transylvanie, et a conduit à la famine de nouveau. La peste a été suivie par une mortalité accrue. Une inondation à grande échelle en juillet 1699 au sud de la Transylvanie, a complété la liste des catastrophes du XVII^{e} siècle.

XVIII SIÈCLE

En comparaison avec les changements politiques, économiques, sociaux, institutionnels réalisés dans les pays de l'Europe occidentale, la situation générale des pays roumains est peu changée. Dans l'évolution du climat, on trouve quelques différences par rapport à la période antérieure et le petit âge glaciaire est moins ressenti. On remarque seulement 17 hivers rigoureux, mais 37 années avec une chaleur excessive, avec une sécheresse pendant 17 années, mais aussi 46 années des pluies excessives, dont 19 avec inondations, et 14 avec grêle dévastatrice. Les récoltes sont bonnes 30 années, pour les autres elles sont médiocres ou mauvaises dont neuf années de famine.

Du point de vue politique, l'Empire ottoman a continué de dominer les Balkans et les principautés danubiennes, mais sa puissance est plus faible, et donc il introduit le régime phanariote (des grecs de Fanar, un quartier de Byzance), à la place de celui des princes roumains, espérant mieux maîtriser le pays. La compétition avec la Russie reste acerbe, car la Russie a tendance à affaiblir le pouvoir de la Turquie sur la mer Noire (qui est devenue un lac turc), pour prendre sa place et la transformer en un lac russe; et c'est ce qu'ils arriveront à faire. La Transylvanie reste encore sous la domination des Habsbourg, qui interdissent aux roumains tous les droits des hongrois et des allemands, même si certains vont à l'uniatisme (entre 1697 et 1700, d'après les promesses que, dès qu'ils s'unissent à Rome, ils auront des droits égaux avec les catholiques et les autres confessions).

Le climat se manifeste au début du siècle par des alternances entre le temps froid et pluvieux. Les années 1700, 1701 et 1702 ont été froides et pluvieuses, avec de grandes inondations. Un messager polonais en passage vers la Sublime Porte note en février 1700: «*Le prince de la Moldavie est parti avec quatre mille personnes, pour aider le Khan, mais à cause de la neige et du froid il est arrivé après la bataille*» (entre la Horde de Crimée et les Tatars de Bugeac, région du sud de Bessarabie).

En 1704, la sécheresse, en 1705 et 1706 l'excès de pluies, la grêle, les inondations, provoquant des pénuries alimentaires et une véritable épidémie de scorbut (en 1704) et la peste (en 1706), en particulier dans la Valachie, où la peste revient de nouveau en 1708, ce qui a causé la mort de six mille personnes. En Moldavie, en 1706 et 1707, il a été enregistré une nouvelle invasion de sauterelles,

qui se propagea vers le sud en 1709 et en Transylvanie en 1710–1712. En même temps, une épidémie de peste est venue de Turquie et s'est répandue vers le nord et l'ouest, de sorte que, pendant ces trois années, les décès semblent avoir atteint 100 000 habitants.

L'hiver de 1709 a été précoce et dur, mais il semble court. Le pasteur suédois Michael Eneman écrit: «*J'ai quitté le 28 novembre Bender (nord de la Bessarabie). A cinq heures du soir, au crépuscule, tous à cheval. C'était un froid terrible, jamais en Suède nous n'avons eu un tel froid ... Quand nous nous sommes approchés d'Ismail (Bessarabie méridionale), il n'y avait plus que des traces de neige sur le sol et il commençait à faire très chaud... Voila des changements inattendus entre chaud et froid...*». Le diplomate hongrois Pal Raday, voyageant dans le nord de la Transylvanie en même temps, se souvient: «*ne pouvant pas avancer en raison de la neige, de la boue et de l'eau, lorsque la nuit est venue, nous avons été obligés de camper dans une forêt ... sur ses bords, il y avait des arbres abattus par des vents forts...*».

En 1710–1711, les sécheresses et l'invasion de sauterelles, associées à la guerre menée par la Russie contre les ottomans sur le territoire de la Moldavie, ont fait d'innombrables victimes parmi les habitants. Le maréchal de Russie Boris Petrovich Şeremetev note, dans son journal de campagne, de la chaleur intense en juin 1711, puis de la pluie et de la grêle. Egalement dans le journal de Pierre le Grand, Tsar de Russie, sur la bataille de Stănileşti sur Prut, où les armées russe et roumaine, dirigées par le Prince moldave Dimitrie Cantemir, ont subi une grande défaite, on trouve: «*20 juin 1711. Cette marche près de la rivière Dniestr a été extrêmement difficile en raison du manque d'eau, de trop forte chaleur, de soif douloureuse, et beaucoup de soldats ont vomi du sang*». En Transylvanie, au cours de cette période, le climat a été très capricieux: inondation en 1711 suivie par une grande sécheresse en 1712 et de nouveau, en 1713, inondations, sécheresse en 1714 et des précipitations en 1715. La peste a continué à faire des ravages les années suivantes, 1716, 1717. En 1718 et 1719, de nouveau la sécheresse, les puits s'assèchent, la nourriture manque, des dizaines de milliers de morts de faim ou de peste, dans toutes les régions.

En 1724, il y a eu une grande sécheresse en Moldavie et, en 1726, en Transylvanie; également, en 1727 et 1728, dans toutes les principautés, les puits et les sources d'eau se sont taries, puis est arrivé un fort hiver neigeux en 1728–1729, d'autres inondations, suivies du paludisme, avec beaucoup de morts, y compris le Prince de la Valachie, Nicolae Mavrocordat, en 1730. De grandes inondations en 1731 en Transylvanie, les habitants émigraient au-delà des Carpates vers la Valachie, même si, là-bas, il y avait la sécheresse et la famine. Un hiver rigoureux en 1732–1733, jusqu'à la fin du mois d'avril, au cours duquel les loups ont mangé des hommes. En 1733–1735, la famine continue, le bétail meurt, la peste endémique hante, surtout depuis le début d'une nouvelle guerre russo-austro-turque en 1735, toujours sur la terre roumaine. En cette période d'environ six ans, la partie la plus endommagée a été le sud-ouest (Banat), en particulier en raison de pluies excessives.

Tout cela a provoqué une importante épidémie de peste entre 1737–1739, dans toutes les régions roumaines. L'Autriche a perdu la guerre avec les turcs et a été obligée de renoncer à l'Olténie (la moitié ouest de la Valachie, prise 21 ans avant, en 1718). En seulement quatre mois, à Bucarest, la peste a tué plus de 10 000 personnes et près de 5000 à Sibiu, alors que certains villages sont restés déserts. Malgré les mesures sanitaires, et la quarantaine imposée, la peste revient en 1742–1743, en raison de conditions climatiques défavorables entre 1738 et 1740, quand il y a eu des inondations après de fortes pluies, et les rigueurs de l'hiver. L'hiver de 1740 est enregistré dans de nombreux documents comme dur et long, avec de la neige jusqu'à la fin d'avril, avec la mort d'animaux, peu de nourriture, le pillage, le gel de la vigne. L'érudit Kelemen Mikes écrit: «*ici (à Bucarest) l'hiver est terrible. Il a commencé le 18 octobre, puis la neige et le froid ont augmenté et le froid est devenu désastreux. C'est comme si nous étions arrivés en Laponie, près de l'océan Arctique, parce que personne ne se souvient d'un hiver si dur. Et c'est la situation dans toute l'Europe. Et cela n'a pas été mentionné, c'est pourquoi on a voyagé en char du Danemark en Suède sur glace !...*». Le chroniqueur moldave Ion Neculce notait: *«C'était un hiver dur avec de la neige à hauteur de la taille. La neige est tombée du Vendredi Saint jusqu'à la Saint George. Le bétail est mort parce qu'il n'avait pas de foin, à*

cause de la pluie. Et les Russes ont mangé tout ce qu'ils ont trouvé». Dans des documents, on mentionne que le Prince Grégoire Ghica a distribué de la nourriture (du millet et du seigle), achetée en Pologne à prix élevé, car, là aussi, le temps a détruit en grande partie les cultures. Ainsi la mortalité a été réduite.

Après un hiver rigoureux en 1748 et un été trop sec, est arrivée une suite d'invasions d'énormes criquets, par vagues successives, entre 1746–1749, cachant le ciel, le soleil et la terre par leurs nuées, et les gens ne se voyaient plus. Les prix ont augmenté et s'installa la famine. Le Prince Constantin Mavrocordat en Moldavie et Grégoire II Ghica en Valachie ont décidé l'abolition du servage, pour faciliter la vie des gens. Puis, en 1750, s'est fini la construction de l'hôpital Pantelimon de Bucarest pour le traitement de la peste, ainsi qu'une annexe à Saint Vissarion, et un hôpital à Iaşi pour les maladies contagieuses. Cependant on a enregistré des centaines de morts à cause de la peste, venant du sud du pays et vu l'état de sous-alimentation de la population.

Dans les années 1750–1751, puis 1752, 1753, 1754 on a enregistré, en particulier en Transylvanie, des précipitations, de la grêle, des inondations, puis en 1755, une grave sécheresse, suivie d'un hiver rigoureux. 1756 a été une bonne année pour la récolte de blé, de l'orge, du maïs, du millet, mais l'épidémie avait déjà fait des milliers de victimes, en particulier dans le sud-est de la Transylvanie, à Braşov. La quarantaine instaurée ne parvint pas à isoler complètement la zone, ainsi l'épidémie se prolongea encore jusqu'en 1757; puis elle continua de 1758 à 1761 dans les deux autres pays.

La nouvelle guerre russo-turque de 1768–1774, menée sur le territoire des principautés roumaines, réactiva de nouveau la peste, en faisant des milliers de victimes en 1770, d'abord parmi les pauvres, et ensuite parmi les plus riches. À la fin de la guerre, l'Empire des Habsbourg occupa une partie du territoire du nord de la Moldavie (Bucovine), le 7 mai 1775, et il l'annexa à la Galice en 1790.

1775, 1779, 1780, sont des années extrêmement riches en précipitations, suivies d'inondations dans toutes les régions de la Roumanie ainsi qu'en invasions de criquets de 1780 jusqu'à 1783–1784.

Les dernières décennies du siècle ont été caractérisées par des caprices climatiques: 1782, inondation, sécheresse, grêle, 1783, hiver dur «*trois blizzards et de la neige jusqu'au toits des maisons*» (C. Manoli, cf. Cernovodeanu, Binder, p. 167); 1784, la couche de neige, en fondant, a provoqué le débordement des rivières, suivie d'un hiver précoce, avant les vendanges; 1785–1786, des pluies torrentielles et des inondations associées aux épidémies sporadiques de peste; 1787, hiver rigoureux, famine, pillages, les gens mangeaient du pain fait d'orties, d'écorces d'arbres, d'épis de maïs, ainsi que la mort de nombreux troupeaux de moutons. Ont suivi des dévastations, émigrations, épidémies (la peste, le scorbut, la fièvre typhoïde). Pendant la guerre austro-russo-turque de 1787–1791, les forces russes ont occupé la Moldavie et les troupes autrichiennes, la Valachie. L'hiver de 1789–1790 a commencé au début de novembre, avec des tempêtes de neige et du froid. Le voyageur et l'écrivain allemand Johann Lehmann se souvient : «*Un hiver terrible a commencé, les paysans ont été bloqués sur la route couverte de neige, la neige a dépassé la hauteur des maisons, la nourriture et les provisions ont été enterré dans la neige... l'hiver a maintenu la population dans la pauvreté et le besoin, et le résultat a été, comme toujours, la maladie*».

L'été 1790 n'a été plus confortable. Le comte Roger de Damas, officier français, volontaire dans l'armée russe a écrit: «*Le 6 juillet, avec mon régiment, j'ai pris la route, difficile en raison de la chaleur extrême... j'ai traversé la rivière Prut. Je ne crois pas qu'en traversant les déserts d'Egypte les troupes auraient souffert plus de la chaleur et du sable que l'armée russe au cours de ce voyage. Tous les régiments ont été touchés par des épidémies, qui ont tué un grand nombre de soldats ...*». Cette guerre a déterminé la fixation de la frontière avec la Russie (1792) au fleuve Dniestr, ce qui a été le début d'un grand danger, pas seulement pour la Moldavie. Le retrait des troupes étrangères a apporté la pauvreté, la désolation, la peste.

Dans les années 1792–1784, de nouvelles catastrophes climatiques: en 1792, 1793, débordement des eaux, en 1794, sécheresse, tarissement des puits, famine, les autorités impériales ont envoyé, par le

Danube, des graines pour le pain et l'ensemencement; en 1795, un hiver sec et froid, suivi d'une sécheresse, la disette, des températures de -30^{0}C en Transylvanie, gel des rivières, à nouveau la sécheresse estivale et la peste, qui s'est poursuivie en 1796, avec des milliers de morts en Valachie et en Moldavie. En ce qui concerne l'épidémie, le médecin Andreas Wolf a souligné dans sa monographie consacrée à la Moldavie: «*La peste, cette épidémie meurtrière, provoque à plusieurs reprises le dépeuplement en Moldavie, le plus douloureux étant dans les zones rurales. La maladie vient toujours de Turquie, par les marchands turcs et grecs ... si ce pays, qui est tant affligé maintenant, avait la chance d'être dirigé par un régime plus fort et plus soucieux, il est certain qu'il prendrait des mesures plus efficaces et plus rationnelles, que celles qui sont en cours, visant à protéger les habitants de cet ennemi mortel*». En 1797, encore des tempêtes de neige en hiver, suivies d'une sécheresse persistante, puis arrivent la pluie et la grêle, mort d'animaux, prix élevé de la nourriture, des sauterelles, les maladies de nutrition se multiplient, notamment le scorbut, en raison d'une alimentation déficiente. En 1798, un hiver rigoureux, cherté de la vie, famine, et inondations à la fonte des neiges.

Au cours de ce siècle, la baisse de la population a été néanmoins plus faible que dans les siècles précédents, grâce aux mesures prises par les dirigeants: nombre croissant d'hôpitaux et système de quarantaine, croissance du personnel médical, importations de céréales, stricte conservation et distribution des produits alimentaires. Dans certaines des périodes les plus aiguës de la crise, la mortalité a atteint un quart ou même la moitié de la population, mais, dans les meilleures périodes, la natalité a progressé. On a enregistré des migrations de la population d'une province à l'autre, en raison des épidémies et de la famine, mais aussi à cause des persécutions ethniques et religieuses, surtout en Transylvanie, où les Roumains représentaient 63,5%, de la population (principalement orthodoxe et, en moindre proportion, gréco-catholique); mais ils n'avaient pas les mêmes droits civiques que les Sicules, les Hongrois (24,1%) et les Saxons (12,4%), de confessions luthérienne, catholique, calviniste, unitariens etc.

Ajoutons que les premières observations météorologiques ont été faites dans les dernières décennies du XVIII^e siècle et poursuivies au XIX^e siècle: en 1770–1774 à Iaşi, en 1780–1803 à Timişoara, en 1780–1790 à Sibiu, et à Bucarest de 1773 à 1849, en général effectuées par des médecins et pharmaciens.

LE XIX SIÈCLE

Le siècle a commencé par une entente entre l'Empire Ottoman et l'empire de Russie, ce qui a conduit à l'occupation de la Bessarabie par la Russie en 16/28 mai1812 (jusqu'en 1918).

Dans les premières décennies du siècle, les premiers points météo ont été crées, initialement non organisés, dans des maisons privées ou des hôpitaux dont les données ont été publiées dans des revues locales (Abeille roumaine, Le messager roumain, Journal de la Moldavie, Annales de Braşov, Isis, Nature etc.).

La première station météorologique a été crée en 1833 à Cluj. Puis d'autres ont suivi en 1851 à Sibiu, en 1857 à Bucarest-Filaret et Sulina, la dernière sous le patronage de la Commission Européenne du Danube, etc. En 1886, a commencé à fonctionner la première station dans les Carpates, à Sinaia à 879 m altitude, suivie en 1926, à Păltiniş-Sibiu (1400 m), en 1927, au Pic Omu (2504 m) et à Predeal (1033 m). L'Institut météorologique a été fondé en 1884 sous la direction du physicien Ştefan Hepites, qui a réalisé une station à Brăila en 1878, où il a fait des observations horaires, parfois pendant la nuit, tandis que son frère Alexandre, avait établi une station météorologique à Galaţi. Ce réseau de stations météorologiques et les stations des précipitations s'étendent à tout le pays. Les données météorologiques sont publiées de 1892 dans le Bulletin météo mensuel.

Parmi les années les plus remarquables du XIX^{e} siècle, on mentionne l'année 1802 avec un hiver dur et beaucoup de neige, 1803, 1804, 1805 pluvieux, avec des inondations, des récoltes pourries dans les champs, 1824, avec une grande sécheresse, des champs de maïs brûlés, 1830 et 1831, avec des inondations. Des hivers rigoureux en 1858 (janvier et février), 1864, 1874, 1880, 1888, 1893 et 1896 (spécialement en janvier.) Des étés très chauds: 1861, 1866, 1870, 1871, 1874, 1895 et des étés frais: 1864 1875, 1882, (spécialement en août), 1884 (tout l'été).

En 1856, une grande sécheresse, ainsi qu'en 1861, 1865 et 1866, 1873–1875, 1883 (août) 1894 (presque toute l'année), 1896 (printemps et automne), 1898 (automne). Par contre, des années pluvieuses: 1858, 1863 et 1864, 1881(spécialement le printemps), 1882, 1884, (les étés) 1897 (quand on a enregistré à Bucarest en juin, 298 mm la valeur maximale tout le long de la période d'observation).

NB. On sait que l'éruption du volcan Tambora en avril 1815 a provoqué «l'année sans été», (1816), lorsque, en raison des fumées et des poussières des cendres volcaniques, réduisant le rayonnement solaire, on a enregistré sur Terre des températures au-dessous de zéro pendant les mois d'été. Il est intéressant que les jeunes chercheurs de l'Université de Suceava (D. Mihăilă, C. Roibu) et Cluj (L. Buzilă) ont montré, dans leurs études sur les anciens hêtres de Bucovine, respectivement le glacier de la grotte de Scărişoara, dans les Monts Apuseni, que la période la plus fraîche, de ce laps de temps, a été enregistré en Roumanie l'année 1818. (Cf. Teodoreanu 2007).

LE XX SIÈCLE

Le réseau de stations météorologiques a été partiellement détruit pendant la première guerre mondiale. Après la guerre et la réunification des trois principautés, en 1918, le réseau météorologique s'est redressé et l'Institut Météorologique a récolté les données trouvées dans les archives de Vienne, Budapest, Odessa, Petrograd.

Mais les observations sont interrompues à nouveau au cours de la seconde guerre mondiale (quand, pendant deux mois, la Roumanie a perdu la Bessarabie le 26 juin, la moitié de la Transylvanie le 30 août et le sud de la Dobrudja le 7 septembre). Le réseau est reconstruit après la guerre et l'Institut Météorologique de la Roumanie est affilié à l'Organisation Météorologique Mondiale.

Sur le réchauffement climatique, en particulier dans les dernières décennies, constaté par le GIEC en raison de l'effet de serre, les spécialistes roumains ont calculé qu'en Roumanie il y a un réchauffement d'environ 0,3ºC en moyenne, mais le phénomène est plus prononcé dans le sud du pays, avec un maximum à 0,8ºC en hiver (mais quand la variabilité du temps est maximale); par contre en automne on constate plutôt un léger refroidissement, en particulier dans la moitié ouest du pays. Le plus grand réchauffement de 1,9ºC est enregistré à Bucarest, en raison de l'urbanisation (Busuioc 2002, cf Teodoreanu 2007).

Pendant ce siècle, on a constaté des hivers très froids en: 1928–1929, 1939–1940, 1941–1942, 1946–1947, 1953–1954, 1962–1963, 1963–1964, 1966–1967, 1968–1969, 1984–1985, 1986–1987, 1995–1996. On a enregistré de températures absolues minimales, au-dessous -30ºC en février 1929, dans nombreuses localités, en particulier en Transylvanie, et en janvier 1942, dans la plaine Roumaine. Le minimum absolu de -38,5ºC a été enregistré le 25 janvier 1942 à Bod – Braşov, dans le bassin des Carpates, suivi par -38,0ºC le 10 février 1929, au Pic Omu, dans les monts Bucegi.

L'un des hivers les plus durs de ce siècle a été celui de 1954 quand, après une série de six tempêtes de neige en février et températures de -25…-30^{0}C, toute la plaine Roumaine est restée sous les congères, et la capitale, Bucarest, a été pratiquement paralysée, couverte par des couches de neige qui ont atteint 2–4 mètres de hauteur. Des hivers relativement chauds: 1914–1915, 1924–1925, 1938–1939, 1948–1949, 1970–1971, 1974–1975, 1982–1983, 1988–1989. Ainsi, le 7 janvier 2001 on a enregistré

22,2ºC à Oravița dans le sud-est du pays; et en février 1995, 26ºC, à Medgidia, au sud-est, près de la mer Noire. Des étés très chauds: 1905, 1909, 1916, 1927, 1936, 1938, 1945, 1946, 1947, 1950, 1951, 1952, 1963, 1995, 2000, 2007. La température maximale absolue de 44,5ºC a été enregistrée près de Brăila, dans la Plaine Roumaine, le 10 août 1951, suivie par 43,5ºC le 5 juillet 2000 à Giurgiu sur le Danube, et le 8 septembre 1946, à Strehaia en Olténie. Des étés frais: 1913, 1933, 1939, 1940, 1949, 1955, 1965, 1969, 1974, 1976, 1978, 1981, 1982, 1984, 1989, 1993. Des températures négatives ont été enregistrées même pendant les mois d'été, non seulement en haute montagne (à Omu -12,0ºC, le 5 à 6 juin 1939, -8,0º C en 6 juillet 1933 et -7,0ºC, le 20 août 1949), mais aussi à plus basse altitude dans les dépressions entre montagnes, par exemple -1.9ºC, le 27 août 1989 à Miercurea Ciuc. Dans la plaine, les températures minimales absolues pendant les étés frais sont descendues à 4 … 5 ºC.

Des étés avec des sécheresses ont été enregistrés en: 1917, 1945–1946, 1965–1966, 1983, 1985, 1992, 2000, et des étés pluvieux en: 1913–1915, 1970–1971, 1991, 1998–1999, avec inondations et dommages dans les villes et les villages des environs.

Une des périodes les plus dramatiques du XX^{e} siècle a été 1945–1947, lorsque, en raison des étés chauds et secs, des ravages de la guerre qui venait de s'achever et des dettes infinies envers l'Union Soviétique, la famine a fait beaucoup des victimes, en particulier en Moldavie; et, de là, des enfants ont été déplacés vers d'autres régions moins touchées par la disette, pour leur permettre de survivre. Il n'a pas été publié de documents exacts du fait des conditions politiques de la Roumanie pendant ces années.

CONCLUSIONS

Un aperçu du climat dans le centre-est de l'Europe montre une ressemblance avec la variabilité du climat historique découvert en Europe Occidentale. Donc, hivers chauds au cours du Petit Optimum Climatique, hivers froids et étés pluvieux avec inondations sur de grandes surfaces au cours du Petit Âge Glaciaire. Le dix-septième siècle a été le plus froid de toute la période de deux millénaires, notamment la période dite «le minimum de Maunder» (Teodoreanu 2010). Mais le climat n'a pas été uniformément chaud ou froid à l'époque.

Les événements climatiques, hivers rigoureux avec neige prolongée, étés pluvieux avec inondations dévastatrices ou étés de sécheresse, doublés par les conditions de luttes constantes entre les Roumains et les peuples voisins sur le territoire des principautés roumaines, étaient généralement accompagnés par la famine, les maladies, en particulier la peste, entraînant une morbidité et une mortalité accrues.

Il est intéressant de faire une comparaison entre les événements météorologiques qui ont eu lieu en Roumanie et celles de l'Europe occidentale, si l'on pense seulement qu'en 2003, en France, une vague de chaleur inhabituelle a sévi, alors que les températures étaient modérées dans l'est; de même en 2007, une vague de chaleur inhabituelle en Europe du sud a été subie, tandis que l'Europe occidentale a connu un été normal.

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Reçu le 17 Mai 2012

THE ANNUAL CONFERENCE OF THE ROMANIAN GEOGRAPHICAL SOCIETY

MAY 31 – JUNE 3, 2012, REŞIȚA

Scientific and teaching meetings organised in various parts of the country represent a very important aspect of the activity developed by the Romanian Geographical Society. The event brings together teaching staff from universities, high-schools and secondary schools, as well as researchers from higher education institutions and geographical research institutes. On these occasions the participants present their scientific results, and the progress made in teaching Geography and promoting this discipline of special relevance in the formation of the new generations.

This year the Conference was organised in the town of Reşiţa by the Romanian Geographical Society, the local "Eftimie Murgu" University, Caraş-Severin County Council, the Mayoralty of Reşiţa Municipium and Caraş-Severin Teachers' House. The Conference theme was ***Geographical Space, as Support of the Human Community***. The proceedings unfolded within five sections: Physical Geography, Human Geography, Regional Geography and Geopolitics; Geography and Geography-related Education in Preuniversity Institutions; Geography of Tourism, Services and Trade, and Geography of Environment.

Among the notable communications read in the plenary session, those delivered by Acad. **Dan Bălteanu** on the **EU Strategy in the Danube Region** and Prof. **Pompei Cocean** on **Territorial Cohesion, a Regional Development Desideratum**, aroused special interest.

The papers held within sections highlighted the efforts made by an impressive number of young researchers and teachers in geographical research and education. Young participants also joined the field application in the Semenic Mountains, many of them getting a first-hand knowledge of an area they had never visited before.

Continuing a praiseworthy tradition of the meetings of Romanian Geographical Society members, the event included a two-day trip on Serbian territory, with visits to *Novi Sad* and *Belgrade*, as well as to the monasteries of *Hopova, Velika-Remeta* and *Krusedol*.

Călin Dănuț

Rev. Roum. Géogr./Rom. Journ. Geogr., **56**, (1), p. 87–89, 2012, Bucureşti.

ANNUAL SESSION OF SCIENTIFIC COMMUNICATIONS, THE INSTITUTE OF GEOGRAPHY, ROMANIAN ACADEMY

JUNE 22, 2012, BUCHAREST

Geographical research within the context of the European Union Strategy for the Danube Region

The European Union Strategy for the Danube Region, signed by 14 riverine states of the Danube Basin and adopted by the European Council in 2011, aims at ensuring territorial cohesion and sustainable development within a space characterised by great socio-economic diversity and significant intra-regional disparities. The main objective of the Strategy is to reduce development differences among the states of the Danube Region through sustainable use of Region's territorial potential and local particularities, and through integration of the sectoral development policies and strategies. In this way, the EU Danube Strategy acts as a target of comprehensive macro-regional cooperation among the Danube Region states along four major pillars: connectivity, environmental protection, economic development and governance, which include a number of specific priority areas focusing on issues of environmental risk management, water quality, biodiversity and landscape preservation, promotion of culture and tourism, economic growth, use of energy, increase of institutional capacity, etc. In view of the EU Danube Strategy objectives and areas of actions, geography could play an active role by undertaking research and interdisciplinary projects, closely linked to the objectives of the EU Strategy for the Danube Region.

In this respect, this year the Institute of Geography of the Romanian Academy devoted its annual communication session to studies that could initiate, continue or promote researches that might well fall under the topics of the EU Strategy and meet its objectives. Therefore, the panel presentations focused on interdisciplinary projects and/proposals concerning environmental protection and risks, socio-economic vulnerability and climate change effects on society, scientific services for the policy and decision-making process; integrated systems of data for research applications, particularly in the Danube Basin – Black Sea Continuum; future development perspectives within the context of the new research directions of global sustainability as outlined at Rio+20 Conference in Rio de Janeiro, June 2012; and last but not least, on past researches on the Danube Valley in Romania as an example and starting point for new research applications.

The sections of this annual session were structured into three themes covering several topics of the EU Danube Strategy. Consequently, presentations falling under researches into the European dimension of Danube Valley referred to studies and applications undertaken within interdisciplinary European projects on land use / land cover, geomorphology, hydrology and biodiversity along the Danube Valley. The two other sections were centered on particular case-studies concerning environmental quality and natural hazards, as well as sustainable development perspectives for the economy and local communities along the Romanian Danube Valley. Apart from their relevant scientific results, such particular approaches are reliable premises for interdisciplinary project proposals within the context of the European Strategy for the Danube Region.

Diana Dogaru

INTERNATIONAL PROJECT

The Institute of Geography is the co-ordinator of the Romanian – Bulgarian Project on **Romanian – Bulgarian Cross-Border Joint Natural and Technological Hazards Assessment in the Danube Floodplain. The Calafat-Vidin – Turnu Măgurele-Nikopole sector (ROBUHAZ-DUN)**, financed by the Romanian – Bulgarian Cross-border Co-operation Programme, 2007-2013. The Project is scheduled to develop over an 18-month interval (May 23, 2012 – November 24, 2013).

Partners:

– National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences (IGGG)

– National Institute of Research and Development for Optoelectronics, INOE 2000, Research Institute for Analytical Instrumentation (ICIA), Cluj-Napoca Subsidiary

– Geological Institute, Bulgarian Academy of Sciences (GIBAS)

– University of Craiova, Geography Department

Project manager: Prof. Dan Bălteanu, Director of the Institute of Geography of the Romanian Academy.

The main goal of this Project is the elaboration of a joint digital (GIS) integrated spatial database for the Danube Floodplain sector between Calafat-Vidin and Turnu Măgurele-Nikopole.

The Project is aimed at identifying dangerous natural phenomena (floods, droughts, heavy rainfall and landslides), the major sources of environmental degradation in the analysed area, as well as assessing socio-economic vulnerability to these phenomena. One of the main results is to find joint research methodologies for the elaboration of **tailored maps of natural and technological hazards**.

The outcomes are expected to offer local and regional decision-makers the necessary scientific support in **the management of extreme phenomena and the identification of optimum sustainable development and environmental protection strategies**. Another target is **to raise people's awareness** in responding to hazardous phenomena occurring in the Romanian – Bulgarian sector of the Danube Floodplain between Calafat-Vidin – Turnu Măgurele-Nikopole. This is to be achieved by organising a series of field campaigns disseminating Project results through graphical materials accessible to several target groups (pupils, students, land owners, local decision-makers, etc.).

The Project was officially launched on June 28, 2012 at the Institute of Geography 12, Dimitrie Racoviță st., sector 2, Bucharest, when the First Steering Committee Meeting between partners took place. More information on Project activities and events is available at www.robuhaz-dun.eu.

Mihaela Sima

Sorin Geacu, *Dinamica populațiilor de cervide şi bovide din fauna României* (The dynamics of the Cervidae and Bovidae populations in the fauna of Romania), Edit. Academiei Române, Bucureşti, 2011, 322 p., 81 figs., 123 tabs.

The result of a ten-year persistent in-depth research-work, this volume authored by Sorin Geacu, Ph.D., contains a huge amount of original data obtained by field investigation, information supplied by forest authorities and locals. In addition, there is a consistent material which the author found in profile journals, often of limited circulation, hunting fond and forest management files, various reports, etc. The diversity of the archive and library sources studied enabled the reconstruction of the evolution of the cervid and bovid fauna in Romania and the natural and, moreover, human influences that acted upon it.

The first part of this work, *General Problems*, looks at the numerical fluctuations of these populations under the impact of various factors, population behavior and taxonomy of the studied species and subspecies, the importance of the physical-geographical conditions of their habitat and the role played by man in the dynamics of these populations in Romania's fauna.

Investigations have revealed the direct involvement of man in the shrinking or expansion of the areas of some big mammals in this country through hunting, poaching, but also the deliberate release into new habitats – the relocation or reintroduction of native species and the colonisation of foreign species. These aspects were often ignored in the biogeographical literature. No less important are the man-made landscape changes through deforestations, forestry works, overgrazing, the burning of stubbles, mechanisation and chemisation of agriculture, all of which have drastically limited fauna habitats and food sources. Numerous data reflect the consequences of extreme climatic phenomena (snowstorms, heavy snowfalls, frosty winters), or seasonal droughts and floods, the proliferation of predators and of some epizootics that have led to the diminution or even extinction of some populations, affecting the native species, but especially the newly introduced ones.

The second part, which forms the bulk of the volume, deals with spatial-temporal dynamics over the last two centuries of the four cervid species (red deer, fallow deer, roe deer and moose) and of three bovid species (mouflon, chamois and wisent) constantly or sporadically present in Romania. The red deer, the roe deer and the chamois represent major components of the native fauna, the fallow deer and the mouflon being allochthonous. Accurate data report on a little known situation, namely the spontaneous but temporary, penetration of some stray moose individuals in Romania, mainly in its north-eastern part. An extensive presentation is made of the wisent, an animal with historical connotations that had disappeared from this country in the 19th century. A few individuals have lately been reintroduced and they live in large wildlife enclosures.

The main aspects analysed for each species, in their temporal course, have in view the numerical size and spatial distribution over a few characteristic intervals: before and during the First World War; 1918 – 1948; 1949 – 1989 and 1990 – 2006. Since cervid and bovid species are subjected to excessive or illegal hunting, changes of legislation of property regime, public order and other socio-economic aspects registered within the above intervals, the size of their populations was substantially affected.

Apart from analysing the situation in Romania as a whole, regional aspects (in historical provinces, physical-geographical units or counties) and local aspects are also depicted. A detailed presentation of the numerical variation of foreign species released into the wild is made, with highlight on prosperity periods followed sometimes by drastic diminutions and even the extinction of the respective nucleus due to the natural factors, or to intensive poaching related to some historical events. Distinct sub-chapters discuss the 28 extinct fallow deer nuclei, a species that registered major numerical fluctuations after colonisation (peak values in 1987), yet still well-represented in some lowlands and hillsides and the extinct mouflon nuclei, a species which in 2006 preserved only three micro-populations (all in enclosures).

Some native species would migrate from the area of release to neighbouring regions, e.g. the red deer, to Botoşani, Ialomița, Tulcea and Constanța counties. There are also information concerning the penetration of some red deer individuals from Bulgaria in the south of Romania. The roe deer populations would expand naturally to various sections of the Romanian Plain, to some counties of Moldavia and Dobrogea, the Tansylvanian Tableland and Oltenia; also interesting is the formation of some populations „of the fields" adapted to living outside of the forest. Relevant information refer to the chamois population dynamics in various Carpathian massifs, actions of reintroduction or translocation being discussed in detail and supplemented by an analysis of the newly-formed nuclei. In this way, it becomes clear that considerable efforts have been made to rebuild the chamois populations and extend them to all favourable habitats, but the negative consequences of poaching are not overlooked either.

Statistical analyses and a multitude of maps mirror the temporal course of the territorial distribution of cervid and bovid species throughout the country or in certain regions, their colonisation (indication of the place of origin and the places of introduction), spontaneous expansion of some species from the place they had been introduced in, etc.

The wealth of information and especially a complex outline of the relationship between spontaneous evolution and the direct or indirect impact of human activity makes this work a fundamental contribution to the fauna of Romania. The volume ought to be considered an indispensable source of reference in analysing the biogeographical characteristics at the level of the country and of its physical-geographical units. At the same time, it is helpful in substantiating the management of protected areas, the conservation of biodiversity and the protection of fauna, highlighting the need for the correct management of hunting fonds, intervention in case of detrimental natural phenomena and last but not least, outlining te need to control poaching far more effectively and strenuously than it has been done so far.

Cristina Muică

Rev. Roum. Géogr./Rom. Journ. Geogr., **56**, (1), p. 91–93, 2012, Bucureşti.

Mihaela Sima (2011), *Mineritul şi poluarea râurilor în Munţii Metaliferi. Aplicaţii în bazinele hidrografice ale Crişului Alb şi Certejului* (Minning and river pollution in the Metaliferi Mountains. Case-study: the Crişul Alb and Certej river basins), Edit. Academiei, Bucharest, 254 p., 4 chap., 175 figs., 34 tables, 210 refs., contents and conclusions in English.

Romanian geography is permanently enriched with modern theoretical and practical studies appreciated by the national and international scientific community. Such a study is due to Mihaela Sima, senior scientific researcher with the Romanian Academy's Institute of Geography. The author has a sound set of knowledge acquired during her student years and enlarged in exchanges of experience and documentation stages in Great Britain, USA and Switzerland.

The present work makes a fresh approach to the Geography of the Environment in Romania. The problems tackled highlight the impact of mining on environmental degradation and opens up new vistas for complex interdisciplinary research into the pollution potential of mining areas in line with the European regulations on environmental protection.

The author's successful achievement is based on a multitude of documentation sources (210 references among which 127 from the international literature), field surveys, accurate mappings and samplings, lots of chemical analyses assayed in profile laboratories), collaboration with international teams and renowned specialists from the Universities of Wales (UK), Zürich (Switzerland) and Chile.

It is for the first time in the Romanian specialist literature that the issue of pollutants, the particularly mining-released non-ferrous metals (copper, lead, zinc, gold and silver) is being considered. These elements have a severe degrading impact on all environmental components (landform, air, water and vegetation), affecting animals, and public health. However, water is a most serious problem because rivers carry the chemical pollutants, basically heavy metals, radioactive substances or contaminated sediments, miles away from their source, impairing also the environment of neighbouring countries.

The aim of this work is to arouse the interest of scientists for studying the impact of any type of mining, with emphasis on the companies' obligation to implement environmental protection standards.

As known, mining in Romania has a millenary tradition, but its extensive development in the 19th and 20th centuries is the outcome of the industrial and technical-scientific revolutions (1850 and 1960, respectively). In the 1990s, the closure of numerous pits and processing units did considerably reduce mining activities. For all that, pollutants spilling over into the river channels and floodplains (through overflows, waste dumps on tailings dam failures) continue to contaminate soils and vegetation and impair the health condition of terrestrial ecosystems. Therefore, it is imperative to put in place synoptic surveillance and ecologisation measures at all mining and related processing sites.

Chapter One rings an alarm bell regarding the impact of mining on drainage basins. It is a conceptual and methodological approach to this issue and to the dangerously cascading risks entailed by activities in this field for all the natural and human components of an already critically vulnerable environment that continues it precarious existence. The case-study of two basins – Crişul Alb and Certej (a tributary of the Mureş River) represents a model of research.

The detrimental effect of all pollutants and of mining works themselves (building quarries and tailings dams, storing wastes and spilling over residue into the channel) have been changing the morphology of landforms, stream channels and floodplains, a reality illustrated in this volume with pertinent arguments.

Assessments on the level of degradation based on a complex study of geomorphology, geology, climate, hydrology, biogeography, land use, population and economic factors emphasize the natural potential of the Metaliferi Mountains, where mining is a widespread traditional occupation.

Chapter Three provide major methodological theoretical and applied research contributions. Samples collected during field investigations have been accurately analysed in specialist laboratories in terms of current national and international standards. The interpretation of results, correlated with local geological and geographical particularities and with each impaired environmental component and its state of degradation, contribute to the originality of this approach.

The values yielded by quantitative assayings of heavy metal water pollution by repeated samplings during characteristic seasons and over several consecutive years (2004-2008 in the Crişul Alb Basin and 2003-2009 in the Certej Basin) were in some cases exceeded 1 to over 1,000 times the European Community guidelines.

Since the Certej Basin is by far more affected than the Crişul Alb, Mihaela Sima proceeded to deep drillings in order to estimate the waste stored in floodplain sediments. The findings revealed the presence of some 20,000 tons of heavy metals, mostly zinc and lead, that are very dangerous for long-term pollution, moreover so, as under certain weather conditions and water discharge, waste can be dislodged and carried by the Mureş River over significant distances, becoming even a cross-border hazard.

Deficient management of the Certej tailings dams may become a source of accidents, e.g. the event of October 31, 1971 when over 55,000 m^3 of contaminated mining sterile spilled over, leaving more than 100 people dead, numerous others wounded, destroying six apartment blocks, a workers' hostel, the 250-year-old Museum of the Mine, individual households, etc., and significantly modifying the stream channel. It was one of the most dramatic anthropic hazards in the mining areas.

The present study, which highlights environmental imbalances in those areas, is but a beginning for further interdisciplinary studies on this issue. The author underlines the necessity for implementing ecologisation measures and for monitoring environmental quality by modern methods and new technologies in order to assess the level of degradation and the quality of water in mining sites.

The conclusions reached by the present study are applicable to all similar situations, hence the practical and methodological value of this volume, an excellent achievement of Mrs Mihaela Sima. Sincere congratulations.

Octavia Bogdan

Viorel Chendeş (2011), *Resursele de apă din Subcarpaţii de la Curbură. Evaluări geospaţiale* (Water resources in the Curvature Subcarpathians. Geospatial assessments), Edit. Academiei Române, Bucureşti, 339 pages, 9 chapters, 230 figs., 54 tabeles, contents and conclusions in English.

Present-day research is called to respond to a major challenge, mainly to assess, over a short period of time, existing water resources by means of high-accuracy spatial analysis. The aim is to meet the needs of a society facing a great incidence of hazardous hydro-meteorological phenomena, as well as to manage and protect water resources in an adequate manner. Water and water resources and all related aspects of securing societal needs were among the priority topics discussed at the Rio+20 meeting – the United Nations Conference on Sustainable Development. The Conference held in June 2012 made a firm statement, reiterating the political commitment to work towards sustainable development and strengthen co-operation in matters of water resources management.

The present volume on the above topics is due to an experienced researcher in the use of GIS and hydrology. Viorel Chendeş puts forward a modern methodology of spatial analysis regarding water resources and river regime in line with international research. This methodology represents an improvement of classical methods by establishing river discharge regionalisation relations and some complex indices. In this way, the author could integrate into the GIS analysis the relevant factors in the formation of water discharge and elaborate some statistic-spatial relations that can be applied also to unguaged river basins. This method is of exceptional practical utility in the study of river regime.

In the nine chapters of this work the author elaborates on the theoretical aspects of GIS utilisation, making a complex physico-geographical analysis of the Curvature Subcarpathians, identifying the factors involved in discharge and sediment load and corresponding spatial indices, also analysing average, maximum and minimum flow-rates on the main watercourses of the study area. Chapter one, clearly and synthetically structured, provides the theoretical and methodological framework necessary to using GIS in hydrology. It is actually kind of guide-book to GIS utilisation. As a matter of fact, each chapter makes a detailed presentation of GIS-based operations and functions underlaying the present study. The volume represents a valuable and extremely original contribution to the spatial analysis of the physico-geographical factors involved in the formation of river discharge, the author adapting or elaborating a number of very important qualitative and quantitative indices such as, Homogeneous Slope Index; Topographic Position Index; Landform Complexity Index; classification of lithological formations in terms of rock resistance and permeability, etc. These elements have been adapted to and integrated into GIS-related spatial analysis. In this way, the author could develop new spatial correlations between the physico-geographical factors participating in the formation of river discharge and sediment load specific to the Curvature Subcarpathians, also correcting existing relations (e.g. between flow-rates and basin area by including the lithology class and other conditioning factors in the relation). These analyses were based on hydrological data obtained from an impressive number of river-gauge stations (68) situated in the Curvature Carpathians and the limitrophe mountainous or lowland sectors, fact that fully validates the results obtained. Noteworthy is the elaboration of the GIS-based maps of mean specific discharge which rely on the Digital Elevation Model and the calculation of relations between average discharge and altitude, the GIS-related operations made for the purpose being presented in detail. The geospatial data-base produced by the author enabled him to develop some major correlations for analysing maximum and minimum flow-rates and their return period, particularly relevant for suspended sediment load, a very important aspect of water regime in the studied Subcarpatian area. According to estimates, this area features the highest suspended sediment load, reaching elevated values, over 25 t/ha/year, especially in the drainage basins of the Câlnău, Râmnicu Sărat and Milcov. In order to identify the physico-geographical variables contributing to sediment formation, the author uses a so-called physico-geographical correlation coefficient, which takes into account several determinants: rock, slope, precipitation, land use, etc. A notable aspect is the critical selection of appropriate indices and indicators and the considerations made on the advantages and disadvantages offered by each of them in terms of the function and purpose of the respective study. The analysis of liquid discharge in the Curvature Subcarpathians, and the assessment of water resources shows the area to hold an intermediate position between its neighbouring mountainous and lowland zones, having the highest suspended sediment load.

The importance of this volume is twofold: scientific and practical, the GIS-based analysis of the physico-geographical factors involved in the formation of discharge representing an original approach of great interest to researchers, practician hydrologists, students and decision-makers in water management.

Mihaela Sima