

## **THE IMPACT OF CHANGING LAND USE UPON THE ENVIRONMENT IN THE METROPOLITAN AREA OF BUCHAREST. PRELIMINARY CONSIDERATIONS**

DAN BĂLTEANU\*, INES GRIGORESCU\*

**ABSTRACT** - In this paper we highlight the major changes in land use during the transition from the centralised to the market economy (1989-2005). Agricultural de-collectivisation and privatisation have caused major structural changes in land uses with direct effects upon the quality of the environment. An urban area appeared around the metropolis where the most important environmental changes took place by dint of those from agriculture, because of agricultural policies and urban expansion. Within the interior ring of the metropolitan area several regional disparities have been highlighted. These are caused by the unequal development of its southern and southeastern areas, on the one hand, and of the western area, on the other hand.

**Key words:** Impact, land use, environment, metropolitan area.

### **INTRODUCTION**

The population of the big cities exerts high pressure upon the environment of the neighbouring areas because of the tendency to widen the residential space, by dint of resource consumption in the metropolitan areas and because of the attraction and great migration of the population towards the metropolis. This pressure causes a radical transformation of the terrestrial cover and land use, the environmental impact being differentiated according to the distance from the metropolis and certain axes of anthropic activity concentration. As a whole, urban expansion accompanies land fragmentation and land use diversification as well as high pressure upon water resources, agricultural land, and biodiversity.

The Metropolitan Area of Bucharest is about to be created. Several variants have been proposed by now (Bălteanu, Grigorescu, 2005). For this paper we have chosen the variant used by the National Research Institute – Development for Urbanism and for the Arrangement of the Territory (URBAN PROIECT).

After analysing several cases studies, significant differences have been highlighted between the different sectors of the Metropolitan Area of Bucharest and they have been included into the general context of sustainable development perspectives.

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Due to its position in the Romanian Plain, the Metropolitan Area of Bucharest reflects the environmental peculiarities of this relief unit. The Romanian Plain has always been an agricultural rural space because of its favourable natural geographic and because of the social and historic circumstances characteristic of this space situated between the Carpathians and the Danube. Agriculture has been its main function (*Geografia României, vol. V, 2005*). Thus, out of the total of 513,056 ha, representing the total surface of the Metropolitan Area (without the Municipality of Bucharest itself), the highest percentage of land is for agricultural use, i.e. 71%, namely 4,081,873 ha out of which: 387,332 ha arable land; 4,324 ha orchards and fruit-tree nurseries (4%); 3,038 ha vines and vine nurseries (1%); and 13,479 ha meadows (10%). In addition to these, the forested areas occupy 53,446 ha (10%), the areas occupied by buildings

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\* Romanian Academy, Institute of Geography  
E-mail: IGARgeoinst@rnc.ro

55,597 ha (10%); and the water areas 3,038 ha (1%) (Figure 1). According to the land use map (Figure 2), the agricultural land occupies most of the territory and this explains its impact upon the environment as a result both of the agricultural practices and the policies that impose its differentiated management.

The agricultural activities put great pressure upon the environmental components and there are obvious effects to be identified for the biotic regeneration potential level, biologic diversity, level of environmental balance, resources, air, soil, potential buildings, and potential of the entertainment resources.

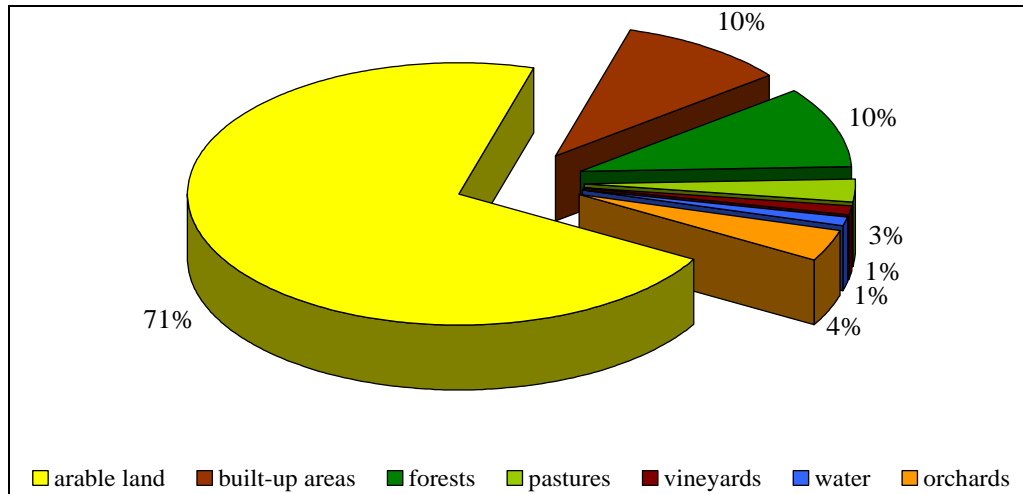


Fig. 1. Percentages of different land use categories in the Metropolitan Area of Bucharest (Corine Land Cover, 2000).

The use of agricultural land, the dimension and the density of settlements and exploitation may be approached according to their qualitative and quantitative impact upon the environment. The changes in agricultural land ownership have had an essential role in the pressure of agricultural activities and their impact upon the natural and, then, upon the anthropic environment.

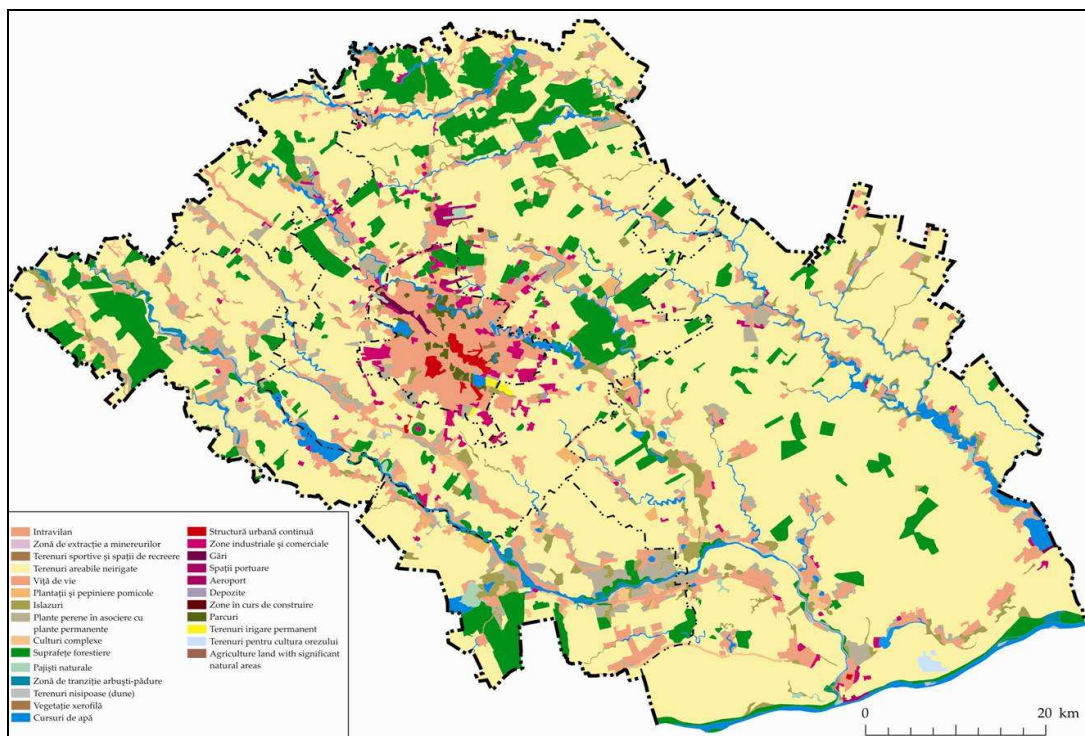


Fig. 2. Land use in the Metropolitan Area of Bucharest, Corine Land Cover 2000. Source: Simion, 2005.

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In this context, agricultural policies have brought relevant changes in the quality of the environment. Moreover, these policies determine the present agricultural practices. Land use changes represent a major form of anthropic impact in the Metropolitan Area of Bucharest. In addition, we mention the differentiation of agricultural practices and the sub-urbanisation process.

### THE MANAGEMENT OF AGRICULTURAL LAND AND THE IMPACT OF AGRICULTURAL ACTIVITIES UPON THE ENVIRONMENT

Transferring certain plots of land from one use to another has begun during the transition period while transferring the land from the cooperatist-collectivist state ownership to private ownership (*Popescu et al., 2003*).

The first great structural changes in agricultural land use took place during the 19<sup>th</sup> century. After the Treaty of Adrianopole (1829), when the export possibilities became greater and the interest in cereal production increased, the great landowners of Wallachia and Moldavia intensified their efforts to increase agricultural land by ploughing the steppe and cutting the forests in the Vlăsiei Plain. Thus, during the first six decades of the 19<sup>th</sup> century, the lands of the Romanian Plain changed radically.

Another important phase was from 1966 to 1989 and it was influenced by the collectivisation of agriculture and its transfer to the state ownership, as well as by rapid urbanisation and forced industrialisation (*Apostol, 2002*). Land betterment works and the merges of former private properties into big state-owned structures and production cooperatives during the communist period had significant effects upon the structure of land use categories, too. Large plots of land in the Romanian Plain, some of them included into the Metropolitan Area, were modified by building dams, drainage, and irrigation systems. In addition, the area the meadow of the Danube included into the Metropolitan Area - an area with the highest instability in land use because of the floods - underwent great changes as a result of the regularisation works of rivers and lakes which had been intensified, especially, since 1962. There had also been dam building, drainage system creation, and regularisation activities since the beginning of the 20<sup>th</sup> century.

After 1989, *the process of transition from a planned economy to a market economy has included agriculture*. Unlike other former Communist countries that have chosen to give the land back to its former owners by offering certain financial stimuli and giving a new juridical status to the former state and collectivist ownership, Romania has focused upon the de-collectivisation process (*Geografia României, vol. V, 2005*). The enforcement of the laws on land (*Law no. 18/1991 on Land, modified by Law no. 169/1997, and Law no. 1/2000 concerning the reconstitution of the ownership right for the agricultural and forested areas claimed according to Law no. 18/1991 on Land and Law no. 169/1997*) in order to give agricultural land back to its (pre-collectivisation) owners or to their heirs generated frequent structural changes in land dimensions and use. This process was accompanied by the destruction and the sales of the collective assets of the former Agricultural Production Cooperatives and State-owned Agricultural Farms.

On the other hand, new types of agricultural exploitation have appeared. These are well represented in the Romanian Plain and have a uniform distribution in the Metropolitan Area: the small and poorly equipped (individual or family) *traditional peasant's households*, *the agricultural businesses* (former State-owned Agricultural Farms), and *the associative structures* (*family associations, agricultural businesses with a juridical status*).

**The individual** exploitation is small (2–3 ha on an average) and it is part of subsistence agriculture. It does not correspond to the exigencies of the market economy. Within the Metropolitan Area, obvious spatial differentiations appear in connection with the average surface: in the commune of Frăsinet (Călărași County) the average surface is 2,2 ha; in the commune of Snagov (Ilfov County) – 1,25 ha; in the commune of Valea Dragului (Giurgiu County) – 2,4 ha (according to the *General Urban Plans* of the communes under scrutiny).

**The agricultural businesses.** In 1991, the former state-owned farms were reorganised and transformed into *businesses* according to *Law no.15/1990 on the reorganisation of the state-owned economic units as autonomous agencies and businesses* and according to *Law no. 31/1990 on businesses*. The agricultural surfaces of these *businesses* where most of the capital is state-owned belonged to the former state-owned agricultural farms and were public assets. The individuals whose land was under the

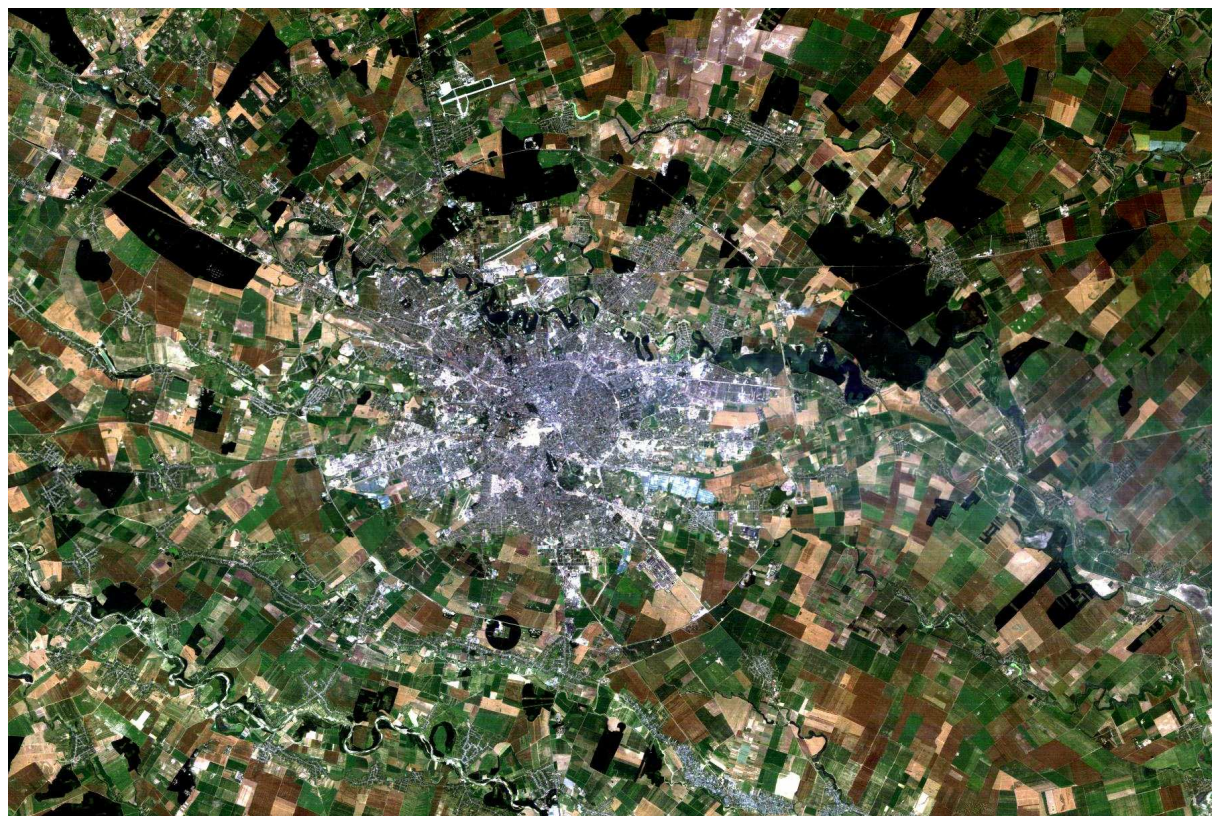
management of the existent businesses could become shareholders according to *Law no.18/1991, art. 36* and *Law no. 16/1994 on renting*.

*The associative structures* appeared as an alternative to the individual farms according to several articles from the *Law on Land no.18/1991*, and the *Law on Associative Structures and Companies with a Juridical Status no. 36/1990*. With or without a juridical status, the associative structures are the most frequent and amongst them *agricultural businesses based on association* are the most numerous.

*Family associations*, without a juridical status, rely on an agreement between at least two families who can use the production, the storage and the processing means and who share the profit from the sales of the goods obtained as a result of their partnership.

The main effects of the enforcement of these laws were the following: the huge *fragmentation* of land and its bad management, land use changes, and the abandonment of most land betterment works, especially the irrigation systems.

*Land fragmentation* has accompanied the process of leaving some plots of land fallow or changes in land use, especially, in the case of individual properties where agricultural land use no longer brought any profit. In some situations the small plots of land are sold or when they have an attractive location they receive several other destinations (residential or entertainment use) as in Snagov, Mogoșoaia, and Corbeanca.



*Fig. 3. The Municipality of Bucharest and its surroundings, Landsat 5 image (TM), 1984.*

This situation is aggravated by both the peasants' lack of interest in tilling the land and the age structure of some communities where there is a high percentage of old people. In the satellite images from Figures 3 and 4 one may notice land use before 1989 (i.e. 1984) when, under the circumstances of the agricultural cooperatist system, agricultural land was more compact and after 1989 (i.e. 2004) when agricultural land looks very fragmented – a situation that is unfavourable for efficient and sustainable use.

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Fig. 4. The Municipality of Bucharest and its surroundings, Landsat 5 image (TM), 2004.

In order to highlight the differences in land management before and after 1989 as a result law enforcement, we have three case studies: the commune of *Frăsinet*, Călărași County with predominant agricultural land use; the commune of *Snagov*, Ilfov County where other land use categories predominate (residential, commercial, etc.) and the town of *Bolintin Vale*, Giurgiu County, where agriculture has not been a significant occupation either before or after 1989.

Before 1989, in the commune of *Frăsinet*, Călărași County, agricultural land was divided into two agricultural production cooperatives: in Tăricești there was 2,477 ha agricultural land (arable land - 2434 ha; pasture - 23 ha; vineyards - 19 ha, and orchards - 1 ha) and in Frăsinet there was 2,427 ha agricultural land (out of which: arable land – 2,061 ha; water + reed – 13.4 ha; unproductive land- 0.17 ha; inner roads – 16.8 ha; buildings (an animal breeding farm) – 14.5 ha, and a vegetal farm – 1,000 ha (cereals and technical plants). In 2005 the agricultural land of the commune was 6,072 ha out of a total of 6,948 ha and it was divided into 20 associations, businesses, and family associations, the remaining land was divided even among individual farms with an average surface of 2,2 ha/household, which shows a high level of fragmentation.

Before 1989, in the town of *Bolintin Vale*, the agricultural production cooperatives had 2300 ha where about 90% of the population used to work. After enforcing the *Law on Land*, the average surface owned by a household does not exceed 1 ha, which shows a fragmentation level higher than in the other localities of the Metropolitan Area. This is because agriculture is not the population's main occupation, people are, especially, involved in civil construction activities. At present, in *Bolintin Vale*, there is no form of agricultural association and many plots of land are fallow.

Before 1989 the commune of *Snagov* had a total surface of 5,698 ha, there was an agricultural production cooperative in each of its 5 villages. After 1989, as a result of enforcing the *Law on Land*, there was a lot of land fragmentation and the average surface owned by a household is 1,2 ha, much less than in the other communes of the Metropolitan Area. 6 agricultural associations were afterwards organised (three of them in Tâncăbești, one in Snagov, and one in Ghermănești) with a surface that does not exceed 800 ha for each of the associative structure.

In the Metropolitan Area the ratio between the agricultural surface and the number of people has an average value of 0,92 ha/inhabitant. The highest values of anthropic pressure because of agricultural use (over 2 ha/inhabitant) exist in the communes situated in the Mostiștei Plain (Gurbănești, Belciugatele, Frăsinet, Valea Argovei, Sinești, and Tărtășești). This is because of the important agricultural potential in

these communes. The lowest values (under 0,4 ha/inhabitant) are in the communes in the proximity of Bucharest: Pantelimon, Jilava, Popești-Leordeni, Voluntari, and Glina, etc. Giving up vine growing in around villages and leaving some plots of land fallow, especially in the Mostiștei Plain, has facilitated land degradation (Apostol, 2002).

**Urban sprawl** is the explosive extension of the metropolitan areas. This process has had major effects on the quality of the environment in the area situated in the proximity of Romania's capital.

At the metropolitan level, Van den Berg et al. (1982) (quoted by Petsimeris, 2003), proposes the urban cycle model in order to analyse the temporal evolution of a functional urban region. The Functional Urban Region (FUR) consists of a *core* and the periphery or the *ring*. These are defined according to the relations established between the two entities. According to this model, the life of a city develops into four main stages: urbanisation, sub-urbanisation, de-urbanisation, and re-urbanisation, all of them with a direct effect upon the urban environment.

- *Urbanisation* is characterised by the rapid expansion of urban areas. Because of industrialisation, during this stage, the main processes of population concentration (people come from the hinterland or from other regions) take place in the centre;
- *Sub-urbanisation* is characterised by an intense process of moving both the population and its economic activities from the centre to the hinterland, the effect of this phenomenon is urban diffusion; at the same time one can notice increasing interactions between the urban zones through mobility, migration, and innovation;
- *De-urbanisation* is characterised by the numerical decrease of people and jobs. This affects the entire agglomeration (FUR). During this stage, the small centres or the periurban space increase their economic activities and the number of people;
- *Re-urbanisation* is characterised by the regeneration of the centre. During this stage one can notice the increase in the centre (interior) of the cities due to the rehabilitation and renewal of the historical centres.

The European de-concentration processes and their effects on the quality of the environment can be evaluated according to the above-mentioned notions. The core and the ring are interdependent from the residential and job location point of view. Thus, they point to the dimension and the dynamics of the anthropic intervention upon the landscape as a spatial and temporal projection of the environment. Under these circumstances, the higher living standards, the growth of the urban population and of its mobility, the easy access to transportation and public utility facilities, land use changes, etc. are direct or indirect consequences of these interdependence relations between the city and its surroundings. The rural area is the most responsive to the changes brought by urban sprawl and its effects can be noticed in all the environmental components, with decreasing intensity from the city towards the surrounding areas.

For instance, in the territorial expansion models of Athens and Rome one can notice linear tendencies of urban development along the main transportation axes as well as the appearance of residential zones outside these cities (Petsimeris, 2003). The astronomical prices of land and the absence of *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 the laws that allowed the fragmentation of big plots of land without any previous zoning of the territory or control of the architecture of the new buildings. For instance, air-photograms show that during 1960-1980 the urban sprawl of Rome, the capital of Italy, had the form and the dimension of a discontinuous megalopolis. During this period *abusivismo* (illegal urban development) had become a usual practice in urban development (Isolera, 1980 quoted by Petsimeris P., 2003). The above-mentioned authors highlight a general development model of the South-European metropolises under the circumstances of an urban evolution similar, in some aspects, with the spatial dynamics of the Municipality of Bucharest.

In the process of *sub-urbanisation* the urban residential areas expand to the rural ones, a phenomenon specific to the metropolitan areas surrounding the great cities. During this process, plots of land are taken out of the agricultural circuit in order to be given residential, commercial uses, to be used by public institutions, use and for storage areas. This phenomenon is obvious in the commune of Snagov where, between 2000-2005, over 1,000 ha were given use in the inhabited area in connection with the tourist functions of this locality. Major changes in land use are caused by local and regional impact projects such as

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the Dracula Park to be built between Snagov and Gruiu localities (on the land of the former Carpathians Holding which is, partially, in public property through RA-APPS (*Regia Autonomă-Administrația Patrimoniului Protocolului de Stat*) (*The Autonomous Agency- the Management of the Public Ceremonial Patrimony*), a golf playground, a hippodrome, as well as the Bucharest–Brașov Highway (*Planul Urbanistic General al Comunei Snagov, 2005*).

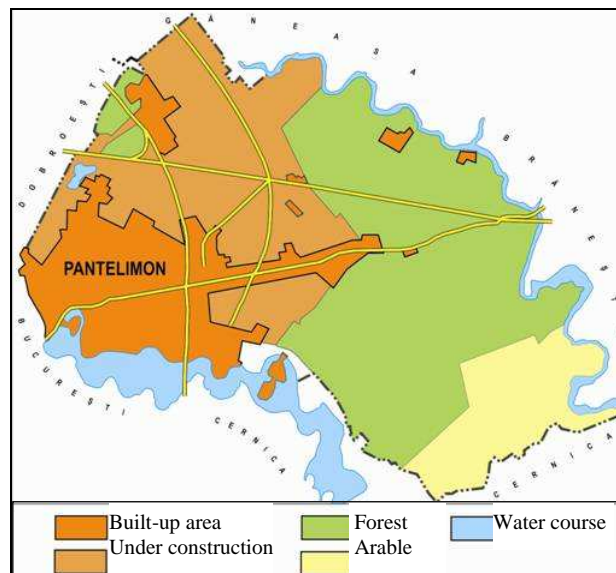


Fig. 5. The recent dynamics of land use in the commune of Pantelimon, Ilfov County (according to the General Urban Plan of the commune of Pantelimon, 2005).

In most cases, the spatial extension of the residential areas has not completely solved the access to transportation as well as the territorial technical infrastructure (water distribution, gas, and sewerage).

Another aspect of land use and land ownership changes is the real estate market. Thus, in the commune of Snagov (very expensive land, elitist residents) the price of a m<sup>2</sup> of land in the inhabited area of the commune (near Snagov Lake) has increased four times from 2004 till 2005.

The tendency to transfer ownership from the local population to outsiders is shown in the demographic dynamics of the respective locality and in the impossibility of including some of the residents in the local population. In the commune of Snagov, the population increases. The extant population is about 8,000 inhabitants, out of them only 5,698 are locals, the others are in transit or they are residents whose main home is in Bucharest.

The analysis of the real estate transactions shows that most of the land has been transferred from those working in agriculture to people who have other occupations, usually outsiders. This emphasizes again the sub-urbanization process in the metropolitan area. At the same time, an incipient real estate market has also appeared in other areas less affected by the impact of urbanisation such as the town of Bolintin Vale where the price of the land in 2005 was 2–3 € (outside the inhabited area) and 10–12 € (inside the inhabited area).

Another effect of the urban sprawl is the absence or the insufficient access to public utility facilities, especially, in the new residential areas. In 2001, only 36 out of the 84 rural settlements of the Metropolitan Area had a centralised system for water distribution, while the other communes got their water from the phreatic layer by means of village fountains (Table 1). In many localities the water distribution system is inadequate as there are big water losses in the distribution network.

Most of the localities in the Metropolitan Area of Bucharest do not have any sewerage networks or water purification stations. In 2001, only 20 settlements (out of the total 94) had sewerage networks but they did not function adequately. In some localities, wastewater flows directly into the river or lake network, without any adequate purification (Pilot study on the Sketch of Territorial Planning of the Metropolitan Area of Bucharest, Phase I – The analysis of the metropolitan development of the Municipality of Bucharest, 2001).

*Table 1. The communes that have a centralised water distribution system.*

County	The communes that have a centralised water distribution system
Călărași	Căscioarele, Ulmeni, Spanțov, Chiselet, Mănăstirea, Valea Argovei, Luica, Ileana, and Fundeni
Dâmbovița	Crevedia and Tărtășeși
Giurgiu	Comana
Ilfov	Bragadiru, Chiajna, Chitila, Jilava, Măgurele, Mogoșoaia, Pantelimon, Balotești, Brănești, Cernica, Ciolpani, Ciorogârla, Corbeanca, Cornetu, Dascălu, 1 Decembrie, Grădiștea, Gruiu, Moara Vlășiei, Nuci, Periș, Petrăchioaia, Snagov, and Ștefăneștii de Jos.

Source: Pilot study on the Sketch of Territorial Planning of the Metropolitan Area of Bucharest, Phase I – The analysis of the metropolitan development of the Municipality of Bucharest, 2001.



*Fig.6. and 7. Household waste, randomly thrown in the commune of Valea Dragului (Giurgiu County) and the commune of Mănăstirea (Călărași County), respectively.*

The use of wood and coal for heating in most individual households has favoured the abusive deforestation with serious negative effects upon the quality of the environment (only 10 localities out of the 94 have a gas distribution network). In most of these localities, the physical and the moral wear of the central heating equipment prevent it from ensuring adequate heating and cause the pollution of the phreatic layer and of the soil (e.g. in Bolintin Vale, Mihăilești, and Niculești).

In the Metropolitan Area, the existence of several inadequate waste deposits or waste deposits created illegally according to the European Union standards determine air and phreatic layer pollution. In many cases, the water from the phreatic layer is the source for drinking water. In the exterior ring of the Metropolitan Area there are many settlements where the household waste is stored by rivers, forests, or along the roads.

## CONCLUSIONS

The increasing urban pressure upon the areas around the Metropolitan Area leads to the diversification of land use and anthropic impact categories upon the environment and it has numerous complex effects upon its components.

Two major directions of the anthropic impact have been identified. At present these generate changes in land use with impact upon the quality of the environmental factors: the transformation of agriculture according to agricultural policies and the urban sprawl through sub-urbanisation. The analysis of these two major causes of environmental changes in the Metropolitan Area of Bucharest has facilitated the



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identification of several intra-regional disparities, according to the dynamics and the intensity of the two vectors of change in the metropolitan environment. In a preliminary analysis, these may be grouped into two areas: the urban area and the exterior metropolitan ring.

**The urban area** includes the localities in the proximity of Bucharest Municipality which undergo urban expansion because of sub-urbanization. The urban area is not uniformly distributed, it is mostly extended towards the northern limit of the Metropolitan Area. The main cause of land use change is the exclusion from the agricultural circuit of several significant plots of land in order to be used for residential, commercial and industrial purposes, etc. The impact of land use conversion is very intense upon all the environmental factors because of the decrease of the forested area, the inadequate access to public utility facilities (water, gas, sewerage), and the inadequate waste management, etc. The localities affected by sub-urbanisation are mostly included in Ilfov County: Pantelimon, Popești – Leordeni, Otopeni, Voluntari, Snagov, and Mogoșoaia, etc. This trend extends towards the neighbouring counties.

**The exterior metropolitan ring** overlaps the river meadow areas of the Argeș and the Sabar rivers in the Mostiștei Plain and in the south-east of the Burnaz Plain where agricultural activities had an important role in modifying the environmental factors even before 1989, the percentage of agricultural land from the total surface being 50%. The period before 1989 meant the collectivisation of agriculture and environmental changes, especially, because of land betterment works.

In the south and the southeastern area of the exterior metropolitan ring, where in many locations agricultural land reaches nearly 90% of the total surface, land fragmentation has accompanied the reintroduction of several traditional agricultural practices. The western area is mainly represented by the Argeș–Sabar river meadow and it offers favourable conditions for growing vegetables. The northeastern area is a transition space between the traditionally agricultural southeast and the residential north. Its potential is not turned into account enough. The favourable elements are the forested areas, the rivers, the transportation network (The Highway of the Sun), etc. The dynamics of the relations between the Municipality of Bucharest and the territory in its proximity requires the development of the transition space between the city and the surrounding localities. This will balance social and economic relations and the protection of the environment in the Metropolitan Area with a view to sustainable development.

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