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The impact of human activities on the environment in the Romanaţi Plain (Romania), during the postcommunist era

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Abstract

The purpose of the article is to present the impact of human activities on natural landscapes in the Romanati Plain. With the change of the communist regime, the form of ownership of the land has changed due to the disappearance of agricultural cooperatives. This has led to land breaking and changing the way it is used. By ccalculating some human environmental pressure indicators, based on statistical data, maps were made using GIS programs, which were then compared and interpreted, thus following the evolution of anthropic environmental impact during the period 1992-2017.

Keywords: *human pressure, Romanați Plain, population density, anthropic activities*

Rezumat. Impactul activităților umane asupra mediului natural în Câmpia Romanațiului (România), în perioada postcomunistă

Scopul articolului este acela de a prezenta impactul activităților umane asupra peisajelor naturale în Câmpia Romanațiului. Odată cu schimbarea regimului comunist, s-a schimbat și forma de proprietate a pământului prin dispariția cooperativelor agricole. Acest lucru a dus la fărâmițarea terenurilor și schimbarea modului de utilizare a acestora. Prin calcularea unor indicatori de presiune umană asupra mediului, pe baza datelor statistice, s-au realizat hărți cu ajutorul programelor GIS, acestea fiind apoi comparate și interpretate, urmărindu-se astfel evoluția impactului antropic asupra mediului, în perioada 1992-2017.

Cuvinte-cheie: *presiunea umană, Câmpia Romanațiului, densitatea populației, activități antropice*

Introduction

The need to assess the human impact on the environment has led to the development and introduction of environmental quality indicators in the international literature, this thing being done by Maruszczak (1988) and Pietrzak (1998), when they assessed environmental quality in the Polish Carpathians.

Pătroescu et al. (2000) made the first hierarchy of the Romanian Plain landscapes and introduced these indicators of environmental quality assessment as a result of the impact of anthropogenic pressure in Romania's literature. In the following years, a number of papers on the environmental quality assessment were published for some of the larger relief units: Oltenia Plain (Dumitraşcu, 2006), Bălăciţa Piedmont (Ionuș et al., 2011), Dăbuleni Plain (Simulescu and Zamfir, 2015), the northern part of the Someşan Plateau (Bogan et al., 2015), or smaller areas: the basin of the Bâsca Chiojdului river (Zarea and Ionus, 2012), Almăj Land (Ianăş, 2013), Ghioroiu commune (Boengiu et al., 2016), the Nera Gorges-Beușnița National Park (Ianăș and Germain, 2018), etc.

Study area

The Romanați Plain (named after the former county of Romanați) represents the eastern subunit of the Oltenia Plain and has an area of approximately 3156 sq. km (being the largest subunit - Badea et al., 2011). It extends between the floodplains of Jiu (west), Olt (east) and Danube (south) rivers, while the northern boundary to the Olteț Piedmont is not so clear, being generally given by the alignment of the localities Craiova - Pieleşti - Balș - Piatra -Olt. Geographically, the plain is situated approximately between the parallels of 43°35' and 44°25' north latitude and the meridians of 23°45' and 24°50' east longitude.

Located in south-western part of Romania, the Romanați Plain has a predominantly agricultural character, so the impact of human activities has played over time a significant role in changing the natural environment. The ancient population of the plain has been highlighted by the numerous archaeological discoveries on its territory, namely the Paleolithic settlements on the Olt valley and the Neolithic settlements in Vădastra commune (Geografia României vol. V, 2005).

The altitudes of the plain descend from north to south, the highest altitudes (190 m) being on the interfluve between Jiu and Teslui rivers, in the northern part of the Leu-Rotunda Plain subunit, and

descend to 20-30 m at the contact of the plain with the Danube's floodplain (Fig. 1).

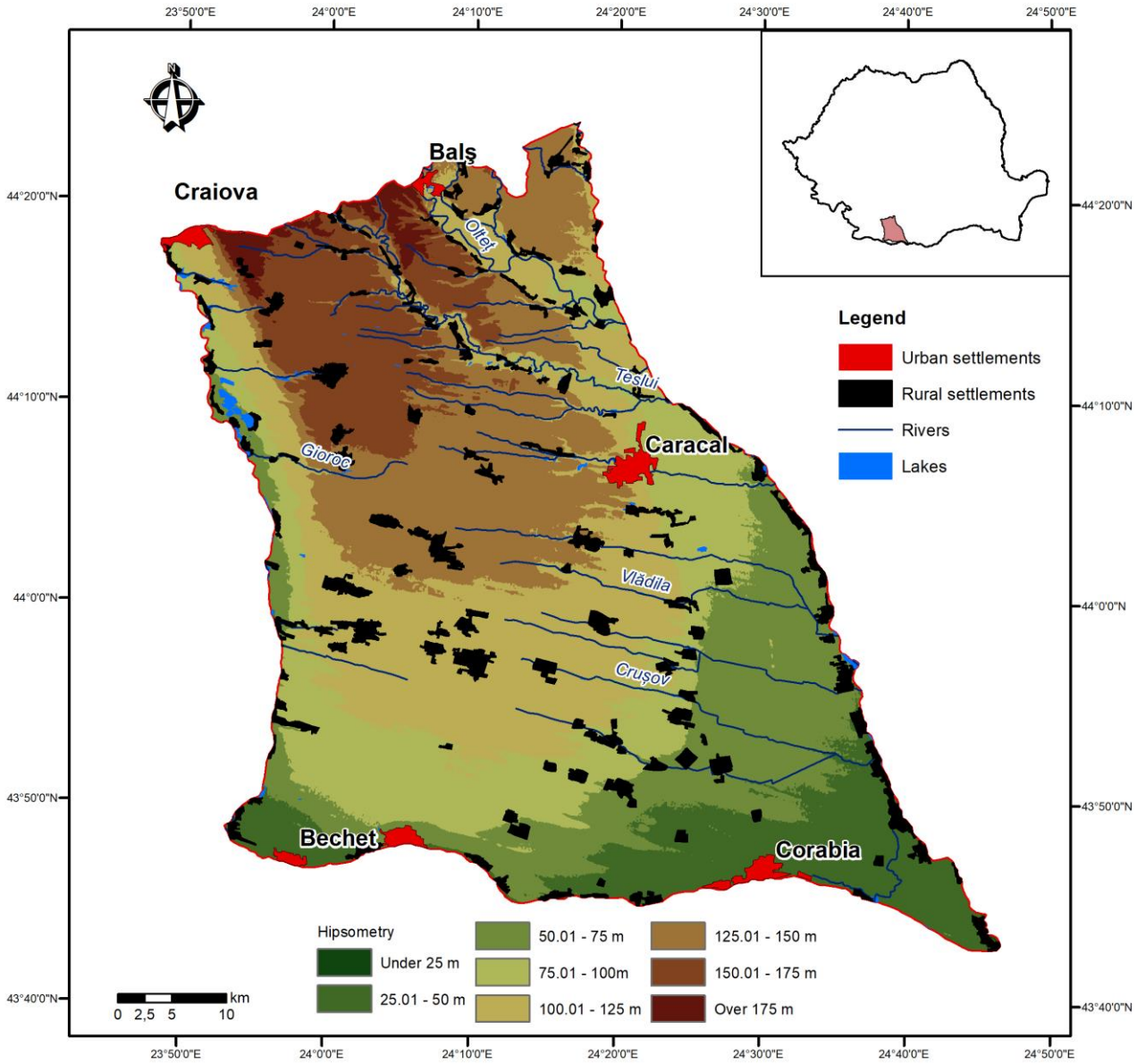

Figure 1: The Romanați Plain – study area

The Romanați Plain is a piedmont plain, with a corrugated surface due to the accumulation of aeolian sands from the Jiu, especially, and the Danube's floodplains, which is affected by deflation and accumulation processes, that shape the areas which are not protected by vegetation.

The deficient internal water resources of the plain corroborated with the high temperatures in the warm season, and the predominantly sandy soils, lead to frequent occurrence of drought phenomenon (Vlăduț, 2007). The De Marton moisture index of 25-26 and the aridity index of 160-210 mm highlight the fact that the Romanați Plain (especially its southern part) has the semiarid and excessively dry type of climate (Vlăduț, 2010; Dragotă et al., 2011).

So, water and climate stress, as well as the intensive cultivation of land, had a bad effect on the initial vegetal formations, leading to a drastic reduction in the number of species and individuals in the flora and fauna species. At present, the natural vegetation covers less than 5% of the study area (Dumitrașcu, 2006).

Thus, in order to assess the anthropic changes on the environment in the Romanați Plain, a number of indexes were selected from the above mentioned literature, such as: population density, landscape artificialization index, naturality index, environmental change index, the index of human pressure on the environment through land use (agricultural, forestry, pasture and hayfields, vineyards, orchards).

Forum geografic. Studii și cercetări de geografie și protecția mediului
Volume **XVII**, Issue **2** (**December 2018**), pp. **123-134**
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Data and methods

In order the calculate the indexes for assessingthe anthropic impact on the quality of the environment, 3 reference years were chosen, namely the Censuses of Population and Housing from 1992 and 2002, and the year 2017, the latter in order to present the current situation. The statistical data was provided by the Dolj, Olt and Teleorman County Statistics Offices.

If for the years 1992 and 2002 the values were calculated for 69 administrative-territorial units, for the year 2017 values were calculated for 78 administrative-territorial units, this being due to the Law No. 84/2004, which provided the administrative reorganization of several communes throughout the country, and the emergence of new administrative-territorial units.

Statistical data were processed using GIS techniques, yielding values for the 3 reference years, for a series of indexes addressing anthropic pressure on the natural environment. The resulting maps and values were then compared and interpreted to give an overview of the impact of human activity on the environment in the Romanați Plain, in the post-socialist era.

For the calculation of the human pressure indicators on the environmental, the following formulas were used:

- Population density

P_d = *No. inhabitants / Total area*

- Naturality index

N_i = *Forest area / Total area*

- Environmental change index

E_{ch} = *Forest + pasture + hayfield area / Built-up area*

- Landscape arficialization index

A_i = *Built-up + industry + communication roads / Total area*

- Human pressure through agriculture

P_a = *Agricultural area / No. inhabitants*

- Human pressure through forest

P_f = *Forest area / No. inhabitants*

- Human pressure through orchards

P_o = *Orchard area / No. inhabitants*

- Human pressure through vineyards

P_v = *Vineyard area / No. inhabitants*

- Human pressure through pasture and hayfields

P_{ph} = *Pasture + hayfield area / No. inhabitants*

Results and discusions

Population density is the first index that was determined and represent the number of inhabitants that live in an area of 1 square kilometer (Fig. 2):

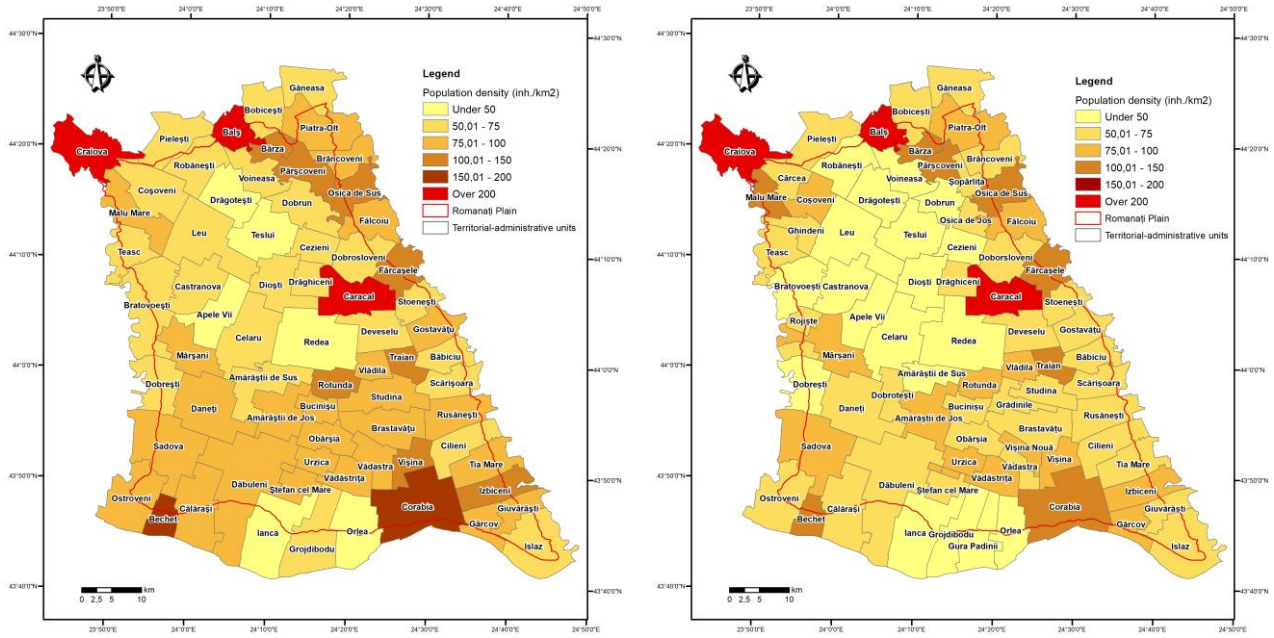

Figure 2: Population density in Romanați Plain (a-1992; b-2017)

In 1992, the total population of the 69 administrative-territorial units comprised in the Romanați Plain amounted 680.126 persons. Most inhabitants were registered in the towns of Craiova (308,810 inh.), Caracal (39,660 inh.), Balș (24,146 inh.), Corabia (22,602 inh.) and Dăbuleni commune (15,048 inh.), while the lowest values, less than 2500 inhabitants, were registered in six communes.

The average population density for the 69 ATUs was 167.69 inh./km^2, the highest values being recorded in the towns of Craiova (5251.87 inh./ km^2), Balș (587.07 inh./km^2), Caracal (569.5 inh./km^2), Corabia (180.86 inh./km^2) and Bechet (150.07 inh./km^2). The lowest values, under 50 inh./ km^2 were recorded in Ianca (45.67 inh./km^2), Orlea (44.62 inh./km^2), Apele Vii (44 inh./km^2), Teslui (42.67 inh./km^2), Drăgotești (42.41 inh./km^2) and Redea (29.26 inh./km^2).

Compared to the year 1992, the total population in 2002, for the 69 ATUs registered a slight increase, up to 685,006 persons, the average population density decreasing from 167.69 inh./km^2 (1992) to 147.36 inh./km^2 (2002). The expansion of some cities, lead to the substantial increase of the total area, thus explaining the high average population density decrease.

As a result of the territorial reorganization in 2004, in 2017, the Romanați Plain included 78 ATUs. The total population has decreased in the studied area by approximately 60,000 persons compared to 2002, to 628,285 persons. The largest number of inhabitants was still recorded in the towns of Craiova (307,290 inh.), Caracal (35,742 inh.), Balș (21,445 inh.), Corabia (18,614 inh.) and Dăbuleni (12,409 inh.). The communes ranking last had less than 1500 inhabitants (3 communes – Șopârlița, Grădinile and Vădastra) and it is worth mentioning the fact that they are not the ones with the lowest values in 1992. This significant drop in population was due to the negative natural growth in rural areas and the migration of young people to cities and aslo to emigration in the better developed countries from Western Europe, in search of a better life.

The average population density decreased from 147.36 inh./ km^2 (2002) to 126.51 inh./ km^2 in 2017, with the highest values being obviously in towns, although decreasing, while in more than half of the communes it was less than 77 inh./ km^2, with values as low as 23.17 inh./km^2 (Redea).

The naturality index represents the ratio between the forest area and the total area (thus determining the degree of afforestation), being calculated at the level of administrative-territorial unit.

Taking into account the values obtained from calculating this index, Ionescu et al. (1989) categorized the degree of landscape damage in 6 categories:

- landscape with ecological balance close to the original one (> 0.60);
- landscape with relatively stable ecological balance (0.45-0.60);
- landscape with weak affected ecological balance (0.30-0.45);
- landscape at the ecological balance limit (0.20-0.30);
- landscapes with strong affected ecological balance (0.10-0.20);
- landscape with very strong affected ecological balance (<0.10).

Being a plain unit and having a predominantly agricultural character, the values obtained for the naturality index (for all 3 reference years), fall within the last four categories of classification, respectively from the landscape with weak affected ecological balance, to the one with very strong affected ecological balance (Fig. 3).

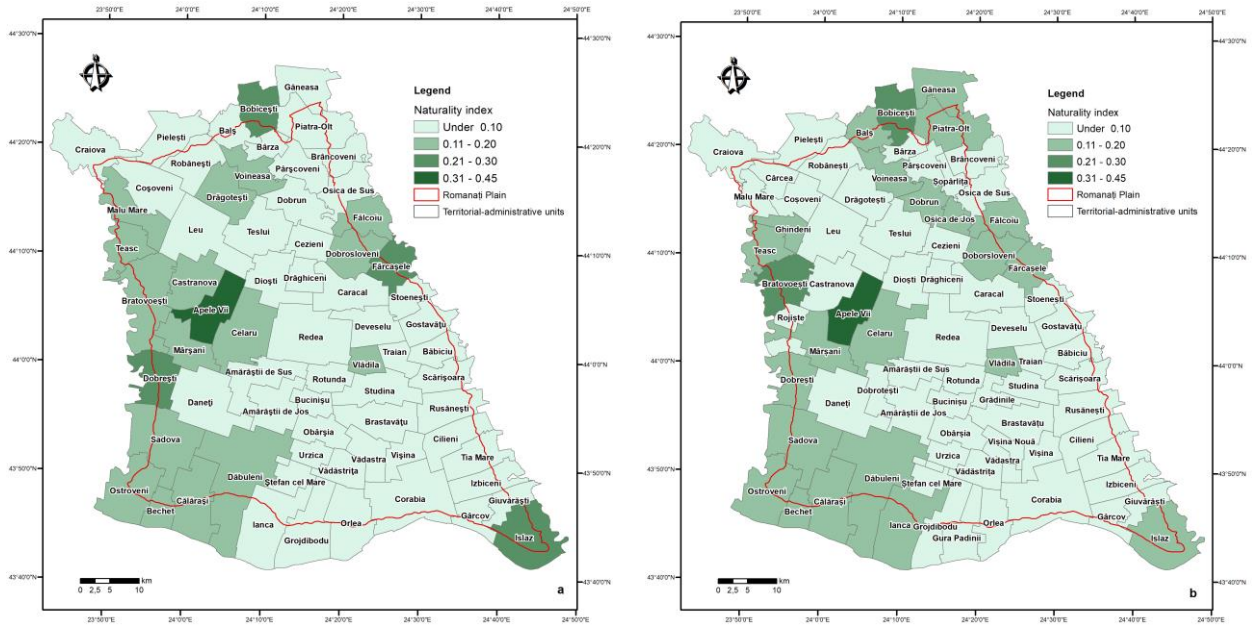

Figure 3: Naturality index in Romanați Plain (a-1992; b-2017)

Forum geografic. Studii și cercetări de geografie și protecția mediului
Volume **XVII**, Issue **2** (**December 2018**), pp. **123-134**
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For the year 1992, the average value of this index was 0.08, the total area occupied by forests being 34,018 ha. The highest values of the naturality index were recorded by the just a few communes (only five registering an index above 0.20). The lowest values were recorded in the ATUs without forests, namely Bucinişu, Craiova, Găneasa, Pieleşti, Redea, Rotunda and Vişina.

Thus, 49 ATUs had a landscape with very strong affected ecological balance, 17 a landscape with strong affected ecological balance, 2 a landscape at the ecological balance limit and only 1 a landscape with weak affected ecological balance.

In 2002, the average value of the naturality index was maintained at 0.08, with the forest area increasing to 35,585 ha.

Regarding the framing in the above-mentioned categories, 48 ATUs had a landscape with very strong affected ecological balance, 18 a landscapes with strong affected ecological balance, 2 a landscape at the ecological balance limit and only 1 a landscape with weak affected ecological balance.

Also in 2017 the average value of the naturality index of the landscape remained constant (0.08), the area occupied by forests slightly increasing to 36,520 ha.

The highest values were recorded in the communes of Apele Vii (0.33), Bobiceşti (0.26), Bratovoeşti (0.26), Fărcăşele and Osica de Jos (0.20). The lowest values were also registered in the communes that didn't own forests, namely Redea, Rotunda, Traian, Vădastra and Vişina Nouă.

Out of the 78 ATUs, 55 had a landscape with very strong affected ecological balance, 20 a landscapes with strong affected ecological balance, 2 a landscape at the ecological balance limit and only 1 a landscape with weak affected ecological balance.

Therefore, between 1992 and 2017, the naturality index remained the same, but the area covered by forests increased from 34,018 ha to 36,520 ha. This was because of the many voluntary actions of afforestation conducted in some communes (Sadova, Dăbuleni, Apele Vii) by diferent NGOs and by the „Rebirth of the Forest" Association, which was formed in Mârșani, with the aim to reforest the unproductive lands from this commune.

The environmental change index was calculated as the ratio between the natural and the anthropic surfaces (Fig. 4). This index was coined by the Polish researchers Maruszczak (1988) and Pietrzak (1998), and was used to assess the environmental changes in the Carpathian region in Poland, and it was calculated using the following formula:

E_{ch} = Forest + pasture + hayfield area / Built-up area

Taking into account the agricultural specificity of the Romanați Plain, Dumitraşcu (2006) adapted the formula for calculating the environmental change index as follows:

E_{ch} = Forest + pasture + hayfield +aquatic area / Built-up + arable + vineyards + orchards area

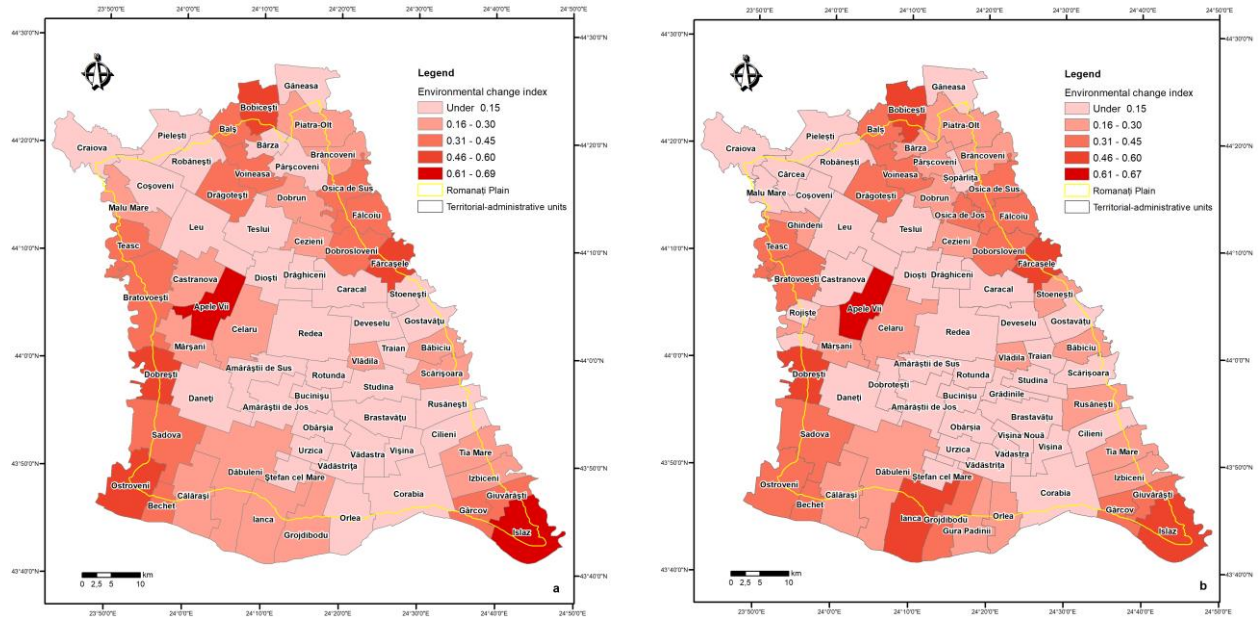

Figure 4: Environmental change index in Romanați Plain (a-1992; b-2017)

In 1992, the average value of the environmental change index was 0.20.

The highest values of this index were recorded in just 6 communes, scattered throughout the entire

analysed area, while 4 other communes and Craiova have an index of less than 0.02. Of the cities and communes included in the studied area, 35 ATUs were included in the category under 0.15, 16 ATUs in the category 0.16-0.30, 12 ATUs in the category 0.31-0.45, 4 ATUs in the category 0.46-0.60 and 2 ATUs in the category over 0.61.

In 2002 and 2017, the average value of the environmental change index remained constant at 0.20. Also, the highest and lowest values of the index remained largely unchanged, as well as the number of administrative-territorial units in each category of values.

Of the 78 administrative-territorial units, 39 were included in the category under 0.15, 18 ATUs in the category 0.16-0.30, 17 ATUs in the category 0.31-0.45, 4 ATUs in the category 0.46-0.60 and 1 ATU in the category over 0.61.

The ***landscape artificialization index*** completes the landscape naturality index and represents the ratio between the built-up areas and the total area of the administrative-territorial unit (Fig. 5).

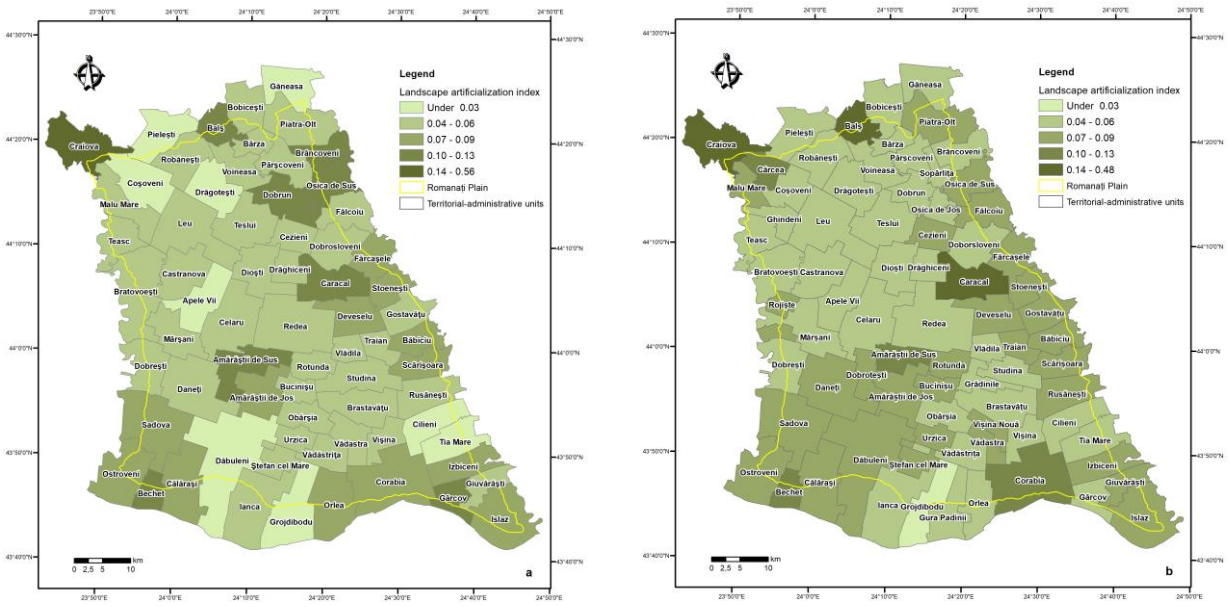

Figure 5: Landscape artificialization index in Romanați Plain (a-1992; b-2017)

In 1992, the average value of the landscape artificialization index in the Romanați Plain had a value of 0.05, the built-up area being about 25,013 ha. The highest values of this indexindex were recorded in Craiova (0.56), Caracal, Osica de Sus and Dobrun (0.13), and the lowest in Coşoveni, Dăbuleni, Pieleşti, Găneasa (under 0.02).

Regarding the framing in the 5 categories of values, 15 ATUs were categorized under 0.03, 36 ATUs in the category 0.04-0.06, 11 ATUs in the category 0.07-0.09, 6 ATUs in the category 0.10-0.13 and 1 ATU in the category over 0.14.

In 2002, the average value of the landscape artificialization index slightly increased to 0.06, and the built-up area increased to 26,120 ha. Craiova (0.47), Caracal, Osica de Sus and Dobrun (0.13) were the localities with the highest values of this indexindex, while Apele Vii, Grojdibodu, Coşoveni and Dăbuleni (under 0.02) recorded the lowest values of the artificialization indexindex of the landscape.

Taking into account the value of this indexindex, 13 ATUs recorded values under 0.03, 38 ATUs values between 0.04-0.06, 11 ATUs values between 0.07-0.09, 6 ATUs values between 0.10-0.13 and 1 ATUs value over 0.14.

Compared to the years 1992 and 2002, the average value of the landscape artificialization indexindex in 2017 slightly increased to 0.07, and the built-up area to 29,725 ha.

In the cities of Craiova (0.48), Caracal (0.16) and Balș (0.14) were recorded the highest values of the landscape artificialization indexindex, while in Orlea, Redea, Tia Mare, Coşoveni (0.03) and Grojdibodu (0.02) the lowest values.

Concerning the classification in value groups, 5 ATUs were in the category under 0.03, 47 ATUs in the category 0.04-0.06, 19 ATUs in the category 0.07-0.09, 3 ATUs in the category 0.10-0.13 and 3 ATUs in the category over 0.14.

Thus, the built-up area increased from 25,013 ha to 29,725 ha, because of the expansion of the built-up areas in cities (Caracal, Corabia, Balș) and rural

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settlements (mainly in the Dăbuleni Plain - south-western part of the Romanați Plain).

Human pressure through agricultural land is an indexindex that represents the intensity of anthropic activity on the environment through the agricultural use of the land in the studied area (Fig. 6). Pătroescu et al. (2000) highlights that human pressure on the environment is even higher as the share of the agricultural area per capita is higher.

According to FAO/UNESCO classification published in "La carte mondial des sols" (1964) 4 categories of landscapes were established:

- territories situated at the limit of maintaining the relative balance of the natural components of the landscape (<0.40 ha/inh.);
- moderately balanced and very weak unbalanced rural landscapes (0.41 - 1 ha/inh.) - characterized by the alternation of cultivated areas and areas with other uses (forests, built-up surfaces);
- heavily unbalanced rural landscapes (1.01 - 2 ha/inh.) - characterized by agricultural crops (the presence of sporadic forest clusters);
- very strong unbalanced rural landscapes (> 2 ha/inh.) - areas where agriculture is intensively practiced.

Dumitraşcu (2006) indicates that the limit imposed by FAO in order to maintain the balance of the environment is 0.4 ha/inh. arable land.

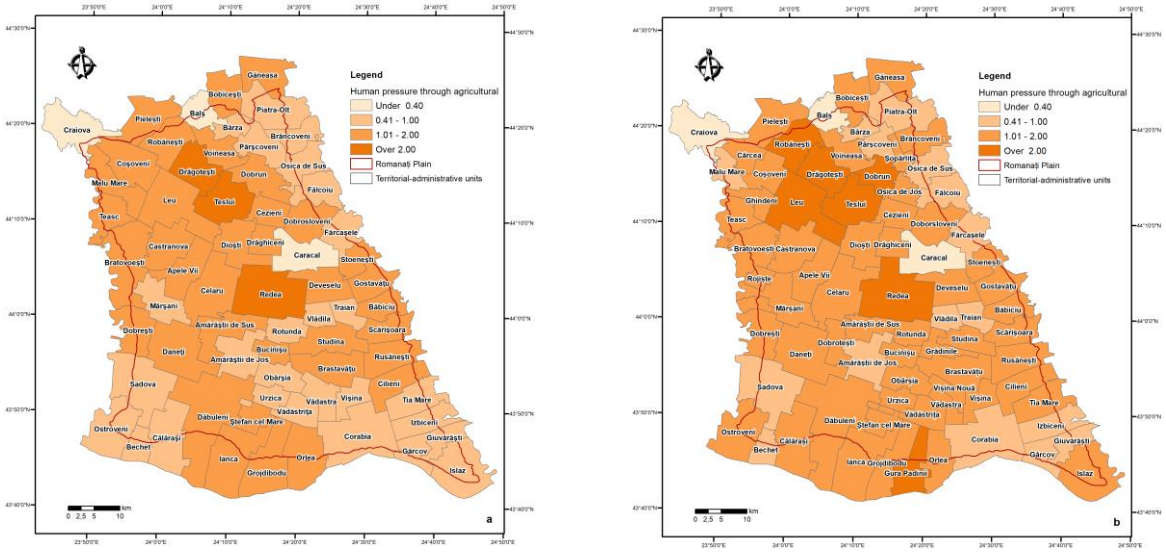

Figure 6: Human pressure through agricultural land in Romanați Plain (a-1992; b-2017)

In 1992, the average value of the human pressure indexindex through agricultural land use was 1.13 ha/inh. The highest values were registered in the communes of Redea (3.24 ha/inh.), Teslui (2.10 ha/inh.) and Drăgotești (2.03 ha/inh.), while the lowest values were in the cities of Caracal (0.15 ha/inh.), Balș (0.13 ha/inh.) and Craiova (0.01 ha/inh.).

According to the obtained values for this indexindex, 3 administrative-territorial units had a relative balance of the natural components of the landscape, 28 ATUs had a moderately balanced and very weak unbalanced landscape, 35 ATUs a heavily unbalanced landscapes and 3 ATUs a very strong unbalanced rural landscapes (Drăgoteşti, Redea, Teslui).

In 2002, the average value of the human pressure index through agricultural land use remained the same, namely 1.13 ha/inh..

As in 1992, the highest values were registered in the communes of Redea (3.74 ha/inh.), Teslui (2.33 ha/inh.) and Drăgotești (2.21 ha/inh.), and the lowest in Caracal (0.15 ha/inh .), Balş (0.14 ha/inh.) and Craiova (0.01 ha/inh.).

Also the classification in the 4 categories of landscapes remained the same, respectively 3 administrative-territorial units had a relative balance of the natural components of the landscape, 28 ATUs had a moderately balanced and very weak unbalanced landscape, 35 ATUs a heavily unbalanced landscapes and 3 ATUs a very strong unbalanced rural landscapes (Drăgoteşti, Redea, Teslui).

The year 2017 brings an increase in the average value of the human pressure index through agricultural land use in the studied area, this being 1.33 ha/inh..

The highest values were recorded in Redea (4.10 ha/inh.), Teslui (2.76 ha/inh.), Gura Padinii (2.63 ha/inh.), Drăgotești (2.42 ha/inh.), and the lowest in Caracal (0.16 ha/inh.), Balş (0.14 ha/inh.) and Craiova (0.01 ha/inh.).

The obtained values revealed that 3 ATUs had a relative balance of the natural components of the landscape, 16 ATUs had a moderately balanced and very weak unbalanced landscape, 53 ATUs a heavily unbalanced landscapes and 6 ATUs a very strong unbalanced rural landscapes (Dobrun, Drăgotești, Gura Padinii, Redea, Robănești, Teslui).

Analyzing the index of human pressure on the environment through agricultural use of the land, it can be observed and increase in the average value of this index, from 1.13 ha/inh. to 1.33 ha/inh.. The highest change in the land use was registered in the Leu-Rotunda Plain (the north part of it), and it was caused by the deforestation of vineyards, orchards and forests, and transforming this land into agricultural land.

Human pressure through forests is an index showing the anthropic pressure on the environment through land use as forests in the studied area (Fig. 7).

The FAO/UNESCO (1964) minimum limit for maintaining the balance of the environment is 0.3 ha of forest per capita.

In 1992, the average value of the human pressure index on the environment through forests was 0.11 ha/inh. (34,018 ha of forests).

The only administrative-territorial units that were above the FAO's established minimum limit were the Apele Vii (0.77 ha/inh.), Bobiceşti (0.40 ha/inh.), Dobreşti (0.38 ha/inh.), Voineasa (0.30 ha/inh.).

The lowest values were recorded in the very poor afforested ATUs (under 0.01 ha/inh.), namely Redea, Pielești, Bucinişu, Găneasa, Vişina, Rotunda and Craiova.

In 2002, the average value of this index was also 0.11 ha/inh., due to both the increase of the number of inhabitants to 685,006 (from 680,126) and the surface occupied by forests (35,585 ha).

The year 2017 brings an increase in the average value of the human pressure index through forests, at 1.13 ha/inh.

This was due to the increase of the afforested surface in the studied area, to 36,520 ha, but also to the decrease of the number of inhabitants by approximately 60,000 persons compared to 2002.

The highest values were registered in the communes Apele Viii (0.90 ha/inh.), Ianca (0.55 ha/inh.), Bobiceşti, Bratovoeşti (0.43 ha/inh.), and the lowest values (under 0.01 ha/inh.) were in Redea, Vădastra, Rotunda, Vişina Nouă and Traian. In this year, 7 administrative-territorial units have exceeded the minimum value (0.30 ha/inh.) of the human pressure index through forests.

The surface covered by forest incresead from 34,018 ha in 1992 to 36,520 ha in 2017, mainly in rural area , in Ianca, Bratovoești and Apele Vii.

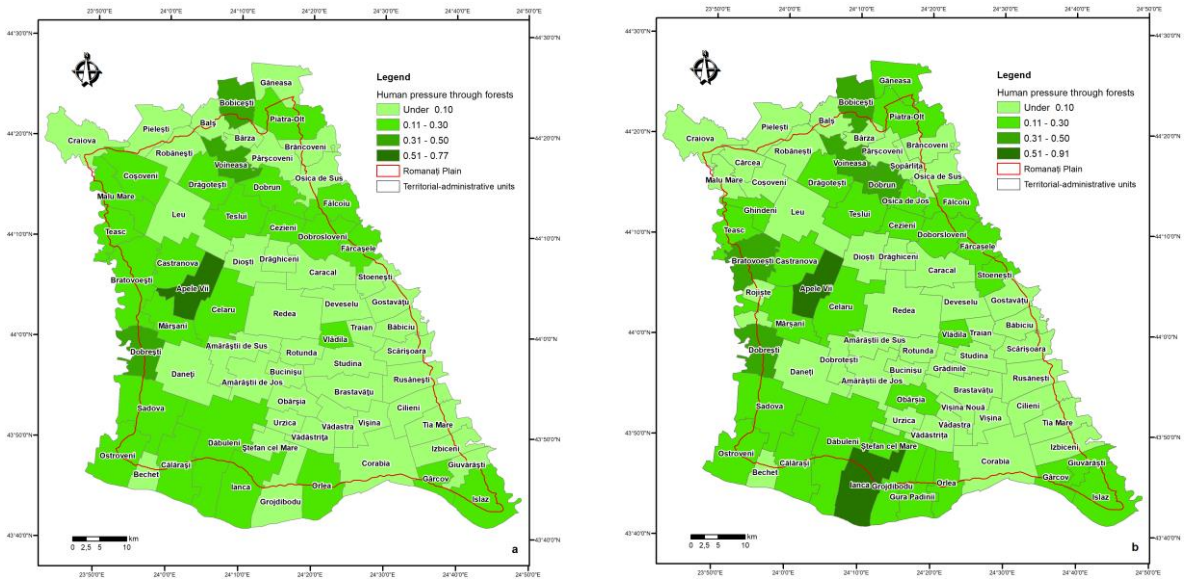

Figure 7: Human pressure through forests in Romanați Plain (a-1992; b-2017)

The human pressure through orchards and fruit tree nurseries is an index of anthropic pressure on the environment through the land use as orchards and fruit tree nurseries (Fig. 8).

In 1992, the average value of the human pressure index through orchards was 0.02 ha/inh., the total area covered by orchards and fruit tree nurseries being of 7782 ha.

Areas with significant surfaces of orchards were found in the south-western part of the Romanați Plain, with the administrative-territorial units in this part recording the highest values of this index: Grojdibodu (0.21 ha/inh.), Orlea (0.20 ha/inh.), Ianca (0.18 ha/inh.), Dobreşti (0.16 ha/inh.), Sadova and Călăraşi (0.10 ha/inh.), mainly in the Dăbuleni Plain.

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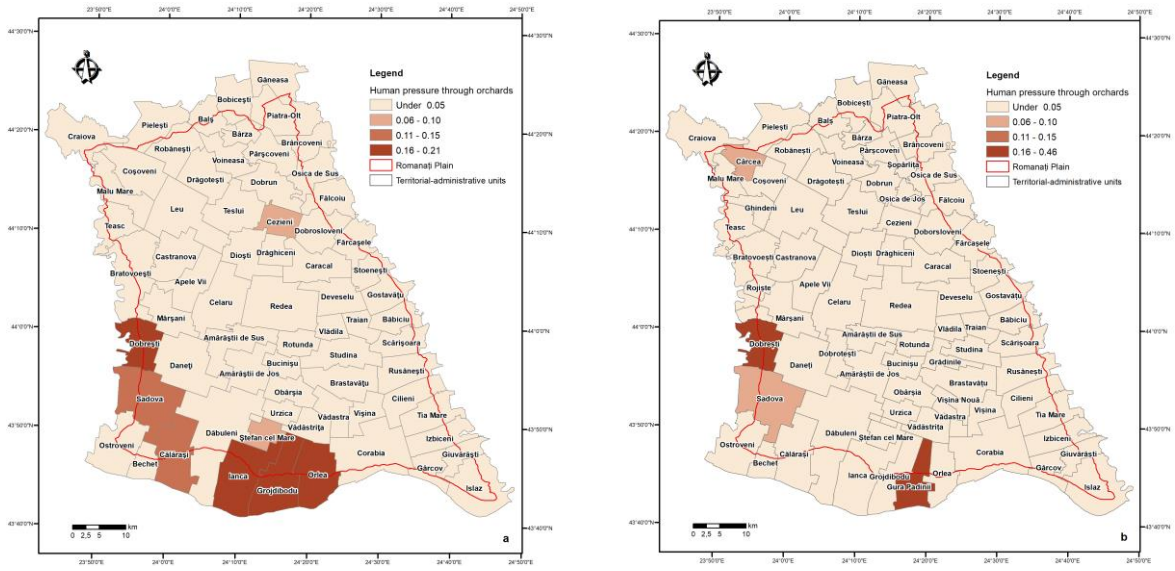

Figure 8: Human pressure through orchards in Romanați Plain (a-1992; b-2017)

In 2002, the average value of the index remained the same, of 0.02 ha/inh., and the total area occupied by orchards and fruit tree nurseries grew slightly, from 7782 ha to 7965 ha.

The most important areas used as orchards and fruit tree nurseries were also located in the southwest of the plain, in the Dăbuleni Plain subunit (Simulescu and Zamfir, 2015).

Compared to previous years, 1992 and 2002, in 2017, the average value of the index decreased to 0.01 ha/inh. The total area occupied by orchards has dropped dramatically to 3257 ha. As a result of the land fund division, most of the orchards and fruit tree nurseries were grubbed, the surfaces occupied by them being currently used mainly as arable land, but also as built-up land, pastures and hayfields.

Compared to the previous years, compared to 6 communes in which the value of the human pressure index on the environment through orchards and fruit tree nurseries was at least of 0.10 ha/inh., in 2017 there were only 2 communes where the value of this index exceeded this threshold, namely in Gura Padinii (0.46 ha/inh.) and Dobreşti (0.17 ha/inh.).

The surface occupied by orchards and orchard nurseries suffered an important decline, this being caused by the deforestation of orchards in order to make way for agricultural land.

The human pressure through vineyards and vineyard nurseries is another index of anthropic pressure on the environment through the land use as vineyards and vineyard nurseries (Fig. 9).

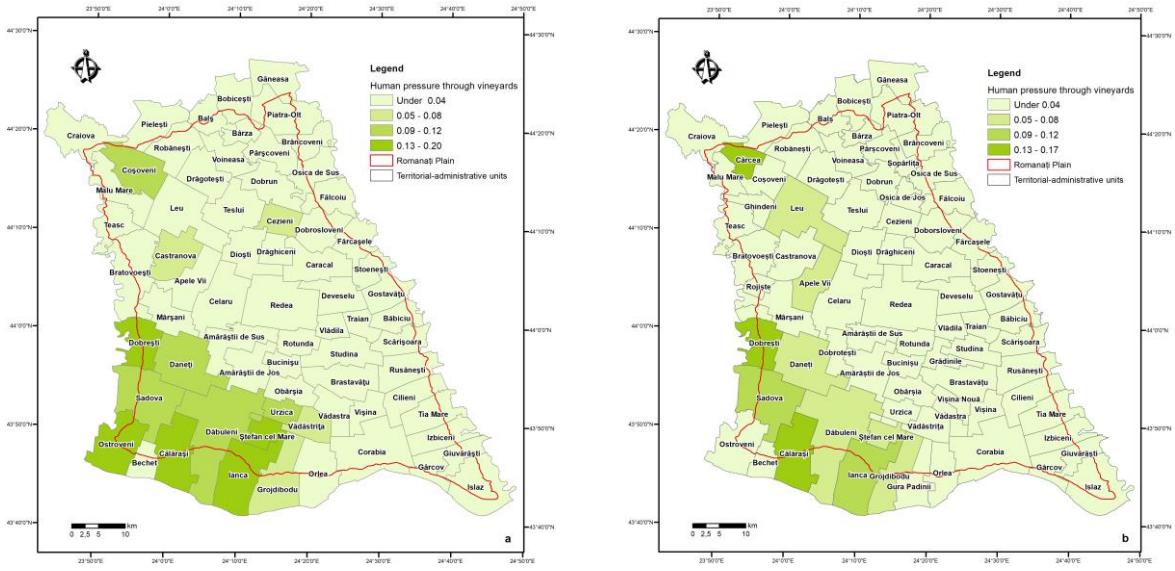

Figure 9: Human pressure through vineyards in Romanați Plain (a-1992; b-2017)

In 1992, the average value of the human pressure index on the environment through vineyards and vineyard nurseries was 0.03 ha/inh., and the total area occupied by these was 11,272 ha.

The highest values were obtained by Călărași (0.20 ha/inh.), Dobreşti (0.16 ha/inh.), Ianca (0.15 ha/inh.), Ostroveni (0.13 ha/inh.), Ştefan cel Mare, Sadova (0.12 ha/inh.), Dăbuleni (0.10 ha/inh.).

In 2002, the average value of the human pressure on the environment through vineyards index was 0.03 ha/inh., while the total surface occupied by these fell slightly, from 11,272 ha to 10,458 ha.

The widest distribution of vineyards and vineyard nurseries, as well as in the case of orchards and fruit tree nurseries, is also represented by the Dăbuleni Plain (southwestern subunit of Romanați Plain).

In 2017, the average value of the human pressure index on the environment through vineyards was the same as in 1992 and 2002 (0.03 ha/inh.), while the total area occupied by these decreased vertiginously, from 10,458 ha to 8466 ha.

If in previous years, high values of this index (at least 0.10 ha/inh.) were recorded in 7 administrative-territorial units, last year, high values were obtained in Dobreşti (0.17 ha/inh.), Călăraşi (0.15 ha/inh.), Cârcea (0.13 ha/inh.) and Sadova (0.12 ha/inh.).

Also, the area covered by vineyards and vineyard nurseries suffered a dramatic loss, the surface decreasing from 11,272 ha in 1992 to 8466 ha in 2017. This was due to the change of land use in the Dăbuleni Plain, from vineyards to agricultural land but also to pastures and hayfields.

Human pressure through pastures and hayfields represents another index of the anthropic pressure on the environment through the land use as pastures and hayfields (Fig. 10).

For the year 1992, the average value of the human pressure index on the environment through pastures and hayfields was 0.07 ha/inh.

The total area occupied by these was 20,383 ha (20,136 ha of pastures and 247 ha of hayfields).

The highest values were obtained in the communes Drăgoteăti (0.34 ha/inh.), Dobreşti (0.25 ha/inh.), Voineasa and Redea (0.19 ha/inh.), and the lowest ones in Craiova and Caracal (under 0.01 ha/inh.).

In general, more extensive use as pastures and hayfields are found in the north-central parts of the Leu-Rotunda Plain and the Caracal Plain, and less in the south of these relief units and in Dăbuleni Plain.

In 2002, the average value of the human pressure index on the environment through pastures and hayfields was still 0.07 ha/inh.

The total area occupied by these increased from 20,383 ha to 21,068 ha, of which 20,818 ha were pastures and 250 ha were hayfields.

Some of these lands have undergone a conversion of their use, coming from former plots of land planted with vines and orchards, which have been grubbed by the new private owners, who have been appropriated after the disbadment of the agricultural cooperatives.

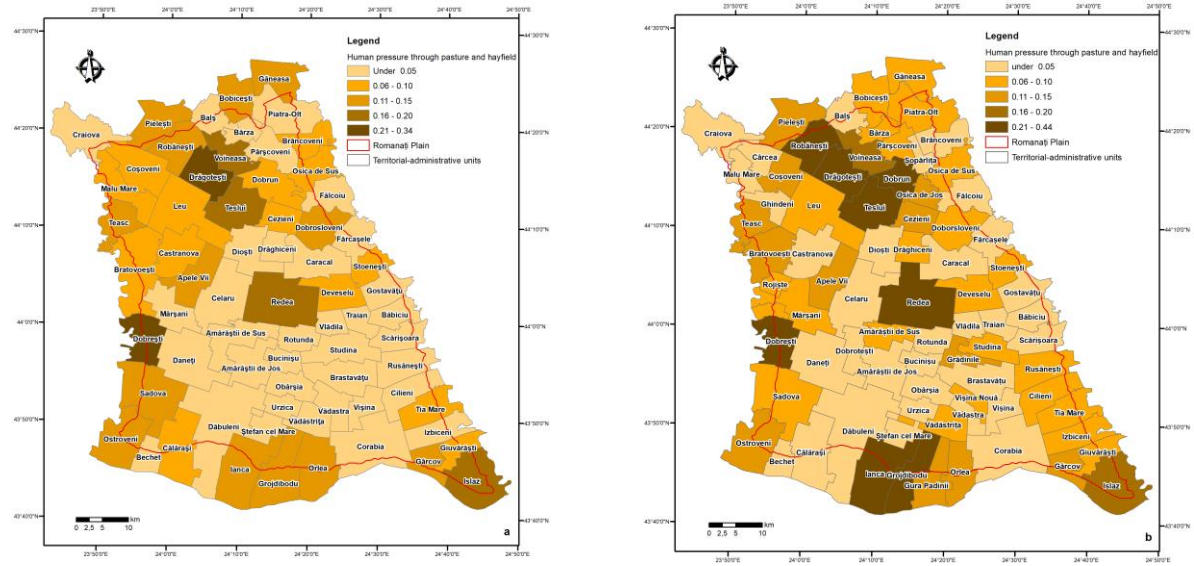

Figure 10: Human pressure through pastures and hayfields in Romanați Plain (a-1992; b-2017)

In 2017, the average value of the human pressure index on the environment through pastures and hayfields increased to 0.08 ha/inh.

The total surface occupied by these continued to increase to 21,124 ha, of which 20,945 ha are pastures and only 179 ha are hayfields.

The extension of pastures and hayfields has continued in the southern part of the Caracal Plain, and northern part of Leu-Rotunda Plain, in particular through the conversion of the poorly fertile agricultural land and degraded land.

The highest values of this index were recorded in the communes of Drăgoteşti (0.44 ha/inh.), Grojdibodu (0.43 ha/inh.), Dobreşti (0.31 ha/inh.), Redea (0.26 ha/inh.), Ianca 0.23 ha/ nh.), and the lowest in Obârșia, Bucinişu, Vişina, and Amărăştii de Jos (less than 0.01 ha/inh.).

Conclusions

The Romanati Plain is a relief unit inhabited since the Paleolithic and whose population is mainly engaged in the agricultural sector, the middle and large settlements concentrating about 80% of the total population.

Beside the 6 cities (Craiova, Caracal, Balș, Piatra-Olt, Corabia, Dăbuleni), most of the settlements are rural settlements, with an agricultural profile (grain, vine, fruit, technical crops, livestock breeding). Thus, the impact of human activities over the years has made its presence felt by modifying almost totally the original natural vegetation and replacing it with farmland, vineyards and orchards, pastures and hayfields.

Regarding the anthropic environmental pressure, the data analyzed for the 3 reference years show, in addition to the demographic decrease, a change in the way land is used. The surfaces occupied by vineyards and vineyard nurseries as well as those occupied by orchards and fruit tree nurseries have fallen vertiginously, instead of these are expanding the surfaces occupeid by pastures and hayfields, as well as agricultural land. A slight increase has also been recorded in the areas occupied by forests, in addition to the national afforestation programs, due to the various planting actions organized on a voluntary basis by various NGOs and private and public institutions, over the last 10 years.

Thus, even in the period after the fall of communism in Romania, human pressure on the natural environment of the Romanați Plain remained high. In this respect, communities and local decision-makers are expected to take measures to protect and improve the environment through a sustainable development approach.

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