# ANALYSIS OF ENVIRONMENTAL FACTORS IN THE LIMITED AREAS CONTEXT. CASE STUDY: BRAILA COUNTY

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***Abstract:*** *Environment represents the totality of environmental factors': air, water, soil, flora, fauna and all these components must be looked at as a whole, fact which leads to a deep knowledge and integrated, at the same time, of them and to a better valorification of them, also.*
*Between the environment and the man's economic activity there were established along time various and complex relationships, which determined not only the progress of the human species, also it departure from other species, but also the emergence and the expansion of some ecological problems which put under the question mark the existence and evolution of the human species itself.*
*The paper wishes to make an analysis of the environmental factors in county Braila by the x-raying the environmental state on its main components - air, water, soil and biodiversity-, of the evolution of the quality of the environmental factors, as well as of their tendencies.*

***Key words****: environmental factors, nature protection and biodiversity conservation*

## INTRODUCTION

Nature is the support to society development, and people's economic activity is based on the continuous natural potential flow from the environment.

The economic activities use environmental resources – air, water, soil and natural resources – and put pressure upon the natural environment. Crop production, livestock production and forestry are activities that put a significant pressure upon soil, flora and fauna, while industry, human settlements and transport can have an indirect negative impact upon these components as direct effect of emissions in the air and of water discharges.

The environmental problems initially have a local origin, but if they develop on a larger scale, they can affect large areas becoming territorial, regional or global problems. The paper intends to approach aspects referring to the evolution of environmental particularities with focus on nature protection and biological diversity conservation in the county Brăila.

## MATERIALS AND METHODS

The study was conducted through selective research methods in accordance with the methodological point of view, all its stages: identification of research problem, delineation of research, information collection, processing, analysis and interpretation of data and elaboration of conclusions.

Documentation used resulted in: statistical documents, studies and scientific literature concerning the quality of environmental factors, statistical materials and studies related to environmental issues in the area studied, regional and local strategies concerning to the investigated space, legislative documents, standards and rules concerning the quality of environmental factors and biodiversity of the area studied.

## RESULTS AND DISCUSSIONS

- ***County Brăila – physical - geographical data***

County Brăila is situated in the East of the Romanian Plain at the confluence of the rivers Siret and Călmăţui with the Danube River. The territory of the county Brăila pertains

greatly to the units of plain and river meadow. There are to be distinguished the relief units: Câmpia Călmăţuiului and Câmpia Bărăganului (51% of the area of the county) and river meadows Dunării, Siretului, Buzăului and Călmăţuiului (49% of the county area).

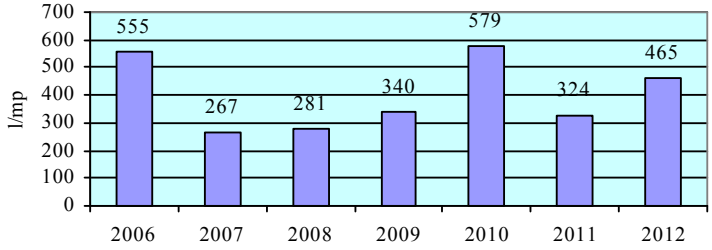
In county the climate is temperate continental, characterized by hot and dry summers, reduced rainfalls, with torrential character and unequally divided, cold winters, without any stable and continuous snow layer.

In county Brăila the annual average temperature of air in the period 2006-2012 was higher by 0.5 -1.8$^0$C than the average of the years 1975-2000.

The reduced rainfalls and their ununiform distribution makes that in all the vegetation period the factor water to be under the drought limit, more stressed in the months July and August. The precipitations have a torrential character during summer an sometimes with hailstones, leading to the damages for crops on extended areas. In summer there emerge long drought intervals (60-90 days).

The water from rainfalls have registered values of the pH- higher than 5,4 units, values indicating the fact that in the period 2006-2012 there were not any acid precipitations.

**Graph 1. Atmosphere precipitations– annual average quantities**




*Source: Annual reports regarding the environment state in county Brăila, 2009-2012, The Agency for the Environmental Protection, Brăila*

The year 2007 was the most droughty, being registered the smallest annual average quantity of the rainfalls, while 2010 was the richest year as regards the pluviometric regime.

The annual average necessary of rainfalls for the county Braila is of 524.6 l/m$^2$, this being covered only in the years 2006 and 2010.

Wind is a climatic element with a great influence in the conditions of the Romanian Plain, the average speed being of 2.9-3.1 m/s. The negative effects of the wind are to be felt mainly in winter, when the snow is under storm, the crops being this way uncovered.

The snowstorm is a winter climatic risk, at the producing of which there are combining two more important elements, the wind speed and the quantity of snow fallen, which is provoking many damages and environmental lacks of equilibrium. On a scale with 4 steps of vulnerability county Brăila is within the area with the highest vulnerability at snowstorm.

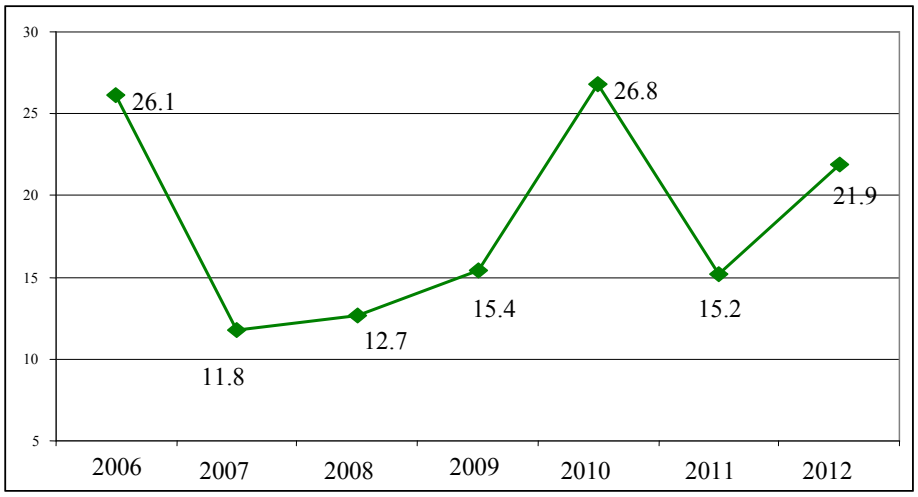
- ***The aridity index***

In order to characterize the climate of a region is necessary to describe the multiannual regime of all the weather elements, in strong connection with the influence of the physical-geographical changing factors. Low values of the aridity index (<22) are characteristic to the areas of maximum aridity. Values of the index of 22-24 are corresponding to the temperate-continental field with aridity influences, with vegetal formations of steppe, predominantly.

It is known the fact that in the last decades the aridity index at the level of the county Brăila has had the value 22 and it suffered mutations from the East to the West.

For the period 2006-2012 the aridity index reflects as extremely suggestive the variation of the degree of continentalism and of the favorability of the climatic conditions for the vegetal carpet. Thus, for the county Brăila, in the years 2006 and 2010, the aridity index exceeded the value 24, ideal value for the crop plants development, while in the years 2007, 2008, 2009, 2011 the aridity index was much under the ideal value, oscillating between 11.8 and 15.4.

**Graph 2. The aridity index at the level of county Brăila, in the period 2006-2012**




*Source: own calculations after the method Em de Martonne*

- ***County Brăila – state and quality of the environmental factors***

***Air.*** The atmospheric pollution represents the introduction by man, directly or indirectly in the atmosphere, of the substances which have bad consequences of nature to endanger the human health, to harm the biological resources and ecosystems, to have an influence upon the climatic changes. The pollution degree of the atmosphere is strictly linked to the number of economic agents and to their activity nature.

**Table 1.**

**Evolution of total pollutant emissions in the atmosphere in period 2006-2012**

- thousand tones -

| | 2006 | 2007 | 2008 | 2009 | 2010*) | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Total emissions | 828.48 | 915.42 | 583.03 | 991.28 | 398.84 | 932.08 | 491.70 |

*) without emissions in the road traffic

Source: Annual reports regarding the environmental state in county Braila, 2009-2012, Agency for Environmental Protection

The total emissions of pollutants in atmosphere have had a fluctuant evolution in the period 2006-2012, registering a maximum level in the year 2009 with 991.28 thousand tones and a minimum one in the year 2010 with 398.84 thousand tones. This great difference is due to the fact that in the year 2010 there were not calculated also the emissions coming from the road traffic. In the period analysed, the energetic sector with the emissions coming from burning (from the energetic industry, from the nonindustrial installations and from the processing industry) has the biggest share, in the total of the pollutant emissions in the atmosphere, followed by the road transport and agriculture. On

the territory of county Brăila there were no significant exceeding of the maximum admitted concentration for the noxes depleted in the environment, as result there were registered no pollution phenomena to affect the life quality and to endanger the human health.

***Water.*** County Brăila has an important network of surface waters, such as:

- Running waters: Danube River (used for navigation, water supply for the population, industry, husbandry and irrigation); Buzău River (utilized for the industry and irrigations); River Călmăţui (used for irrigatons); River Siret (used for pisciculture and irrigations); River Strachina has a reduced number of uses.
- Lakes: clastocarstic (Ianca, Plopu, Movila Miresii Secu, Lutu Alb, Tătaru, Colţea, Plascu); river limans (Jirlău, Ciulniţa and Câineni), meadow rivers meadow lakes.
- Other categories: meandre lakes and deserted branch (Blasova, Batogu, Lacul Sărat); accumulation lakes (Gălbeni, Satuc and Mircea Vodă); therapy salty lakes (Lacul Sărat I and II, Câineni Băi, Movila Mireii, Batogu); sweet water lakes (Blasova, Plopu, Lacul Dulce); pisciculture settlements (Măxineni, Grădiştea, Vultureni).

The underground waters in the county Brăila are phreatic waters grouped in the large meadows of the Danube, Siret, Buzău and Călmăţui at a depth variating between 0 m in the low meadows and 20 m on the fields covered with sands and waters of the depth grouped either in cobble stones, or in the sandy deposits, their depth variating between 50 and 200 m.

The monitoring of the surface waters, in the county Brăila, is made this way: Danube River is monitored in 3 sections of surveillance, and the River Buzău is monitored in 2 sections. For the underground waters, monitoring is made in 4 water bodies. In the year 2012 in body 1 (3 drillings), body 3 (22 drillings) and body 4 (24 drillings) the qualitative state (chemical) of the water was good, and in body 2 (44 drillings) the qualitative state of the water was weak.

In the period 2006-2012, the waters of the River Danube and of the River Buzau were situated in the limits of the second quality class. The wasted waters in Braila municipality are depleted directly into the Danube without being cleaned, even if in 2011 was inaugurated the cleaning station, this will be functional starting with the year 2016. Although it suffers the polutant impact of depleting the wasted waters, the big flow of the River makes that the values of the pollutants concentrations not produce the modification of the quality class.

As regards the underground waters there are registered especially exceedings of the contents of organic substances, iron, nitrogen, total durity, due to the influence the running surface waters have (the main source being their anthropic charge) and of the depletions of wasted waters insufficiently cleaned or not cleaned. There is registered also a high degree of mineralization, the residuum fixed indicators values, chlorides, sulphates, being over-exceeded at the majority of drillings monitored for the period 2006-2012.

***Soil.*** The relief very weakly biased, lacking at greatest part a superficial drill, the climatic conditions, semiarid, have determined the formation of the tchernozem soils in the different phases of evolution, on greatest part of Brăila county. Thus, the tchernozems occupy over 52% of the area of the county and comprise a variate range. The strong anthropic modifications due to the constructions (dwellings, industrial platforms, roads, etc) have led to the destructuring of the initial soil profile and the emergence of the so called anthropic protosoils on 34% of the county area.

The main share of the land areas in county Brăila is of the agricultural lands, over 81%. In the total of the agricultural area, the share of the arable land is over 90%

**Table 2.**

**The repartition of the agricultural land by utilization classes in the period 2006-2012**

- ha -

| Utilization categories | Area | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Arable | 349401 | 349830 | 353087 | 349089 | 350447 | 350447 | 350625 |
| Pastures | 33144 | 33274 | 28905 | 33171 | 31743 | 31733 | 31332 |
| Vineyards | 4825 | 4686 | 4840 | 4492 | 4519 | 4529 | 4545 |
| Orchards | 730 | 636 | 640 | 640 | 654 | 654 | 658 |
| Total agricultural | 388100 | 388428 | 387470 | 387392 | 387363 | 387363 | 387160 |

*Source: Annual reports regarding the environmental state in county Brăila, 2009-2012, The Agency for Environmental Protection Brăila*

In the analysed period the evolution of the agricultural area did not suffer major changes. With all this, in the year 2012 the agricultural area was by 940 ha smaller than in the year 2006. In the seven years there were diminished the areas with pastures, orchards and vineyards, while the arable area registered a slight increase. Over 70% of the agricultural lands in county Brăila are inscribed in classes II and III of quality, being thus pretable for agriculture practicing.

The soil quality is determined by natural factors as are: the relief, climate, vegetation, time, but also by anthropic factors. Thus, the farm practices not adapted to the environmental conditions, the treatments and fertilizations made without agro-pedological and agro-technical foundation, the depletions of dangerous chemical substances, the deposits of wastes of all kinds represent anthropical factors which modify sensibly and rapidly the soils quality.

Thus, in year 2012, in county Brăila an area of 115451.81 ha was affected by different processes of degradation, which represented almost 30% of the total of the agricultural area.

**Table 3.**

**Land areas affected by different processes of degradation in county, in the year 2012**

| Process type | Area ha | % of the area affected | % of total agricultural area |
|---|---|---|---|
| Gleization | 33687.12 | 29.18 | 8.70 |
| Saliniztion | 17469.75 | 15.13 | 4.51 |
| Sodiumization | 6042.95 | 5.23 | 1.56 |
| Salinization + sodiumization | 35939.99 | 31.13 | 9.28 |
| Erosion | 770.00 | 0.67 | 0.20 |
| Dunes relief | 21540.00 | 18.66 | 5.60 |
| Total | 115451.81 | 100.00 | 29.82 |

*Source: Annual report regarding the environmental state in county Brăila per year 2012, Agency for the environmental protection Brăila*

The most serious soil degradation process in county Brăila was a combined one, which is the salinization and sodiumization, process which affected 31,13% of the area, followed by one of gleization with 29.18% of the area. These phenomena are limitative elements especially active upon the soil.

The fertilizers of any kind, applied rationally, occupy a prioritary place for the maintaining and increase of the soil fertility, for the increase of agricultural productions. Nevertheless, in the conditions in which they are used without taking into account the soil nature, the concrete weather conditions and the necessities of the plants, they could lead to the degradation of the ecological balance, especially by accumulation of nitrates.

The evolution of the total chemical fertilizers was fluctuant, with a maximum 67.5 kg/ha in the year 2007 and a minimum of 37.9 kg/ha in the year 2008. The reduced chemical fertilizers consumption in the period 2008-2010 is due mainly to the reduction of the quantity of utilized chemical fertilizers.

**Table 4.**

**Evolution of the total chemical and organic fertilizers consumption products in county Brăila, in the period 2006-2012**

- kg/ha -

| Specification | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Total chemical fertilizers consumption | 51.5 | 67.5 | 37.9 | 44.7 | 44.6 | 65.5 | 67.2 |
| Total organic fertilizers consumption | 20.0 | 20.1 | 20.2 | 24.5 | 24.5 | 18.5 | 18.6 |

*Source: own calculations after INSSE data, TEMPO-Online and after data from the Annual reports regarding environmental state in county Brăila, 2009-2012, Agency for the Environmental Protection Brăila*

In the period 2006-2012 the organic fertilizers consumption did not have major fluctuations, due to the fact that it was maintained a share equal approximately between the increase of the organic fertilizers quantity utilized and the areas on which they were utilized. In years 2009 and 2010 there were utilized the biggest quantities of organic fertilizers.

Soil is the environmental factor exposed most easily to pollution, and among the soil pollutant factors, the greatest prejudices are brought by the pesticides. Pesticides are absorbed in different proportions by the plants and animals, fact which leads to their unwished presence in people food, and also in the water.

In ratio with the whole country there is a number of 1963 localities constituted into vulnerable zones to nitrates pollution, of which 40 localities are in county Braila. From administrative point of view, county Braila is made of: municipality l Brăila, 3 towns (Făurei, Ianca and Însurăţei) and 40 communes.

Among the 40 localities vulnerable to nitrates pollution from farming activities there are the 3 towns and 37 localities (except communes: Bărăganul, Ciocile and Roşiori).

- **Biodiversity**

***Flora.*** In a more far past the vegetation characteristic to county Brăila was represented by steppe in the plain areas and by meadow and pond vegetation in Balta Brăilei. Steppe was upturned and replaced with crop vegetation (agricultural crops) in a share of 95%. It is to be found today only in islands, on uncultivated lands, and on the edge of the roads, along digs and irrigation channels. From 230 species of wild flora inventoried in county Brăila there were not identified species of national or community interest.

***Fauna.*** Nonvertebrates are represented through the biggest number of species, while the vertebrates are less numerous, both as species number and as number of individuals. In county Braila there were inventoried 90 nonvertebrates species, considered of community interest for which there must be constituted special areas of preservation and special areas for avifaunistic protection. From the total of 305 species of vertebrates inventoried at the county level, 160 species need a strict protection, from which 121 species are of community interest and, 39 of national interest. At level of county Brăila, from the total of 305 species inventoried, 35 species are vulnerable, 18 species are periclited, 4 species are critically periclited, and 3 species are almost threaded.

***The natural protected areas.*** The protected areas represent the most important method to preserve biodiversity and to offer models for development in harmony with nature, in the context of the accelerated economic development in the last decades.

***a) Protected natural areas of national interest***

In county Brăila there are 3 protected natural areas of national interest – one natural park (Balta Mică a Brăilei – 22989 ha) and two natural reservations (Lacul Jirlău Vişani –

838.66 ha and Pădurea Camniţa – 1.2 ha), the total area of which is of 23828.86 ha and represents almost 5% of the area of the county.

***b) Protected natural areas of international interest in county.*** In year 2001 Balta Mică a Brăilei was declared site RAMSAR (position 1074) under the name of Insula Mică a Brăilei (The small Island of Braila) and has an area of 17586 ha. There were inventoried 207 species of birds, representing half of the species of migrating birds characteristic to Romania, of which 169 protected species on international plan, through the *Conventions in de la Berne, Bonn and Ramsar*.

***c) Natural areas of community interest or sites Nature 2000***

In year 2012, on the territory of the county Brăila there were delimited 9 areas of special avifaunistic protection, totaling an area of 59788.37 ha and representing 12.5% of the area of the county: Balta Albă-Amara-Jirlău 1213.8 ha; Balta Mică a Brăilei 24821.6 ha; Balta Tătaru 8583.66 ha; Dunărea Veche-Braţul Măcin 6228.05 ha; Ianca-Plopu Sărat 1982 ha; Lunca Siretului Inferior 1824.6 ha; Măxineni 1504 ha; Berteştii de Sus-Gura Ialomiţei 2962.7 ha; Valea Călmăţuiului 10667.8 ha.

Initially on the territory of the county were designated 7 areas of special avifaunistic protection areas, and in the year 2011 there were added two more (Berteştii de Sus – Gura Ialomiţei and Valea Călmăţuiului).

In the year 2012, on the territory of county Brăila thre were declared 9 sites of community importance, totaling an area 43318.74 ha and representing 9.08% of the county area: Balta Albă-Amara-Jirlău-Lacul Sărat Câineni 2835 ha; Balta Mică a Brăilei 20872 ha; Braţul Măcin 4503.4 ha; Lunca Buzăului 978.18 ha; Lunca Siretului Inferior 1755.67 ha; Valea Călmăţuiului 8603.04 ha; Ianca - Plopu - Sărat – Comănească 3222 ha; Lacul Sărat – Brăila 377 ha; Sărăturile de la Gura Ialomiţei - Mihai Bravu 172.45 ha.

Initially on the territory of the county Brăila were designated 4 sites of community importance (Balta Albă-Amara-Jirlău-Lacul Sărat Câineni, Balta Mică a Brăilei, Braţul Măcin and Valea Călmăţuiului), and after the year 2011 there added 5 more (Lunca Buzăului, Lunca Siretului Inferior, Ianca-Plopu Sărat-Comănească, Lacul Sărat-Brăila and Sărăturile de la Gura Ialomiţei-Mihai Bravu) .

In the year 2012, in county Brăila there existed 22 protected natural areas, of which 3 national interest natural areas, 1 natural area of international interest and 18 sites Nature 2000 (9 areas of special avifaunistic protection and 9 sites of community importance). Only 10 of them had administrators appointed, with regulations and management plans in different stages of elaboration and approval.

***d) protected natural areas of county or local interest***

Initially in county Brăila there were declared as protected natural areas of county interest 5 protected areas: Balta Mică a Brăilei, Lacul Jirlău, Pădurile Camniţa and Viişoara, as well as Popina Blasova. Afterwards, the first three obtained the status of protected area of national interest, and, Pădurea Viişoara and Popina Blasova have in present the status of protected natural areas of county interest.

In the period 2006-2012, both the natural protected areas, and on the placements where are implemented plans/projects, there was not found any significant negative impact as result of the utilization of the lands or exploitation of the natural. But the anthropic pressures exercised upon the natural ecosystems in the last decades have induced the modification of the ecological composition and structure, respectively of the productive and support capacity of biodiversity. The major consequences upon biodiversity are to be found in a number of significant changes of qualitative and quantitative order in the structure and functioning of ecosystems.

## CONCLUSIONS

The geographical position and relief of county Braila confers to the climate a temperate continental character. From the analysis made in the period 2006-2012, on the background of the increase of the annual average temperatures and the decrease of the volume of annual average rainfalls, the aridity index is often situated under the value of the zones of maximum aridity and under the ideal value for the development of crop plants which means that in county Brăila the aridization phenomenon is in a continuous accentuation.

In the period analyzed there were not registered pollution phenomena for the air to affect the life quality and to endanger the human health. This thing was possible on the background of the reduction of the total pollutant emissions in the atmosphere.

The quality of the waters of the Danube River, the main supplier of gross water for the supply with water for the population and for irrigations, industry and other utilizations, was inscribed in the a II-quality class. As regards the quality of the underground waters it is registered the exceeding of the contents of organic substances, iron, nitrogen, total durity and a high degree of mineralization at the majority of drillings monitored for the period 2006-2012.

The quality of the soil is affected by one or more restrictions, and the damaging influences of them are reflected in the deterioration of the characteristics and functions of the soil, respectively in their bioproductive capacity, but what is more serious, upon the quality of the agricultural products and food security.

In the last decades the vegetation of the county Braila suffered profound modifications. The specific steppe fauna was upturned and replaced with crop vegetation (agricultural crops) in a percentage of over 95%, today being met only is landary.

Biodiversity of county Brăila is preserved in protected natural areas. In year 2012 there were 22 natural protected areas, such as: 3 natural areas of national interest with a total area of 23828.86 ha representing almost 5% of the county area; one natural protected area of international interest – site RAMSAR Insula Mică a Brăilei with an area of 17586 ha; 18 natural protected areas Natura 2000; 2 protected natural areas of county interest. In the period 2006-2012 the number and area of these natural protected areas was increasing. If all this would be given to some administrators and would benefit of management plans and functioning regulations, it would be ideal for the biodiversity preservation.

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