THE MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE

THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY

NATIONAL REPORT ON THE STATE OF ENVIRONMENT IN 2013

Bucharest - 2014

**THE MINISTRY OF ENVIRONMENT
AND CLIMATE CHANGES**

THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY

NATIONAL REPORT ON THE STATE OF ENVIRONMENT IN 2013

ANPM

Bucharest

TABLE OF CONTENTS

1. COUNTRY PROFILE

1.1 GEOGRAPHIC AND CLIMATIC DATA

The present territory of Romania, also called the *Carpathian-Danubian-Pontic* space, overlaps the European territorial system, outlined by the loop of the Romanian Carpathians and adjacent regions imposed and subordinated to the Carpathian Mountains, being bordered in the South by the Danube River and in the East by the Black Sea.

On the Globe, Romania is situated in the northern hemisphere; at the intersection of 45° parallel Northern latitude with the 25° meridian Eastern longitude.

In Europe, Romania is situated in the South-Eastern Central Europe (*fig. 1.1.*), half the distance between the coast of the Atlantic Ocean and the Ural Mountains, inside and outside the Carpathians arch, within the lower basin of the Danube, having a gateway to the Black Sea.

Fig. 1.1 Physical map of Europe

Romania's neighbours are: Ukraine to the North, Republic of Moldova to the East (the complete border being represented by the Prut River), Bulgaria to the South (mainly being a fluvial border, the Danube River), Serbia to the South-West, and Hungary to the West. The Romanian borders stretch on a distance of 3 149.9 km, out of which, in 2007, 1876 km became EU borders (towards Serbia, Moldova and Ukraine), while the Black Sea border measures 194 km along the continental platform and 245 km on shore; the Romanian Black Sea coast stretches out between the border with Ukraine and the border with Bulgaria). The area of Romania is 238.391km ^{2}, plus 23.700km ^{2} represented by the Black Sea platform.

The Romanian territory is between parallels 43^{0}37'07" and 48^{0}15'06'' Northern latitude and between meridians 20^{0}15'44'' and 29^{0}41'24''Eastern longitude. Having an area of 238.391km^2, it is the 13th largest country in Europe.

Romania's geographical position

Extreme Point		County	Eastern longitude [1]	Northern latitude
North	Horodiştea Village	Botoşani	26⁰42'05"	48⁰15'06"
South	Zimnicea City	Teleorman	25⁰23'32"	43⁰37'07"
East	Sulina City	Tulcea	29⁰41'24"	45⁰09'36"
West	Baba Veche Commune	Timiş	20⁰15'44"	46⁰07'27"

1) According to Greenwich

Romania has an ellipse shape, with a territory length, in a straight line, of approximately 735 km from East to West and of approx. 530 km, from North to South. The total length of Romania's frontiers is 3,149.9 km, out of which 1,085.5 km land and 2,064.3 km rivers and sea.

Fig. 1.2 Geopolitical map of Europe

Length of the frontiers *(km)*

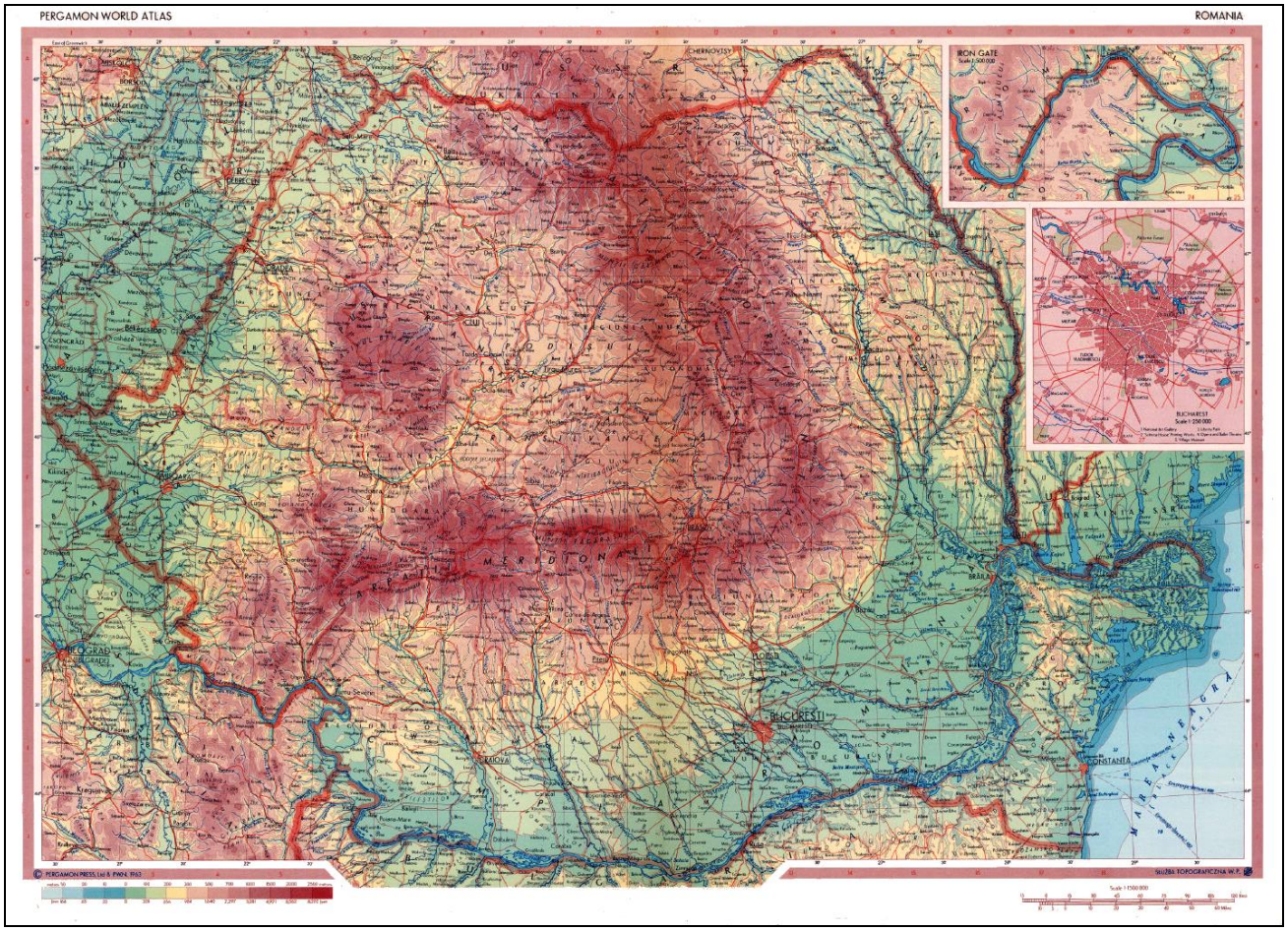
Borders	*Land*	*River*	*Sea*	***Total***
Bulgaria	139,1	470,0	22,2	631,3
Serbia	256,8	289,6	-	546,4
Hungary	415,9	32,1	-	448,0
Ukraine	273,8	343,9	31,7	649,4
Republic of Moldova		681,3	-	681,3
Black Sea	-	-	193,5	193,5
Total	**1.085,6**	**1.816,9**	**247,4**	**3.149,9**

1.1.1. RELIEF AND GEOLOGY

The relief of Romania has three major morphologic steps, proportionately distributed in the form of an amphitheatre. The high step, of the Carpathians (the highest peak Moldoveanu 2,544m), the **medium** step, corresponding to the Sub-Carpathians, hills and plateaus and the low step, of the plains, river meadows and Danube Delta (the youngest relief unit, continuously developing and with an average altitude of 0.52 m). The main characteristic of these relief components is their proportional distribution in form of an amphitheatre, characterized by four elements: variety, proportionality, complementary and symmetrical layout, with approximately equal distribution of the main relief units (35% mountains, 35% hills and plateaus and 30% plains) *fig. 1.3* .

The Carpathians have an area of 66,303 km², which represents approx. 27.9% of the total area of the country, on a length of 910 km.

Fig. 1.3 Physical map of Romania (from PERGAMON World Atlas)



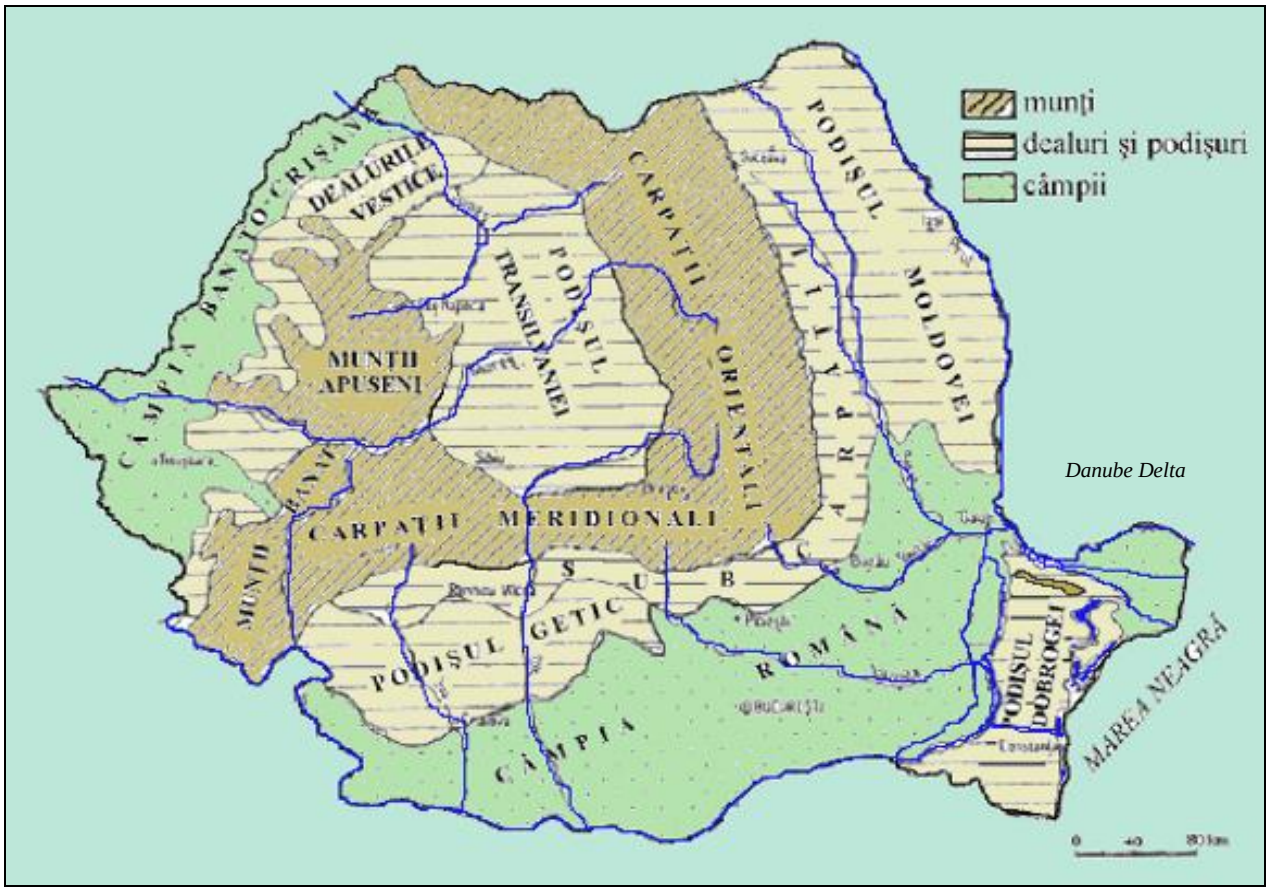
Inside the Carpathian arch lays the **Plateau of Transylvania**, with an area of approx. 25.000 km² and an altitude of 400 m to 600 m. Outside the Carpathian Mountains (the relief in descends by steps, almost concentrically disposed), is a ring of hills - ***Sub Carpathians and Western Hills*** - the most densely populated areas, due to rich underground resources (oil, gas, coal, salt) and favourable conditions for cultivating vine and fruit trees.

In eastern and southern regions there are three large plateaus (*Moldova, Dobrogea and Getic*) and **Mehedinti Plateau**, while two great plains lay in the south and west, the **Romanian Plain** (narrowed towards East) and the **Western Plain**.

Romania benefits from all types of aquatic facilities: rivers and streams, lakes, groundwaters, marine waters. Romania's hydrographical and hydrological peculiarities are determined mainly by its geographic position within the temperate continental climate and the presence of the Carpathian arch.

The inter-mountain depressions are represented by the depressions in the area of the Oriental Carpathians (Comăneşti, Bârsei, Gheorghieni, Ciucului, Borsec-Bilbor, Jolotea), depressions from the area of the Middle Carpathians (Loviştei, Petroşani, Caransebeş-Mehadia), depressions within the Western Carpathians (among which the depression of Bozovici or Almajului) and depressions in the area of Apuseni Mountains (Brad-Săcărâmb, Zlatna-Almaş, *Roşia Montană*). There are also internal depressions - Transilvaniei depression, Panonic depression and Şimleul Silvaniei depression, (*fig. 1.4)*).

Fig. 1.4 The main relief units of Romania



The Danube Delta is the lowest region of the country, under 10 m altitude, with vast expanses of marshes, lakes and thatch. The river and maritime levees (Letea, Caraorman, Sărăturile) are a little bit higher and they host the fishermen villages. *The Danube Delta has been included in the UNESCO World Heritage List in 1991 as being a natural reserve of the biosphere.*

From the geologic point of view, subject to the geotectonic evolution, the Romanian territory is divided into:

- ***platform units*** consisting of the *Moldavian Platform,* the *Wallachian Platform* and the *Scythian Platform*, (formed during pre-alpine orogenic cycles, more or less subject to peneplanisation, resulting the Carpathians' foreland).
- ***alpine units***: the *North Dobrogea Orogene (*Dobrogea Mountains, eroded*)* and the *Carpathian Orogene* (the Carpathians and the Apuseni Mountains), *fig. 1.5*.

The platform units

The Moldavian Platform – located in the North-East of the country, covers the territory between the Urals, the Carpathians and Scandinavia, morphologically looking like a high plain, with a chain of plateaus and hills, separated by the valleys of the hydrographical grid, containing accumulations of: siliceous sands (99.5% silicon dioxide), common sands for concrete and mortars, gypsum, sulphur, lime stones, lignite, natural gases, mineral waters, lenticular turfs along the hydrographical grid, etc.

The Scythian Platform (consisting of Bârlad Sector and the Danube Delta Sector), morphologically looks like systems of terraces and river meadows created by alluvial deposits, gravels and sand, in the same time loess deposits being carried by wind to the high plains.

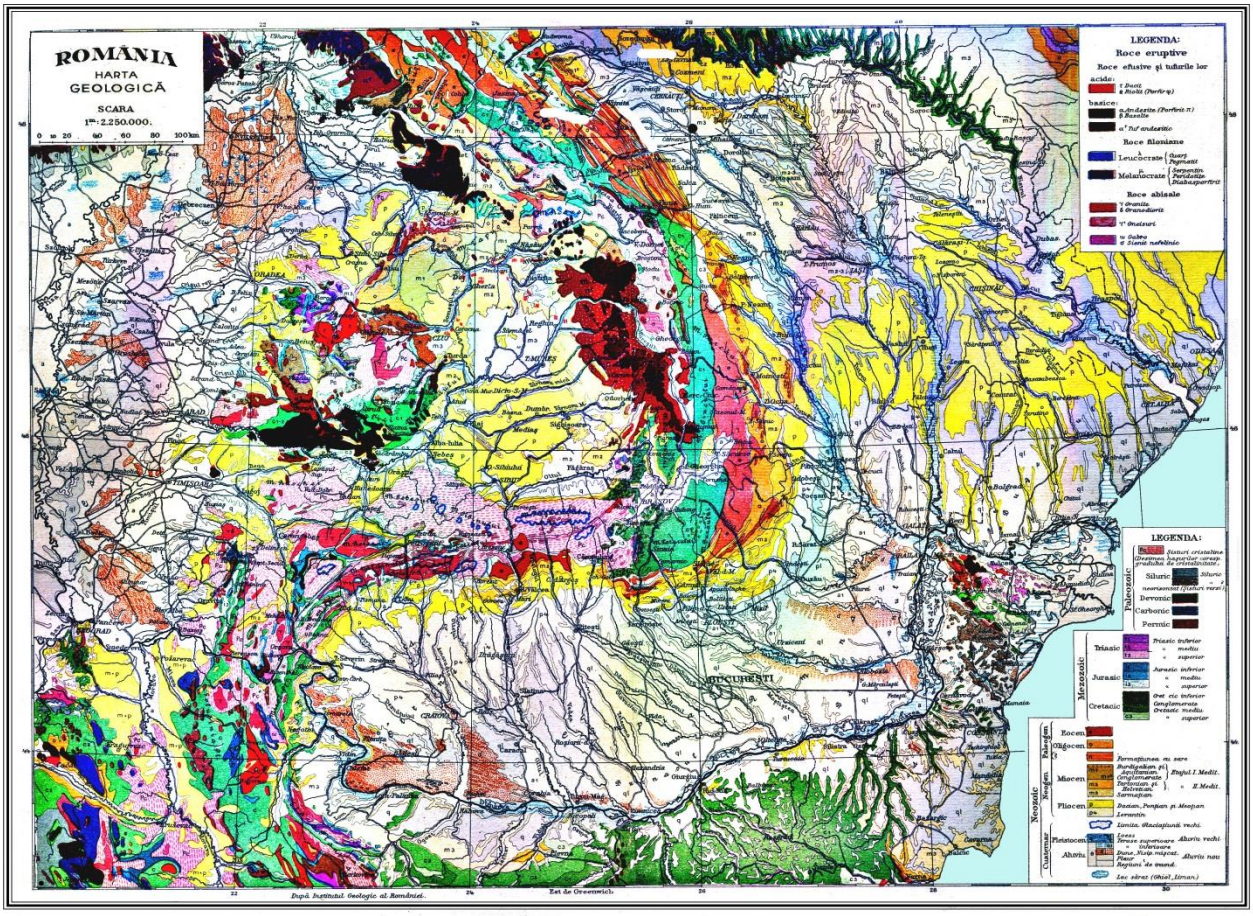
The Moesian Platform (consisting of the Wallachian Sector, the South-Dobrogea Sector, the Central-Dobrogea Sector), is located between the Carpathian Orogene (in West), the alignment represented by the Carpathian Orogene and the North Dobrogea Orogene (in North) and the Balkan Orogene (in South). Towards East, it continues in the continental shelf of the Black Sea, being made of crystalline foundation and a sedimentary multi-layered blanket deposited in several sedimentation cycles, which reflects the evolution conditions in various stages, consisting of: argillite, sandstones, lime stones, gypsum, marls, clays, calcareous sandstones, river-torrential gravels, river-lake and stream sands, wind carried sand, loess, with pockets of hydrocarbons, gases and useful rocks. At the surface there are only quaternary deposits forming the plains and plateaus units (lake and stream sands and gravels, wind carried sand, loess).

Alpine Units

Alpine orogene units take approximately 67% out of the total area of the Romanian territory.

The North Dobrogea Orogene has a lateral and insular position at low altitude and with a small area; its geotectonic evolution ended in the Lower Cretaceous, way before the Carpathian one (which continued to evolve until the Neogene-Pleistocene). It covers the north third of Dobrogea, being bordered at South by the Peceneaga-Camena fault, at North it reaches to the Southern edge of the Danube Delta, along the Sfântu Gheorghe fault, towards East it descends below the newer sediments of the Black Sea, and towards West it continues beyond the Danube River.

Fig. 1.5 Geologic Map of Romania (Geographic Atlas, 1928)



The Carpathian Orogene is distinguished by altitude, area and position. The ***Carpathians*** are part of one of the youngest orogene assemblies of the planet, from the Western Europe to the eastern edge of the Asiatic continent, known by the name of *Alps–Himalaya Range*. The alpine geosynclinals of the ***Apuseni Mountains*** is separated from the Oriental Carpathians by the Transylvanian median Massif, and in West it is bounded by the Pannonian Median Massif. It is famous for the wealth of ferrous and non-ferrous mineral rocks and the noble rocks: Gold, Silver.

The ample deformations during the Neozoic age lead to considerable reformations of the Romanian relief configuration. Therefore, very large sectors enter into a severe subsidence against the neighbourhoods, forming the internal depressions (intermountain) of *Transylvania* and the *Pannonian Plain*, the latter having inlets on the western ridge of the Middle Carpathians and Apuseni Mountains, where they create adjacent depressions. Also, other narrow sectors of the internal and external structures of the Carpathians are subject to subsidence, becoming intermountain depressions, some of them accompanied by volcanism, such as the ones located in the Southern Apuseni Mountains.

The Volcanic Unit started shaping back in the Neogene, when the first eruptions on the north-western side of the Eastern Carpathians took place, along some fault systems upon the contact with the Transylvanian Depression. The consolidation of the volcanic chain contributed to the delimitation of some sedimentary basins in the Eastern area of the Transylvanian Depression, such as the ones of Mureş and Olt Rivers, and to the remoulding of some hydrographical arteries. In the Eastern Carpathians the following *volcanic chains* could be evidenced: *Oaş-Gutâi-Lăpuş, Ţibleş-Rodnei-Bârgău* and *Căliman-Gurghiu-Harghita*, while in west, in the Apuseni Mountains, one can find the *Metalliferous Mountains, the Zarand Mountains, Codru-Moma, Poiana Ruscăi, Trascău.*

The seismic hazard is caused by several epicentral subcrustal and crustal zones: *Vrancea, Făgăraş-Câmpulung, Banat, Crişana, Maramureş* and *Dobrogea*, plus the epicentre zones of local interest: *Jibou* and *Târnava Region* in Transylvania, *northern and western* Oltenia, *northern* Moldavia and the *Romanian Plain*. Out of

these, the *subcrustal zone of Vrancea* is the most active and the more important given the energy release, the ampleness of the macro-seismicity area and the persistent and concentrated nature of the epicentres. In the other regions, two strings of moderate and less profound seismicity are obvious along the edge of the Middle Carpathians and the Pannonian Depressions as well as along the Eastern Carpathians, going towards SE along the line of Peceneaga-Camena Fault, causing low depth and small magnitude earthquakes at long time intervals. The earthquakes in these areas are connected to fractions of the crust and faults delimiting crustal blocks more or less mobile. In order to evaluate the seismic risk level of various regions of the country, one should not only consider the influence of the earthquakes from Vrancea, but also the seismic activity of the sources of local hypocenters, which might increase the level of hazard risk to which the population in the respective regions would be subject to.

Given the variety and complexity of the geologic structures, *the Romanian territory has optimum conditions to accumulate useful mineral substances: ore deposits, mineral combustible deposits, salt deposits and salts, useful rocks, mineral waters, geothermal waters, etc. Important reserves of hydrocarbons, gases and coals are quartered within the platform areas and in the intermountain depressions (Transylvania, Pannonian).*

There are also numerous geological reservations some of which are: Lacul Roşu (Red Lake)-Cheile Bicazului (Bicaz Gorges), Piatra Teiului (Linden-Tree Rock), Pietrele Doamnei (the Lady's Rocks), Plaiul Hoţilor (the Land of Thieves), Lacul Sfânta Ana (St. Ana Lake) and Valea Iadului (the Hell's Valley), Dugoavele Hill.

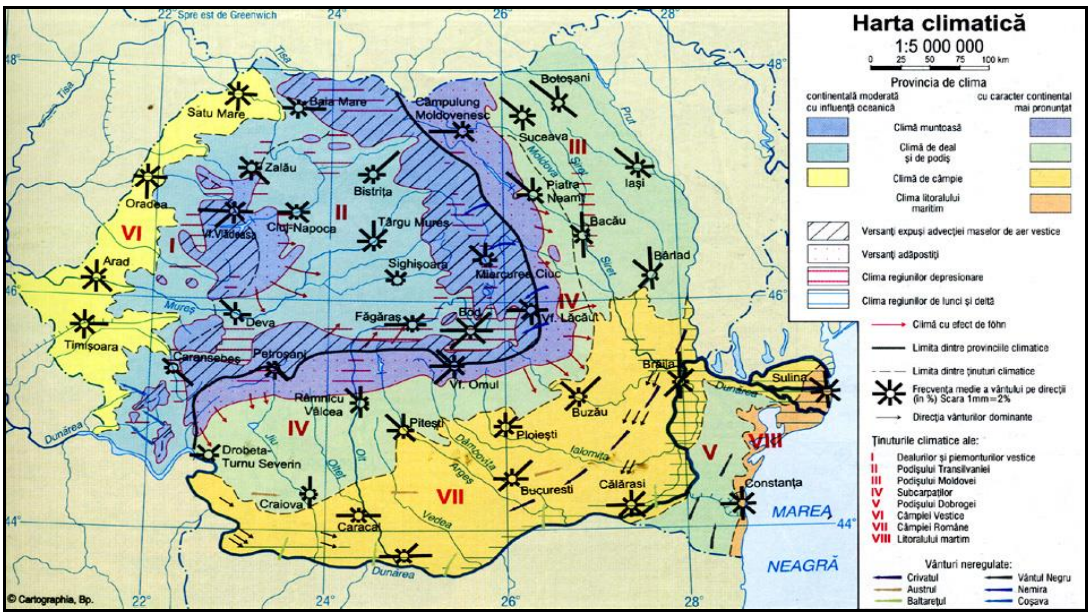
1.1.2. CLIMATE

General climatic characterization

The Romania's climate is temperate-continental of transitory type, being marked by eastern, oceanic, Scandinavian-Baltic, sub-Mediterranean and Pontic influences. Thus, in Banat and Oltenia, the Mediterranean tendency is present, featured by smooth winters and a richer pluviometrical regime (especially in autumn). In Dobrogea, there is a Pontic tendency, by rare and yet teeming rains. In eastern regions of the country, the continental character is more pronounced. The northern part of the country (Maramures and Bucovina) experience the effects of the Scandinavian-Baltic tendency, having a cooler and more humid climate with frosty winters In the western part of the country there are more pronounced influences of low pressure systems, generated over The Atlantic Ocean, which cause moderate temperatures and richer precipitations. According to Köppen classification, Romania is characterized by the following climate types *(fig. 1.6):*

- *cool temperate climate* (**Dfb**), without a well individualized dry season and moderate thermal summers, hot and cold season are well determined, this climate type defines most of the country's territory;
- *warm temperate continental climate* (**Cfb**), with moderate humidity throughout the year, without a excessively intense dry season and relatively mild summers, cool and hot seasons are well defined, this climate type is representative for the Western half of the Romanian Plain and West Plain.
- *the temperate continental climate* (**Cfa**), similar to **Cfb**, but with summers that can be excessively hot, is specific to Dobrogea Plateau and the eastern half of the Romanian Plain;
- *the cool mountain climate* (**H**), with high humidity throughout the year is found in the upland massifs of the Carpathian arch. *(souce N.A.M.)*

Fig.1.6. Climatic map of Romania, climatic areas

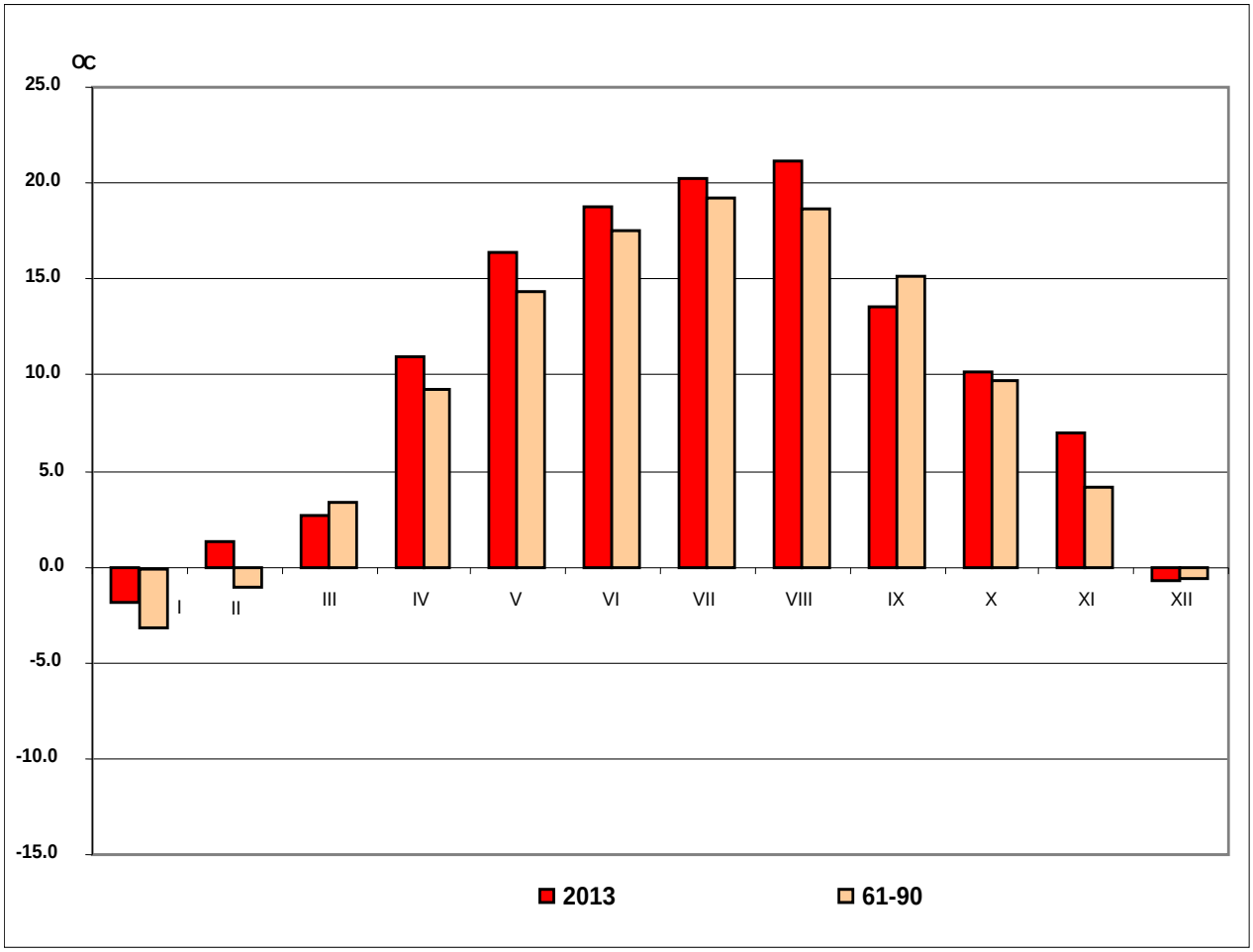


1.1.2.1. Climatic data for year 2013

In 2013, the annual country average temperature level, 10ºC, was 1.1ºC above the normal climatologic standard value (1961-1990). In the classification of annual average temperatures in Romania, from 1961 to date, 2013 is placed on the 7th position, with 2007 with the highest average annual temperature in this range.The positive deviations of the average monthly temperatures compared to the standard value for each month individually oscillated between 0.5ºC (October) and 2.8ºC (November), and the negative ones were recorded only in March and September, when the national average monthly temperature was with 0.7ºC, respectively with 1.6ºC below the normal climatologic value of the month (Chart 1.1).

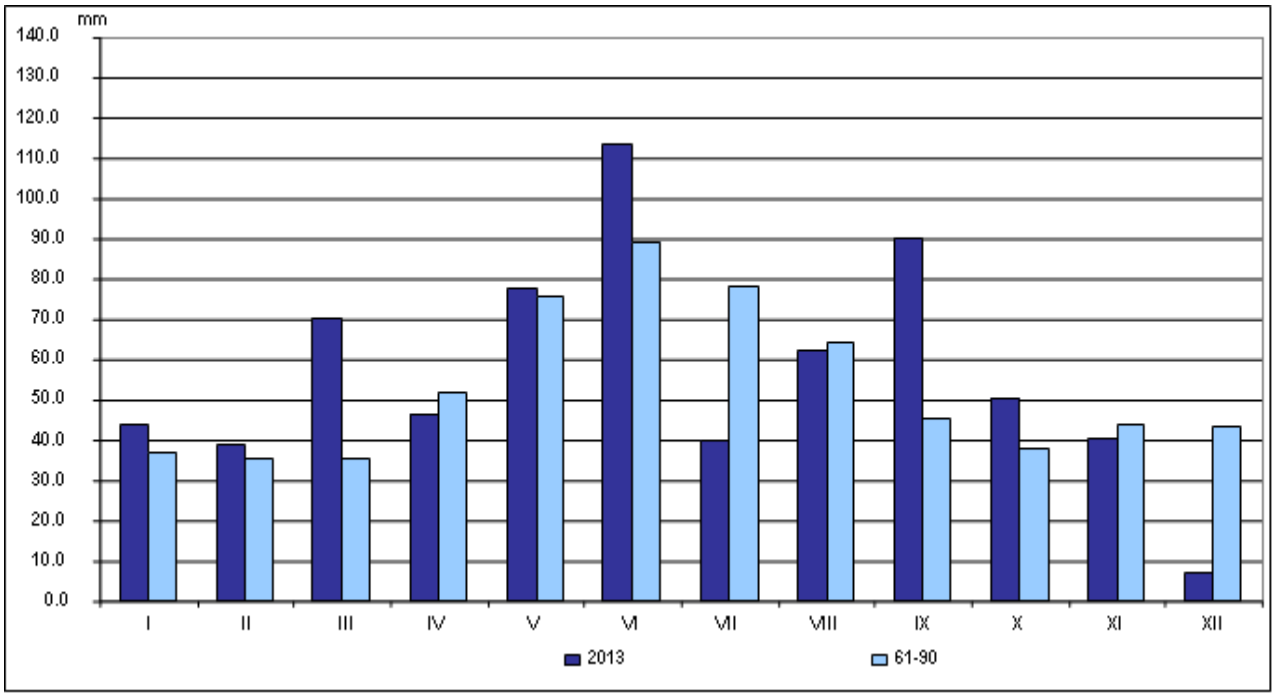
The annual quantity of precipitations, country average value (683.5 mm) was only 7% above the normal climatologic standard value (1961-1990). In the classification according to the annual amount of precipitations, at national level, from 1961 up to the present day, 2013 ranks at number 19, with 2005 having the largest annual amount of precipitations. Therefore, the positive deviations in January, February, March, May, June, September and October ranged between 3% (May) and 98% (March and September), and the negative deviations for the rest of the months ranged within 3% (August) and 80% (December) (Chart 1. 2)

Chart 1.1 Monthly average temperatures (ºC) across Romanian territory from 01.01 to 31.12/2013, compared against the normal standard climatologic average (1961-1990).



Source: ANM

Chart 1.2. Monthly quantities of precipitations (mm) across Romanian territory from 01.01 to 31.12/2013, compared against the multi-annual average (reference period 1961-1990).



Source: ANM

1.1.2.2. Extreme climatic phenomena in 2013

In the first five days of April, rainfall caused flooding that affected more than 140 municipalities in 15 counties. Damages have been reported in more than 100 homes and more than 11 bridges were damaged. Also, 23 county roads and 30 communal roads were affected by floods. Due to incurring rainfall landslides were as well recorded. In late May, storms were reported in many parts of the country and in Bucharest, the storm on May 23 caused one death and many damages. In Corabia, Olt County, hail fell and the ice layer reached 10 cm in height. From June 3 to 6, 2013 were affected by floods approx. 44 localities in 14 counties. In Botosani and Neamt the traffic was hampered on eight county roads. In Galaţi, in Matca, a dam was broken and several homes were flooded, and in Vaslui county one death was recorded.

The effects of the flood on the Danube in Romania, in early June, significantly decreased compared with those in Hungary, Serbia and Slovakia, in spite of being registered material damages in certain sectors.

The rainfalls recorded during the period June 30th to July 1st, 2013 caused floods in Dobrogea, Moldova, Muntenia and Bucharest. Were affected many housings, the road infrastructure was destroyed in the Medgidia and Cernavoda, and traffic was blocked on two national roads. After the flood there were people trapped in cars or isolated inside the houses. The heavy rain fallen between September 11 to 13th has caused floods in Galaţi. Following these, there were recorded nine deaths and hundreds of homes were affected. Strong winds and heavy rains during the period of September 30 to October 1st, caused damages in the South and East, in the counties of Calarasi, Braila, Buzau, Constanta, Giurgiu, Dambovita and Bucharest. The Black Sea ports were closed, dozens of households were flooded and several localities were left without electricity. In Bucharest, in addition to flooding, three people were seriously injured and 75 cars were damaged by fallen trees. In Harghita, Prahova, especially Braşov, due to precipitation as snow, traffic was difficult, and between Brasov and Predeal, due to the fallen trees, there were problems also in the railway traffic. In December, in the lowlands, there was reported dense fog with reduced visibility below 200 m and isolated, even below 50 m.

In 2013, the National Meteorology Administration issued 75 general meteorological warnings / alerts of which: 26 meteorological information, 41 yellow code meteorological alerts and 8 orange code meteorological alerts. For severe meteorological events were issued a total of 2511 *nowcasting* warnings / alerts.

Fig.1.7. *River Map of Romania*

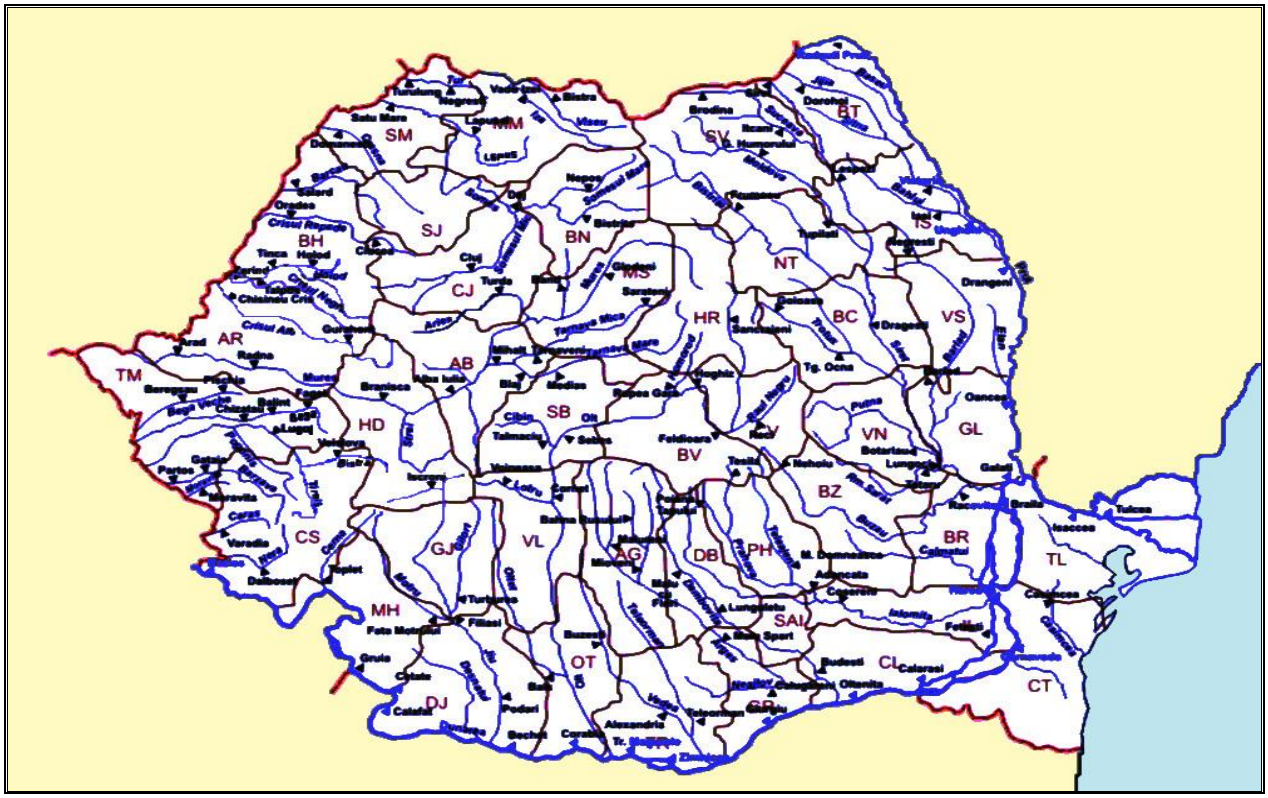
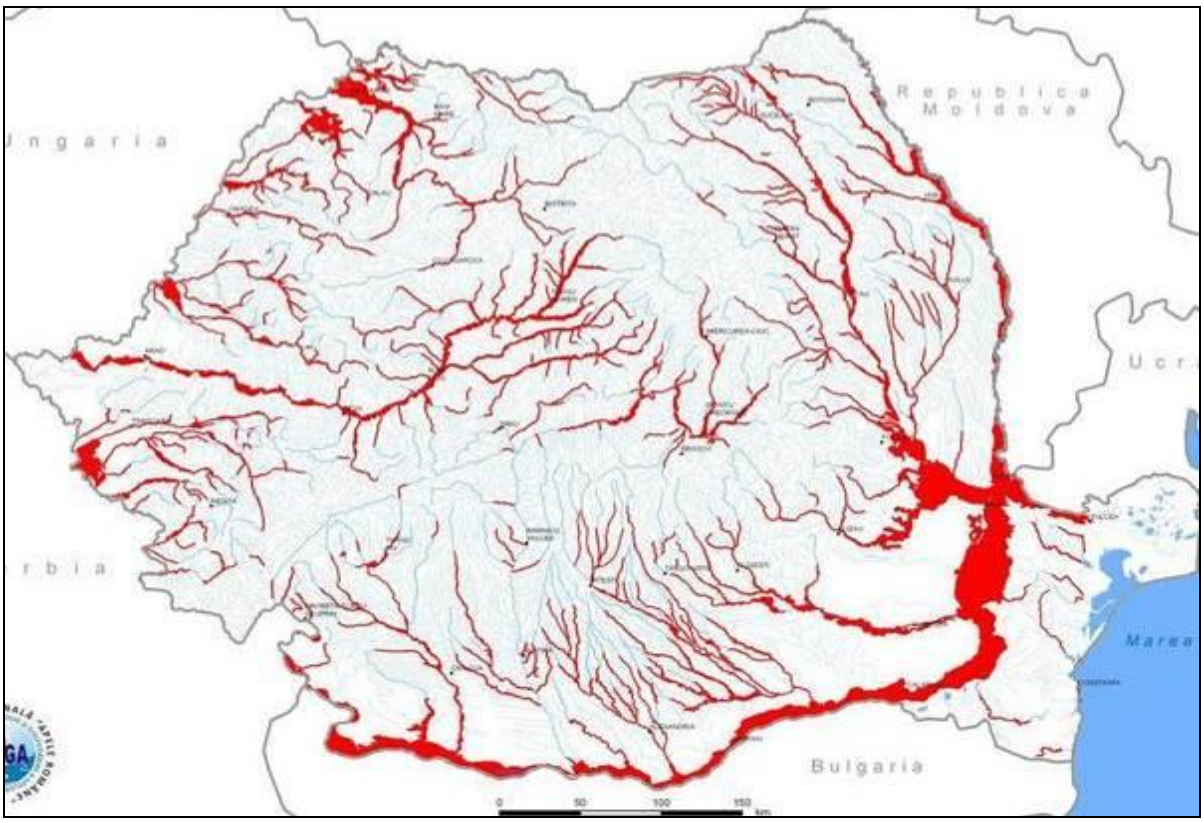


Fig 1.8 Map of areas with significant flood risk potential *(source - rowater.ro)*



1.2 DEMOGRAPHY

The demographic characteristics, total number of population, density, structure by ages, influences directly the pressures exercised on the environment. According to the final data of 4th of July, 2013, published by the National Institute of Statistics, following the *Census of the population done on 20th of October, 2011,* Romania has a stable population of 20,121,641.

Urban population: approximately 54%, of the total stable population. Compared to the situation at the penultimate census, the percentage of the stable population in the urban environment increased with 1.3 percentage points, at the loss of the rural environment.

From 1990 to 2011, Romania's population dropped from 23,211,395 inhabitants (*peak reached in the period of 1992 – 1994)*, to 20,121,641 inhabitants, therefore dropping by 13.3% (*Chart 1.3*).

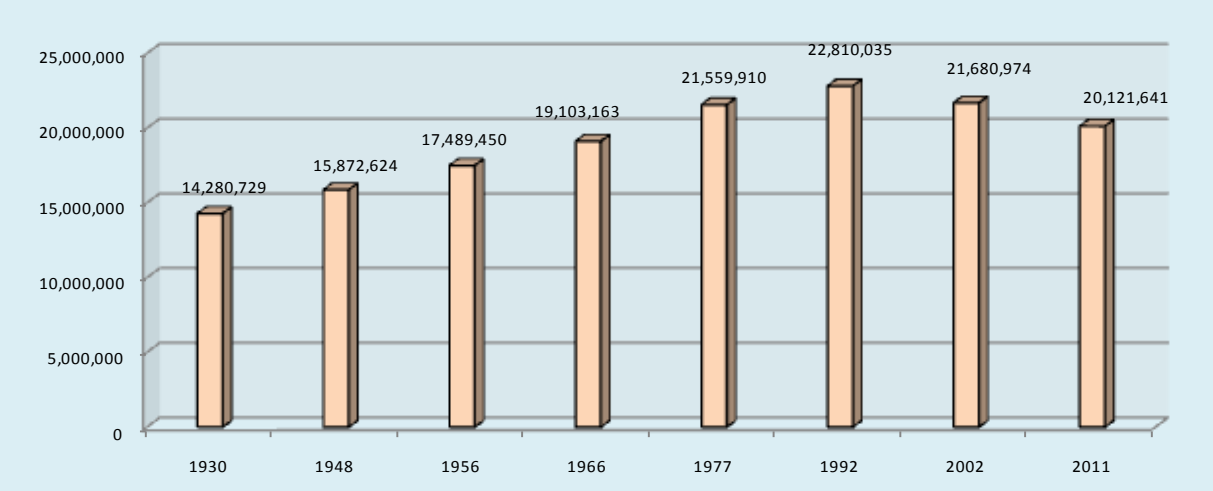
Moreover, in Bucharest, Romania's capital and the largest city, at the census of 2011, the city population was of 1,883,425.

The first six counties, with the exception of Bucharest Municipality (1,883.4 thousand), as number of stable population, are: Iasi (772.3 thousand), Prahova (762.9 thousand), Cluj (691.1 thousand), Constanta (684.1 thousand), Timis (683.5 thousand), and Dolj (660.5 thousand people).

Covasna (210.2 thousand), Tulcea (213.1 thousand), Salaj (224.4 thousand), Mehedinti (265.4 thousand), Ialomita (274.1 thousand) and Giurgiu (281.4 thousand) are the counties with the smallest number of people that are part of the stable population.

(*Source: INS, www.recensamantromania.ro/ 04.07.2013*)

Graph 1. 3 Population Evolution by census, period 1930 – 2011



1.3. TERRITORIAL ADMINISTRATION

From administrative point of view, the Romanian territory is organized into communes, towns and counties (41 plus Bucharest. *fig. 1.8*). From historical point of view, there are 3 traditional provinces: Walachia (including Oltenia, Walachia and Dobrudja regions), Moldova and Transylvania (including Transylvania and Banat regions).

One of European Union' objectives is to promote economic and social progress, balanced and sustainable development by strengthening cohesion among member countries. A region (administrative territorial unit) is seen, by the Council of Europe, as the unit just below the state level, with elected Public Administration authority, having their own financial resources. Romania is divided into administrative units called counties.

In order to apply the regional development policy, in Romania were established 8 development regions as a result of a free agreement between the county and local level counsels corresponding to NTUS 2 level *(Nomenclature of Territorial Units for Statistics)* of EU divisions, but without regional administrative responsibilities (*fig. 1.9*). Development regions refer to the regional subdivisions of Romania created in 1998 and works in particular for the coordination of regional development projects.

Fig. 1.8. Administrative map of Romania

Developing regions are not administrative units; do not have legal personality, being the result of an agreement between the county and local councils. Romania's development regions are named after the geographical position occupied within the country:

- ***Northeast Region 1***
  Consists of the following counties: Iaşi, Bacău, Botoşani, Neamţ, Suceava, Vaslui
  - *area = 36,850 km^2; inhabitants = 3,302,217*

- ***Southeast Region 2***
  Consists of the following counties: Brăila, Buzău, Constanţa, Galaţi, Tulcea, Vrancea
  - *area = 35,762km^2 ; inhabitants = 2,545,923*

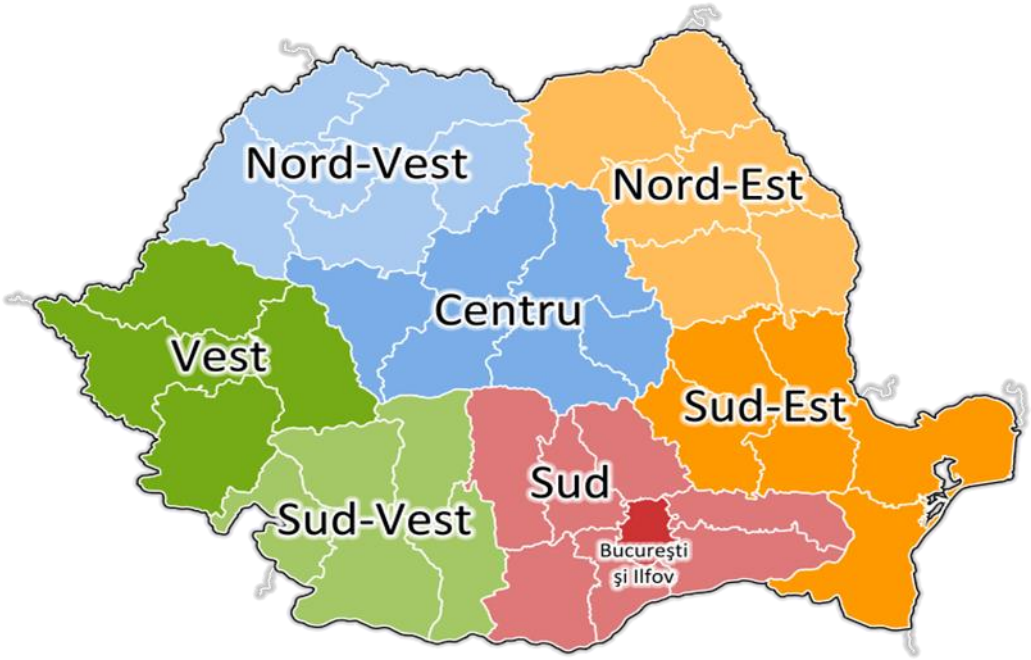
- ***South Muntenia Region 3***
  Consists of the following counties: Argeş, Dâmboviţa, Călăraşi, Prahova, Giurgiu, Ialomiţa, Teleorman
  - *area = 34,450 km^2; inhabitants = 3,136,446*

- ***Southwest Oltenia Region 4***
  Consists of the following counties: Dolj, Gorj, Mehedinţi, Olt, Vâlcea
  - *area = 29,212km^2; inhabitants = 2,075,642*

- ***West Region 5***
  Consists of the following counties: Arad, Caraş-Severin, Hunedoara and Timiş.
  - *area = 32,034km^2; inhabitants = 1,828,313*

- ***Northwest Region 6***
  Consists the following counties: Bihor, Bistriţa-Năsăud, Cluj, Maramureş, Satu-Mare and Sălaj.
  - area = 34,159 km^2; inhabitants = 2,600,132

Fig. 1.9 Development regions map



- ***Centre Region 7***
  Consists of the following counties: Alba, Brasov, Covasna, Harghita, Mures, Sibiu
  - *area = 34.100km²; inhabitants = 2,360,805*

- ***Bucharest-Ilfov Region 8***
  Composed of Municipality of Bucharest and Ilfov County
  - *area = 1,821km²; inhabitants = 2,272,163*

(Source: NIS www.recensamantromania.ro 04/07/2013)

1.4. NATURAL RESOURCES

The total of Romania's capitalizing resources, through its geographic and geologic environment, form the natural resources. These are:

• *non-renewable resources* - minerals and fossil fuels;

• *renewable resources* - water, air, soil, flora, wild life, including the non-exhausting ones - sun, wind, geothermal and wave energy.

Between the components of the natural resources, there are strong links and interactions, so that any anthropic intervention on one of them inevitably affects the others too.

The use of these resources is done in a complex and coordinated manner, for simultaneous fulfilment of various objectives.

Non-renewable natural resources

The natural raw material non-renewable resources are energy generating sources, especially fossil fuels, whose typical representatives are mainly: hydrocarbons (petrol, natural gases) and coal deposits. Other non-renewable resources are: ferrous and non-ferrous metal deposits, useful rocks.

Some of these resources have been exploited and processed with technologies that led to massive pollution of some areas of the country. The emissions of atmospheric pollutants from the industrial activities (energy, chemical petrochemical industry, siderurgical and metallurgical industry, the of building materials' etc.) substantially contribute to environmental pollution.

Renewable natural resources

The most important renewable natural resources of Romania are: *water resources*, made of surface waters - rivers, lakes, Danube River and underground waters, *soil, fauna, flora, forests, sun and wind energy.*

A special resource category is *the mineral waters* (sparkling, sulphur, ferruginous waters etc.) and *geothermal waters*

These resources can be used unlimited if done rationally. Their exploitation above their natural renewal rate leads to their diminishing and finally to their exhaustion.

Of the 27 major water inland courses, the longest interior river is the river Mures, 761 km long and the shortest river is the river Trotuş, with 162 km in length. The most extended hydrographical basin is the one of the Siret River, having a surface of 42.890 km^2.

Along with the Carpathians and Black Sea, Danube represents one of the major components of the natural environment of our country. Danube's course may be subdivided into four sectors: Baziaş - Porţile de Fier (Iron Gates) sector; Portile de Fier - Călăraşi sector; Călăraşi - Brăila sector; Brăila - Black Sea sector. Being the second largest river in Europe, after Volga, Danube represents the water source for different uses, food (fish fauna) and cheap energy, by means of the hydroelectric power plants from the Iron Gates I and II.

The Danube forms, when meeting the Black Sea, one of the most beautiful wet areas in Europe, namely the *Danube Delta*, with a total surface of 4,178 km2, distributed on the territory of two neighbouring countries: Romania and Ukraine.

The Black Sea is Romania's gate towards seas and oceans, and Black Sea seaside and coast area offers a variety of conditions for harnessing the underground (petroleum, natural gas), aquatic (the fish fauna) and land riches (tourism and leisure).

There are over 3,450 lakes in Romania, with a total surface of approximately 1.1% of the entire surface of the country. Generally, the lakes have small surfaces, as approximately 91.5% of them have below one km^2.

As for their origin, the lakes are divided into *natural* and *anthropical lakes*. The main natural lakes occupy a total surface of 92,892.3 ha. The main anthropical lakes occupy the total surface (on normal retention level) of 102.454 ha, in this surface being also included the Portile de Fier lake surface, at the confluence of the river Nera with the Danube and the barrage, of 70,000 ha.

A category that has a spectacular growth is represented by *wind energy*, Romania being considered one of the most active countries for investments in the field of renewable energy, in the field of wind and photovoltaic energy. Romanian legislation supports renewable energies projects through the green certificates that allow investors to have a return on investments. Green certificates are granted for electric energy produced by renewable sources and delivered to consumers. In 2011, 2012, because of the dryness, they became strategically important, producing, during some periods, more energy than Hidroelectrica. At the end of last year, Romania ranked 10th in the chart of the most attractive countries in the world in regard to wind energy investments, surpassing countries like The Netherlands, Italy, Japan or Australia (*according to the "Renewable Energy Country Attractiveness" study, published by Ernst&Young, http://forbes.ro)* Moreover, the output in the wind energy plants for 2012 was of 2640.7 million of KWh, increased with 1397,6 million KWh (47%) compared to 2011 (*according to data made available by the National Institute of Statistics . NSI*). Romania having at the end of 2012 an installed wind power capacity of 1.9 gig watts, which accounts for 5% of the national power production. The investments made in the construction of green energy production units exceeded 3 billion and are mostly carried out by private companies. Up to present day, the development of wind farms has been massive in Dobrudja, in the coming years to be extended to other regions of the country (Moldavia and Banat), according to the prognosis studies performed.

Another category of the natural regenerative resources is represented by *the water springs*. In Romania, there are known over 56 types of natural mineral waters. More than a third of the mineral waters in Europe are encountered in Romania. Since antiquity, some of the lakes that were built up inside the craters of the old salt mines or arisen from the erosion or collapse of parts of the mountains were known as having therapeutic effects. In turn, these lakes form another source of treatment. Some well-known spas are: Băile Herculane, Băile Felix, Covasna, Sovata, Băile Tuşnad, Vatra Dornei, Slănic Moldova, Mangalia, Eforie Nord, Govora, Băile Olăneşti, Călimăneşti, Căciulata etc.

Out of the total surface of the country 61.71% represents *agricultural surface*, 28.28% being *forests and forest vegetation* and 10.02% *waters and other surfaces.* The Romanian *pedoclimatic* resources are a renewable potential represented by fertile soils, as: chernozems from the Romanian Plain, West Plain, Moldova's Plateau, Transylvania's Plain, Dobrudja and other areas.

The agricultural soils occupy 14.7 million ha, the tillable ones being of 9.4 million ha and the forests around 6.7 million ha.

The vegetation varies, with a high tendency of originality. The following three areas of vegetations may be distinguished: *alpine, forest and steppe.* The alpine vegetation from mountain areas is very vulnerable to the

environmental factors and anthropogenesis ones, as they regenerate in an extremely difficult manner. This is why some species are represented by little exemplars and easily disappear as result of the activity of the interfering factors. The main dangers are the uncontrolled pasturage and tourism.

The steppe and silvosteppe vegetation spreading in areas short on humidity on Dobrogea's Plateau, the Romanian Plain, Moldova's Plateau and West Plain, were mostly replaced by agricultural cultures.

The significant variety of the flora and fauna in Romania derives from the complexity of the relief. Romania's flora and fauna are harmoniously divided and form a highly valuable wealth, based on controlled and rational exploitation. Romania is a country with a great biological variety and a high percentage of natural ecosystems. The fauna is rich in species, some protected, as the black goat, bear, rock aquila, lynx, blackcock, birch cock and other species that present hunting interest.

Romanian forests preserve a genofund of great diversity. In order to preserve this valuable natural capital and to ensure a favourable conservation status for natural habitats of great natural and community importance, Romania has taken important steps, by implementing the legislative elements specific to the European Union, as well as of some programs and projects dedicated to preserving the biodiversity

In Romania, in 2012, there were *protected natural areas* comprising: 44 scientific reservations, 13 national parks, with the largest one named Domogled - Valea Cernei, 206 natural monuments, 699 natural reservations, 15 natural parks (including Danube Delta), 148 special bird and fauna protection areas, 3 biosphere reservations (Danube Delta, Retezat and Rodna), 383 sites of community importance and 12 wet areas of international importance.

1.5. ECONOMY

According to the Constitution of 1991, **Romania's economy** is a market economy. According to it, the state is obliged to ensure free trade and protection for fair competition. Romania's economy goes by the law of supply and demand.

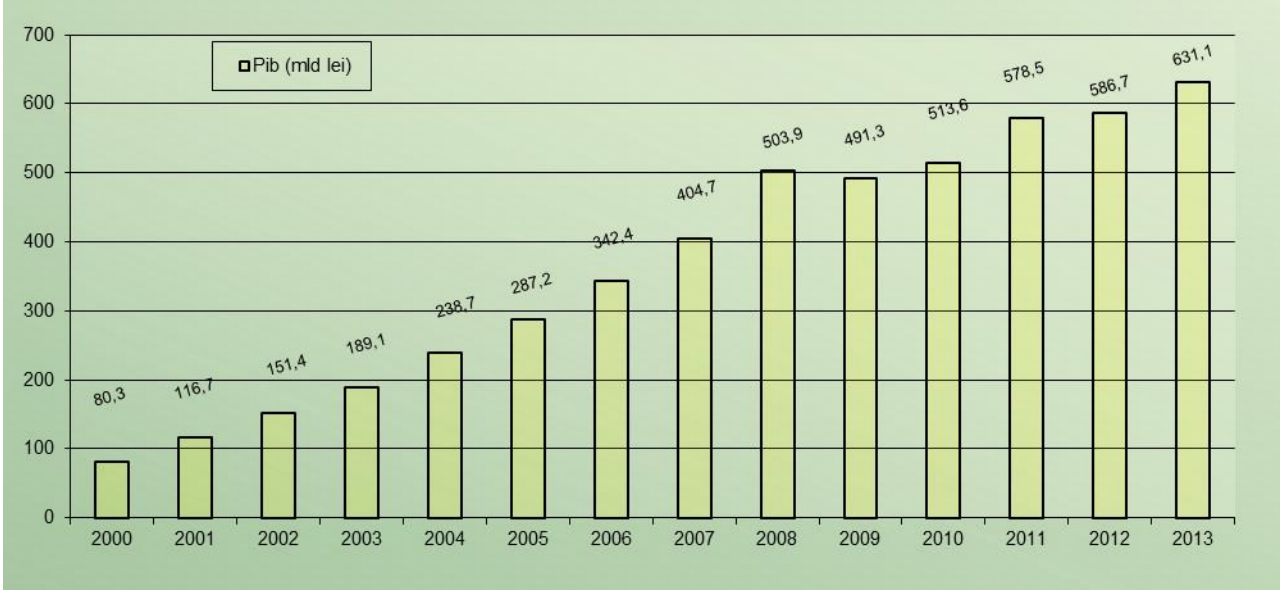
With an estimated GDP of 631.1 billion lei in 2013 *(chart 1.4),* Romania is part of the middle- higher income countries.

GDP value in 2000-2013

Anul	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
GDP –billion *RON*	631,1	586,7	578,5	513.6	491,3	503,9	404,7	342,4	287,2	238,7	189,1	151,4	116,7	80,3
GDP – billion *EURO*	140	131,7	122,7	119.8	116,3	136,8	112,2	97,1	79,2	60,8	52,6	48,4	44,8	40,2

Source: www.insse.ro

Graph 1.4 GDP evolution in Romania 2000-2013



The main *sectors* of the Romanian economy are: industry, energy, construction, agriculture, tourism, communications (internet, mobile and landline phone), commerce, trade and public sector.

Romania's main *industries* are: textiles and footwear, metallurgy, light machinery and assembly of machinery, mining, wood processing, building materials, chemical, food and oil extraction and refining. Pharmaceutical industry, heavy machinery and household appliances, IT have a steady annual growth. Currently, the car industry is very wide and oriented towards the market. Romania's economic power is focused primarily on the production of goods by small and medium enterprises, in industries such as precision machinery, motor vehicles, chemicals, pharmaceuticals, household appliances and clothing.

The GDP estimated *(on the 5th of March 2014)* for 2013 was Lei 631130.1 million, current prices, on the rise – in real terms – with 3.5% compared to 2012 *(source: www.insse.ro)*

The most significant contributions to the GDP growth in 2013 compared to 2012 have been brought by the following branches:

- Industry (+ 2.3%), accounting for 30.0% of GDP and whose workload has increased by 8.1%;
- Agriculture, forestry and fishing (+ 1.1%), with a lower share in GDP (5.6%) and whose workload has increased by 23.4%.

Positive contributions to GDP growth were brought also by Information and Communication, Real Estates and Professional, Scientific and Technical Activities; Administrative Services Activities and Service Support activities.

Negative contributions to GDP growth came from: Construction, Wholesale and Retail Trade; repair of motor vehicles and motorcycles; transport and storage; hotels and restaurants, financial brokerage and insurance.

In terms of using the GDP in 2013, compared with 2012, the increase was due mainly to the net export (with a contribution of + 4.1%), due to a growth of 12.8% in exports of goods and services, related also to a significantly lower increase of imports of goods and services by 2.3%; final consumption expenditure of households (+ 0.9%), accounting for 60.9% of GDP, whose value increased by 1.4%.

A negative contribution recorded the gross fixed capital formation (-1.5%), accounting for 22.9% of the GDP, whose volume decreased by 5.7%; final consumption expenditure of public administrations (-0.6%), accounting for 14.9% of GDP, whose volume decreased by 4.1%.

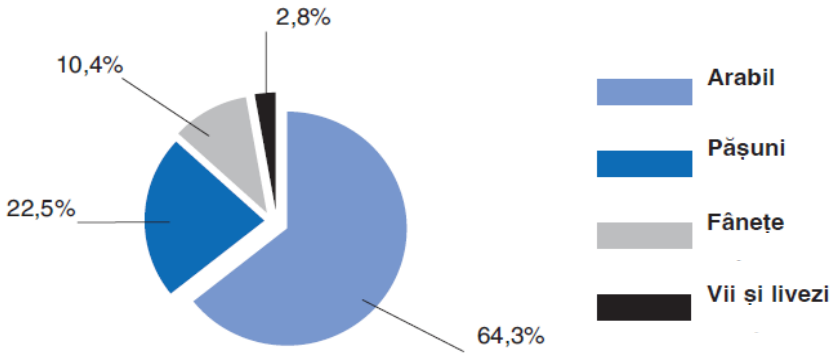
(*source: www.insse.ro, March 5, 2014*)

Romania has an agricultural area of around 14.7 million hectares of which ten millions are occupied by arable land. According to an assessment made in November 2008, approximately 6.8 million agricultural hectares are not worked. Due to the Common Agricultural Policy (CAP), Romania benefits from agricultural funds worth 14.5 billion euros in 2007-2013, as mentioned by the World Bank Partnership Strategy with Romania.

The agricultural area at the end of 2010 (thousand hectares): Arable 9405 ha, Pastures 3288.8 ha, Hay lands 1529.7 ha, Vineyards 213.4 ha, Orchards 198.6 ha. **Total: 14.635 million hectares.**

The main crops of Romanian agriculture are wheat, rye, barley, corn, peas, beans, sunflower, rapeseed, soybeans, potatoes, sugar beet; the orchard area grows apples, pears, peaches, apricots, plums and other, the percentages of use are represented in graph 1.5.

Graph 1.5 Agricultural areas according to the usage model at the end of 2010



(*source www.insse.ro, Yearly statistics 2011)*

Transport – through its geographical location, Romania is the intersection area of several lines of transportation, linking north to the south of Europe and east to the west. On the other hand, the transportation network in Romania ensures the link between the Community transportation network and the transportation networks of non-community neighbouring states in Eastern Europe and Asia *(by road, rail, air and naval).*

The road network grants access to most of country's localities, the network's density being of 0.64 km/km2; the network's length measures 84.887km (streets exclusively), out of which 17.110 km (20,2%) national roads, 35.587 km (41,9%) county roads and 32.190 km (37,9%), communal roads (*Fig.* 1.10.).

At the same time, some of the national roads are also European Roads, 6.269 km (36,6%) of European roads crossing Romania, namely: E58; E60; E68; E70; E79; E81; E85; E87 (Class A); E574; E576; E577; E578; E581; E583; E584; E671; E673; E675; E771 (class B), of which 644 km (17.1%) representing highways, 270 km (1.6%) representing three-lane roads and 1704 km (10.0%) four-lane roads.

At the end of 2013, the length of highways has increased by about 95 km, with a total of about 650km of *highways* in operation.

Highway A1 (*București - Pitești - Curtea de Argeș - Sibiu - Orăștie - Deva - Lugoj - Timișoara - Arad - Nădlac - Hungary*), part of the *IV European Transport Corridor,* which will connect Dresden/Nurnberg and Istanbul. The route of the Romanian highway starts in Bucharest and provides exit to the Hungarian border at Nadlac, passing through Pitesti, Sibiu, Deva, Timisoara and Arad

- total designed kilometres 576
- in use: 309km
  - *București - Pitești Nord, 128km, in use;*
  - *Sibiu ring road, 17km, in use;*
  - *Sibiu - Orăștie (82,1km, of which 60km in use, corridor Vintișoara - Orăștie, 24,1 km, Cunta - Vintisoara, 19,8 km, Sibiu - Săliște, 16,1km)*
  - *Orăștie – Deva (32,5 km, in use).*
  - *Deva - Lugoj (99,5km, of which 17 km in use, între Traian Vuia and Balint, the rest being in execution).*
  - *Lugoj – Timișoara (35,1km, of which 9,5km in use, Izvin - Giarmata, (Timișoararing road)).*
  - *Timișoara - Arad, (45km, in use).*
  - *Arad – Nădlac, (38,9 km, in execution).*

Highway A2 (Highway of the Sun, *Bucharest-Constanța)*, 203km, completed;

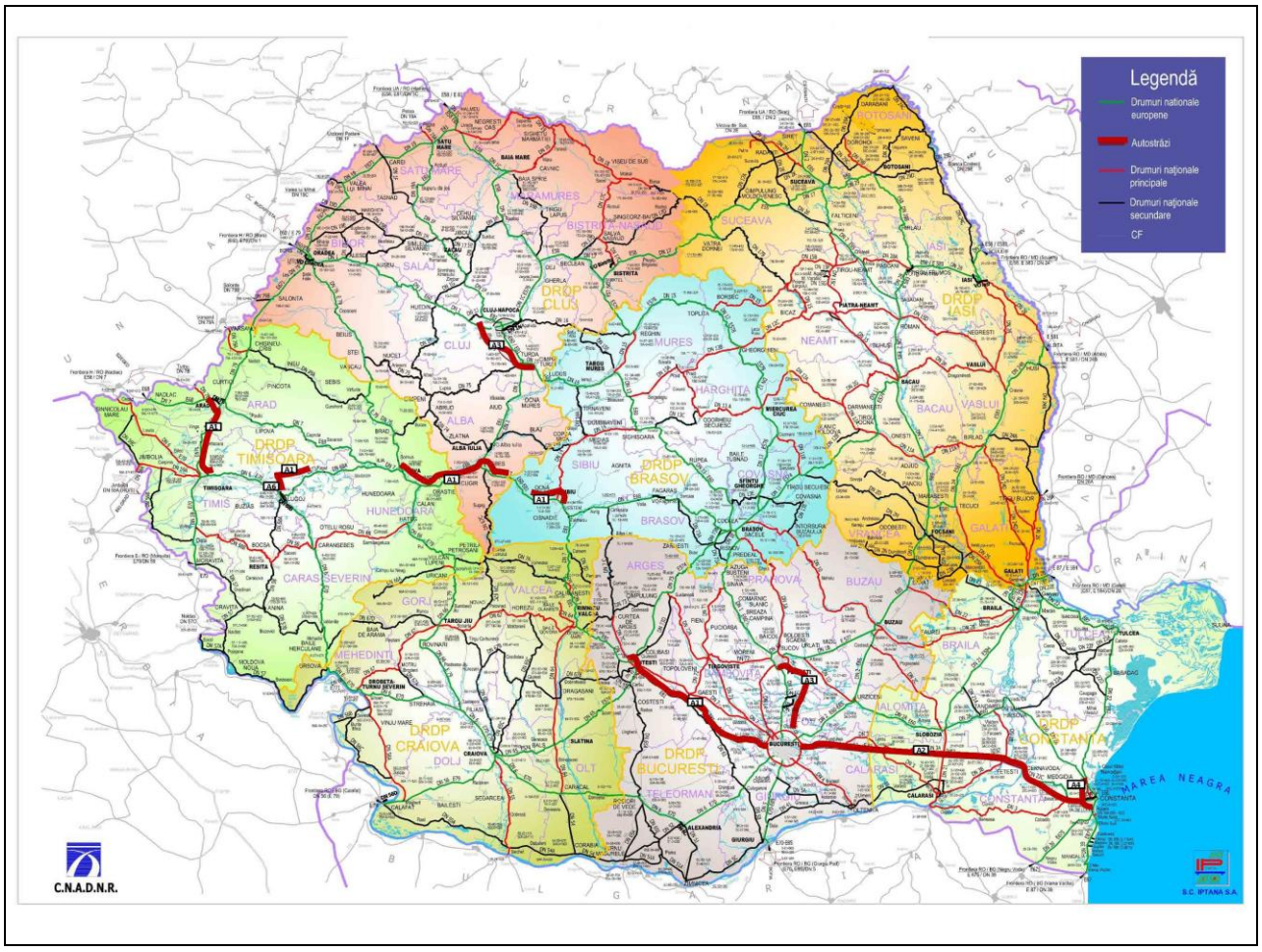
Highway A3 (*Bucharest-Brașov-Borș*), also named Transylvania Highway on the Brasov – Bors section, connecting Bucharest with the exit towards Hungary through Bors. A number of two sections are operational: Bucharest – Ploiesti and Campia Turzii – Gilau

- total no. of designed km 584
- in use: 114 km
  - *Câmpia Turzii- Gilău (Cluj Napoca Vest), 52km;*
  - *București-Ploiești, 62 km.*

Highway A4, is the by pass of Constanta, built as highway. It is fully functional. In the future, it is intended to extend highway up to the southern border of Romania with Bulgaria.
By pass Constanta (Ovidiu-Agigea), 22 km, completed.

(source: www.cnadnr.ro, http://130km.ro/autostrazi.ntml)

Fig. 1 10. Highways and National Roads Network in Romania



The **airports system** in Romania, is made of 17 airports, out of which 4 are opened for domestic and international traffic of people and goods, and 13 are highly specific and of local interest.

Bucharest International Airport –Henri Coanda, is the main Romanian airport running 75% of the international traffic of people and goods.

The **main airports** in Romania are: *Henri Coandă International Airport* (Otopeni), located at 10 km away from Bucharest. There are other operational airports at the outskirts of the cities of Constanţa, Timişoara, Arad, Cluj-Napoca, Sibiu, Suceava, Bacău, Baia Mare, Caransebeş, Craiova, Iaşi, Oradea, Satu Mare, Târgu Mureş, Tulcea.

The waterways network is exclusively located in the south and south-east of Romania with a density of 6.5 km/1000 km2; the network is 1,779 km long out of which 1,075 km represent international navigable Danube, 524 km navigable branches of the Danube and 91 km of artificial navigable waterways (the channels Danube - Black Sea and Poarta Albă - Năvodari); the network of inland waterways and the Black Sea counts 35 ports, out of which 3 maritime ports, 6 fluvial-maritime ports and 26 fluvial ports. *(source MTI)*

The main Romanian ports:

- **Black Sea ports**: Constanta (the largest Romanian port), Mangalia, Midia-Năvodari and Sulina;
- **Danube ports -** Moldova Noua, Orşova, Drobeta - Turnu Severin, Calafat, Corabia, Turnu Măgurele, Zimnicea, Giurgiu, Oltenița, Călăraşi, Cernavoda,, Hârşova, Măcin, Brăila, Galaţi, Tulcea ;
- **Ports on the Danube - Black Sea Channel**: Cernavodă, Medgidia, Basarabi, Agigea-Constanţa Sud.

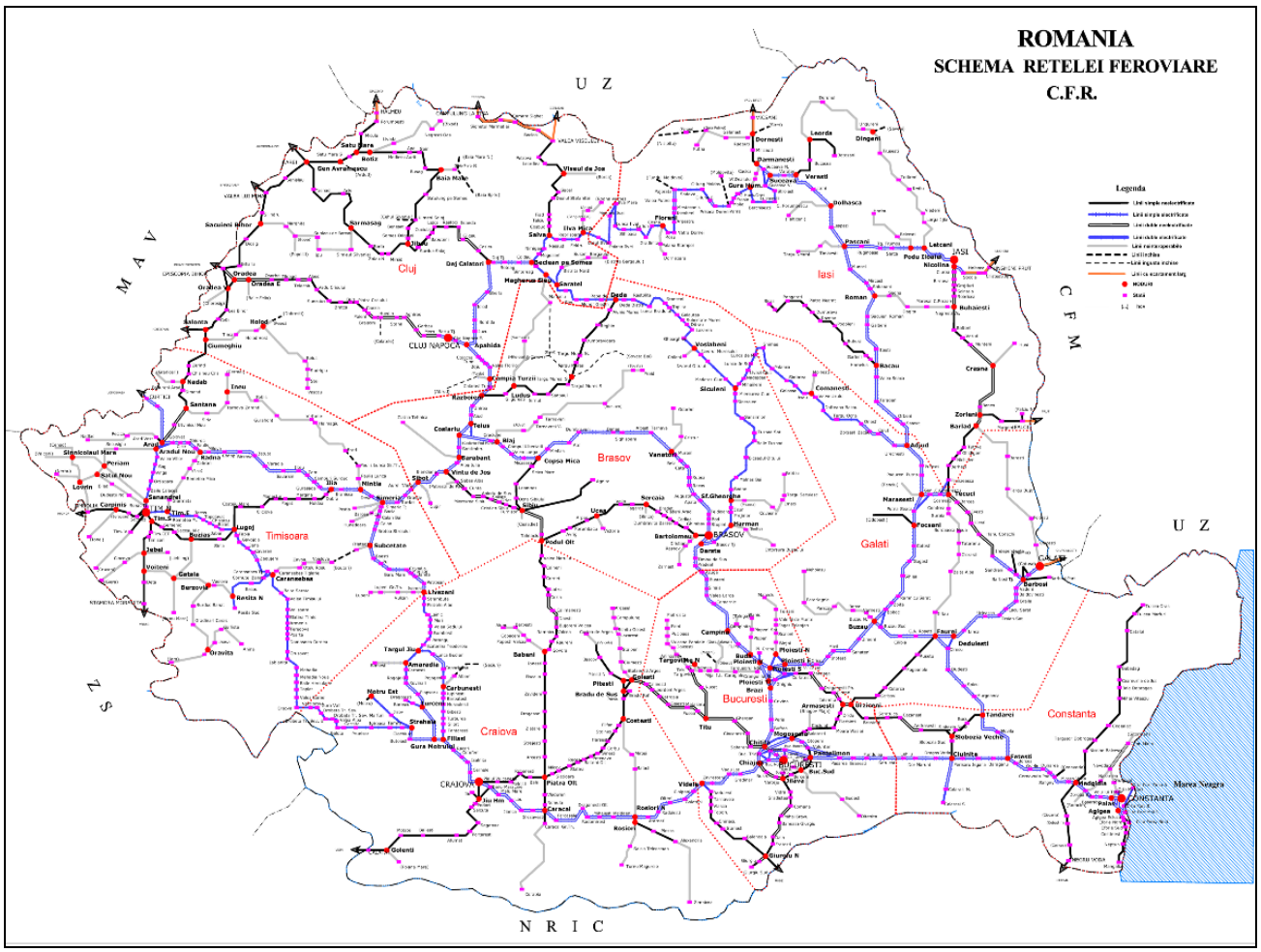
Railways infrastructure

It practically covers the entire country, with a density of operational lines of 45,2km/1000km² (fig. 1.11), ensuring connections with all railway networks from the neighbouring countries; length of the network 10768 km, out of which 10630 km (98,7 %) with standard gauge, 4 km with narrow gauge lines and 134 km (1,3%) with wide gauge lines.

Likewise, 2.965 km (27%) double lines, 3.942 km (35,9%) electrified line, most having standard gauge of 1.435mm; across the territory, the network includes 1,051 stations and flag stations, 50 depots and remises for locomotives, 120 car revisions and workshops and 106 lines maintenance sections, art works and block and interlocking and telecommunication installations, CFR (Romanian Railways) network being the fourth in Europe by size. *(sursa http://cfrsa.infofer.ro, http://www.insse.ro)*

Fig. 1.11. Railways network map

(sursa http://cfrsa.infofer.ro)



2. AIR QUALITY

2.1 EMISSIONS OF ATMOSPHERIC POLLUTANTS

Romania has the obligation to limit annual emissions of acidification, eutrophication and ozone precursors' greenhouse pollutants under the values of 918 thousand tons/year of sulphur dioxide (SO_2), 437 thousand tons/year for nitrogen oxides (NO_x), 523 thousand tons/year for non-methane volatile organic compounds (NMVOC) and 210 thousand tons/year for ammonia (NH_3), values that are national emission ceilings.

National emission ceilings for sulphur dioxide, nitrogen oxides, volatile and ammonia organic compounds, set for 2011 are those provided in the Protocol to the 1979 Convention on long-range transboundary air pollution, to reduce acidification, eutrophication and troposphere ozone levels, adopted in Gothenburg, on 1st of December 1999, ratified by Law no. 271/2003 and represents the maximum amount of pollutant that can be emitted into the atmosphere at national level in a calendar year.

Romania annualy reports, as per the European and international requirements, estimates of emissions of air pollutants covered by Directive no. 2001/81/EC on national emission ceilings for certain atmospheric pollutants **(the NEC Directive)** and by the protocols of the Convention on Long-Range Transboundary Air Pollution, done at Geneva on November 13, 1979 **(the CLRTAP)** and respectively the Protocol on Heavy Metals, the Protocol on Persistent Organic Pollutants and the Protocol to abate acidification, eutrophication and ground-level ozone **(the Gothenburg Protocol).**

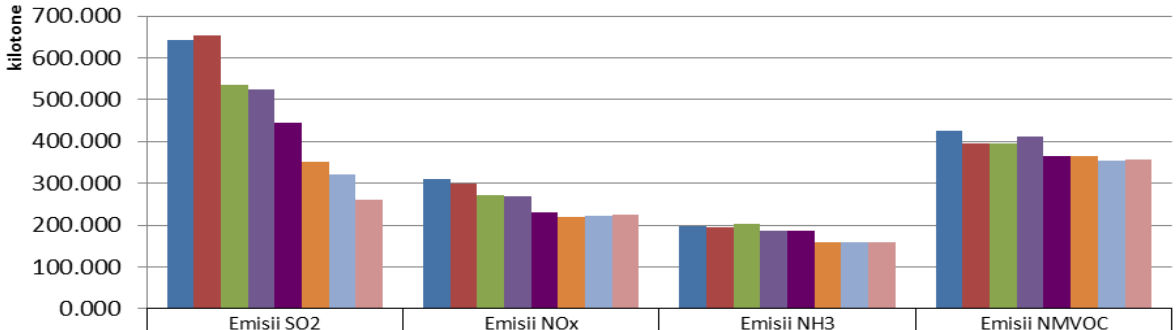
For the NEC Directive are developed the final national inventory of emissions of sulfur dioxide, nitrogen oxides, volatile organic compounds and ammonia, two years after the current year and the preliminary national inventory of emissions of sulfur dioxide, nitrogen oxides, organic compounds ammonia and volatile organic compounds and ammonia, for the previous year of the current year.

For the CLRTAP protocols are developed the annual national inventory of air pollutants covered by the protocols, two years after the current year, using the updated version of the EMEP/EEA 2009 on the development of emission inventories. Emissions of air pollutants for the period 2005-2012 were recalculated using the updated version of the EMEP/EEA 2009 on the development of emission inventories. Also, in accordance with the Gothenburg Protocol, it is developed, update and reported the national projections of emissions of pollutants covered by the Gothenburg Protocol, considering 2030 as the target year.

For the CLRTAP protocols, every 2 years is developed and reported to the CLRTAP Secretariat the report on strategies, policies and programs designed to fulfill the obligations provided under the CLRTAP protocols.

EVOLUTION OF SO_2, NO_X, NMVOC AND NH_3 EMISSIONS FOR THE PERIOD 2005-2011

Graph 2.1.1. *Evolution of annual emissions of acidification and eutrophication greenhouse gases as well as ozone precursors*

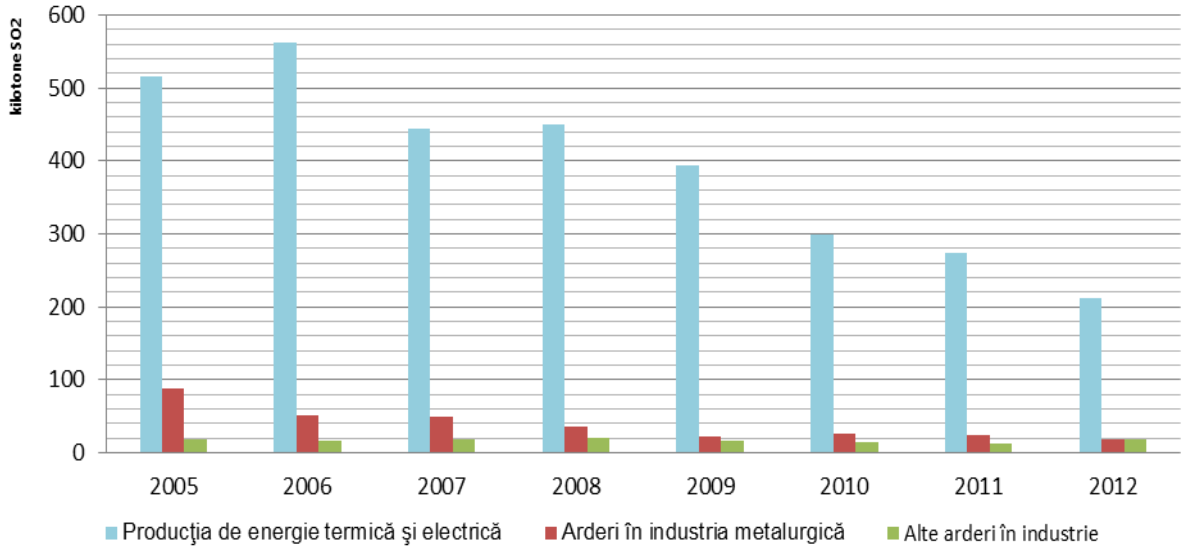


	Emisii SO2	Emisii NOx	Emisii NH3	Emisii NMVOC
2005	642.584	309.056	198.501	424.813
2006	652.925	297.874	195.884	395.755
2007	534.933	271.684	201.959	395.478
2008	525.771	269.567	185.544	410.855
2009	443.579	230.052	185.961	364.052
2010	350.336	217.939	159.814	363.812
2011	321.565	222.527	158.609	354.386
2012	259.666	225.816	158.509	356.583

Sulphur dioxide emissions corresponding to 2012 are characterized by a decrease of about 59.59% compared to 2005; significant decreases occurring in areas like "Burning in the metallurgic industry" (79.81%), and "Production of heat and power "(58.79%). In the "National navigation" sector there was an increase in emissions of SO_2, with 27.5%. In the "Road transport" sector, for all vehicle categories there was a significant decrease of over 94.96% compared to 2005 due to lower fuel sulphur content.

In 2012, the largest contribution to the national total was from the large combustion plants, which are sources of the "Production of heat and power" sector, whose emissions were about 212.375 kt (81.79%). Emissions from burning in the steel industry had a share of 6.81% and those in other industries had a share of 7.31% of the national total.

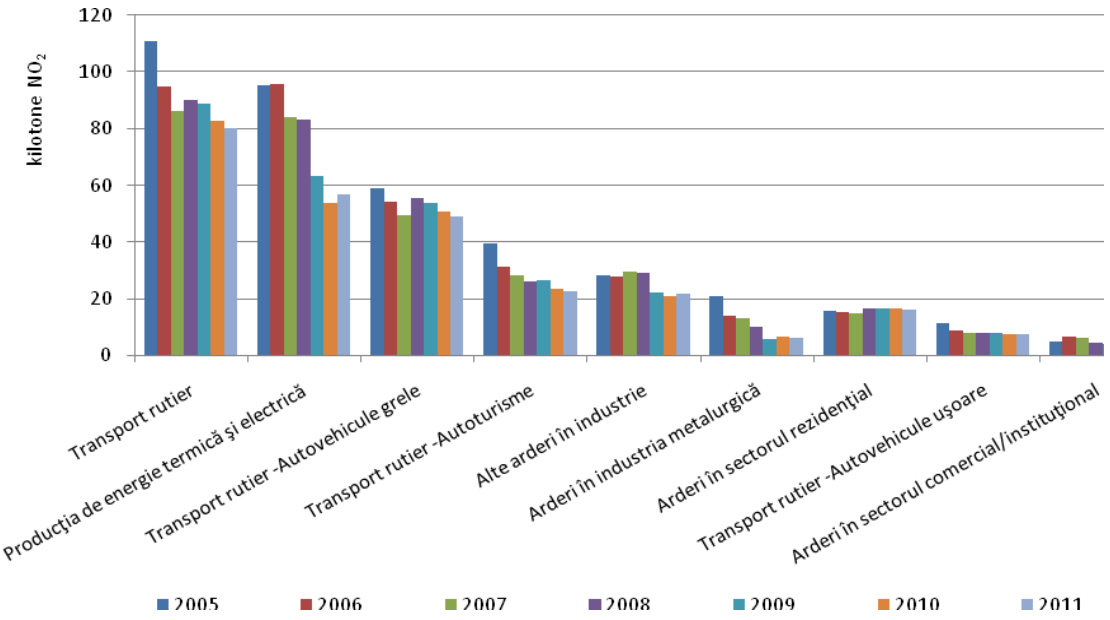
Graph 2.1.2 *Evolution of SO_2 emissions in the sectors with the largest contribution to the national total*



The total NO_x emissions in 2012 amounted to 225.816 kt, compared to 309.056 kt. in 2005. NO_x emissions derive especially from the "Road Transport" sector (38.92%) and the "Production of heat and power" (23.38%).

Nitrogen oxide emissions calculated for 2012, which saw declines compared to 2005, were the ones from sectors like "Production of heat and power" (75.1%), "Burning in metallurgic industry" (44.68%) and "Burning in the commercial/institutional sector" (27.61%). Increases in NO_x emissions compared to 2005 were recorded in "Burning in the residential sector" (7.81%) (Fig. 2.1.3).

Graph 2.13 *The evolution of NO_x emissions in the main industrial and transportation sectors*

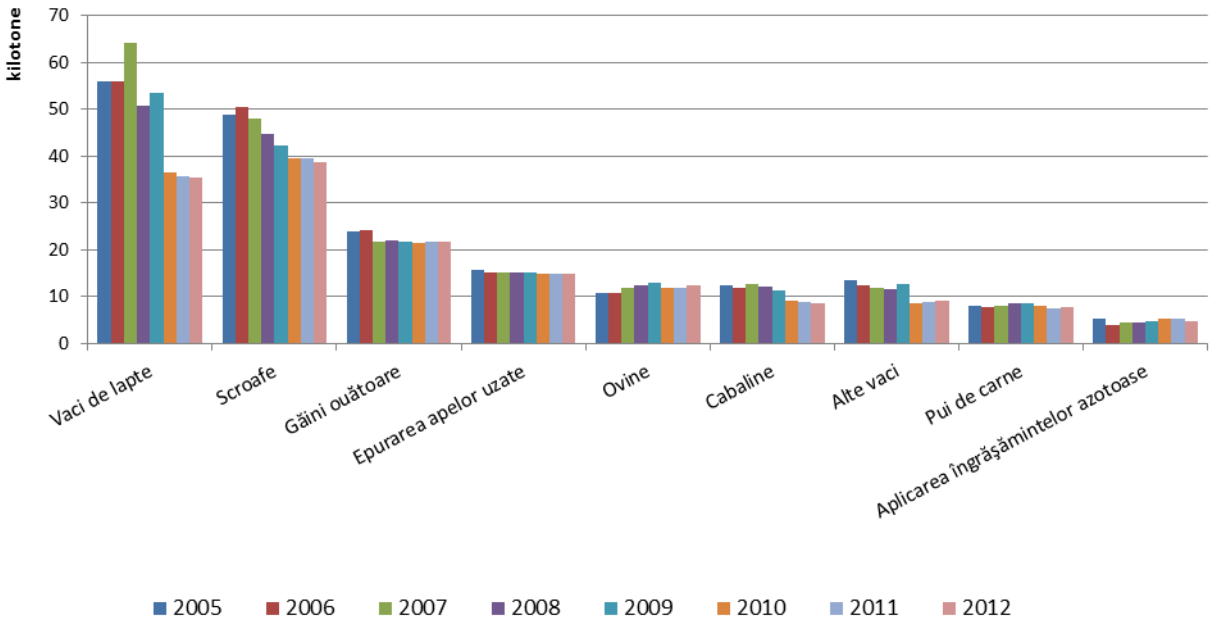


NH_3 emissions have decreased in 2012 by 20.15% compared to 2005. During the analysed period, the highest value was recorded in 2007 (201.959 kt). In 2012, total NH_3 emissions were 158.509 kt.

Change in emissions from livestock activities is explained by fluctuations in the number of livestock.

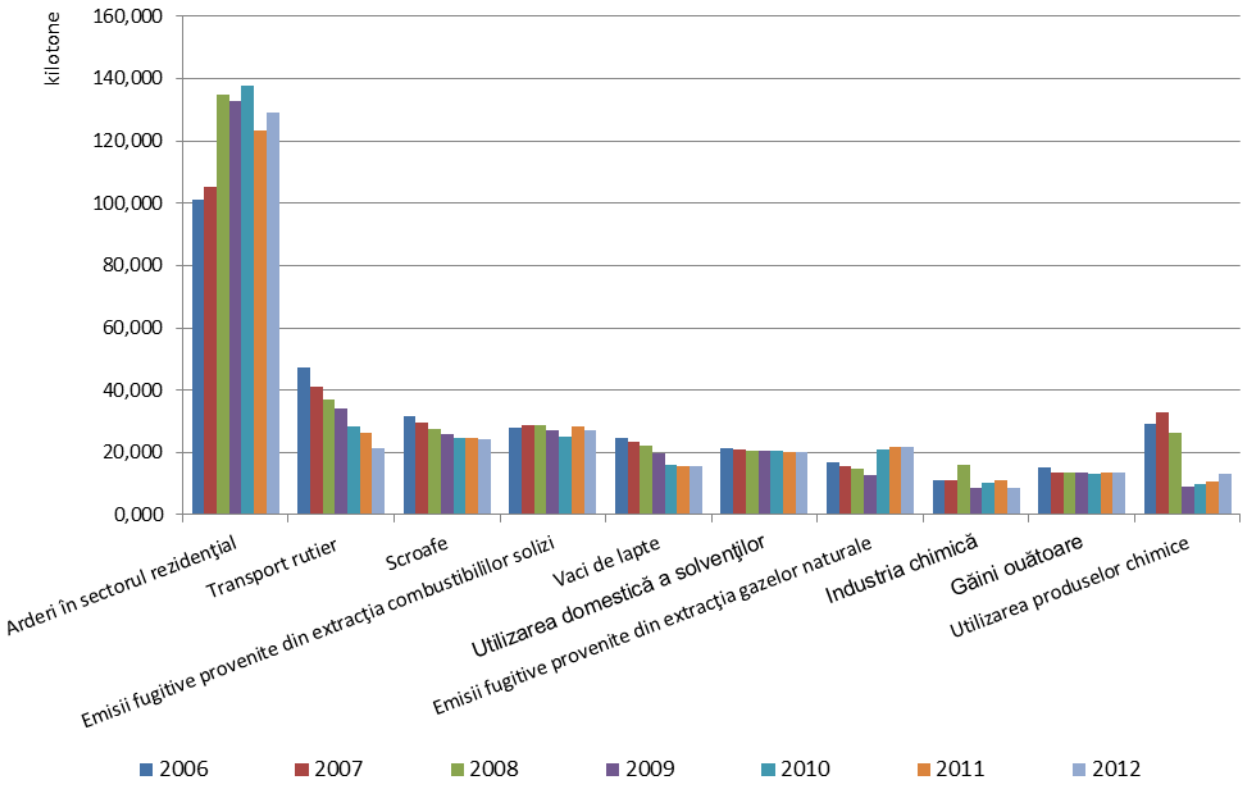
The most important share in the national total is represented by the manure management from dairy cows breading (22.38%), sows (24.41%) and laying hens (13.75%) and the waste water treatment (9.33%) (Fig. 2.1.4).

Graph 2.1.4 . *Evolution of NH_3 emissions from agriculture and wastewater treatment.*



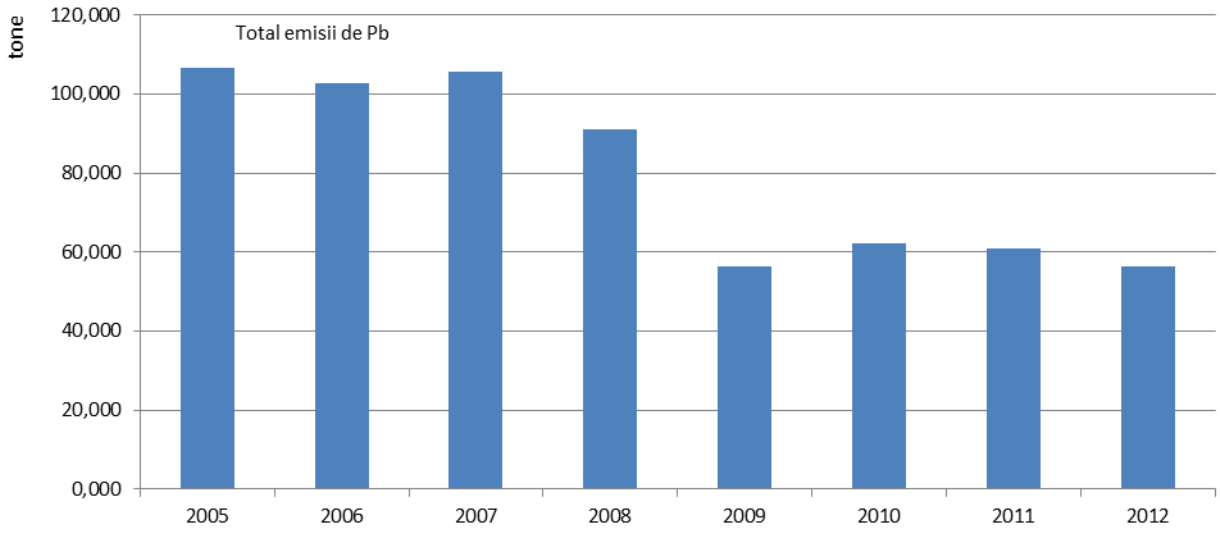
NMVOC emissions decreased in 2012 compared to 2005 by 16.06%. A decrease is noted compared to 2005 in the "Road Transport" sector of 74.44% and "Chemical industry" of 42.44% (Fig. 2.1.5).

Graph 2.1.5 *Emissions of NMVOC from sources with the largest share in national total*



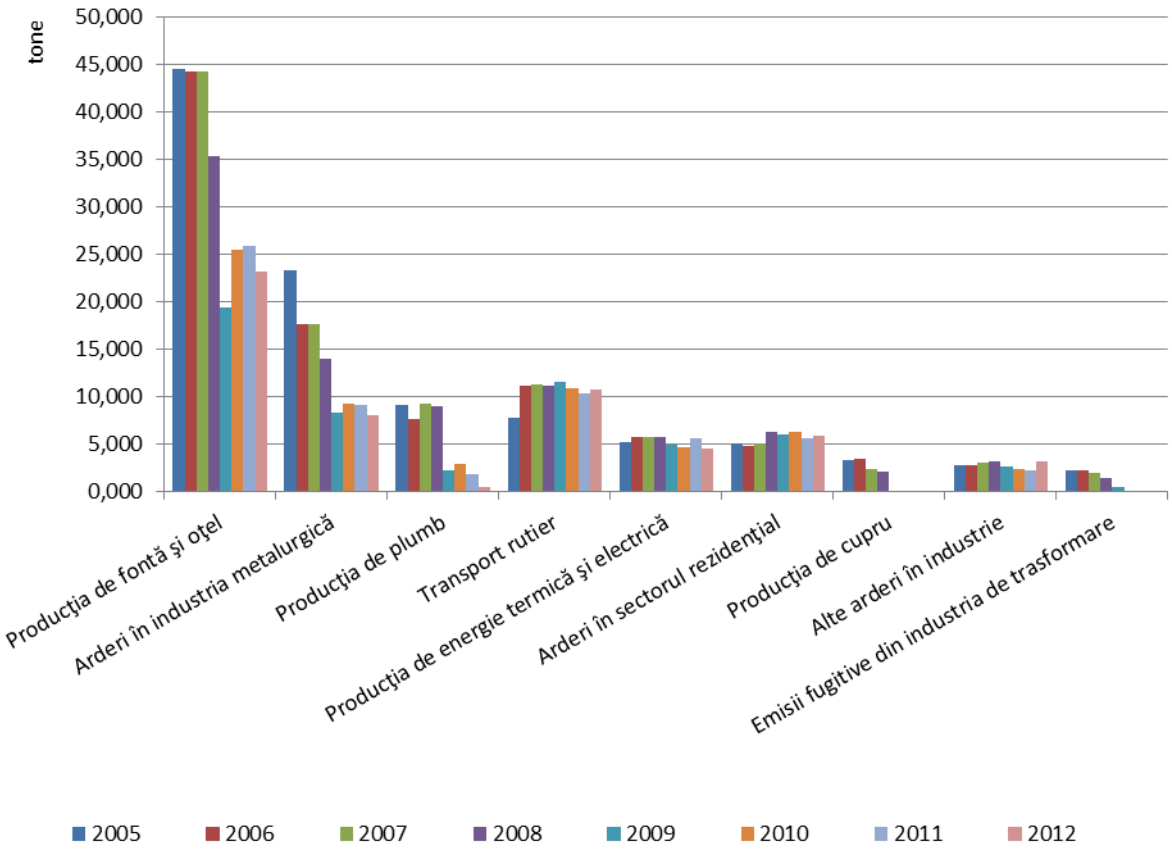
Total emissions of lead (Pb) decreased by 47.22% from 106,708 tons in 2005 to 56,324 tons in 2012 (Fig. 2.1.6).

Graph 2.1.6 *Evolution of the total emissions of Pb*



The most significant decreases were recorded in the sectors "Production steel" (95.82%) and "Burning in the metallurgic industry" (65.37%). At the other end, there is the "Road transport" sector which generated higher emissions by 39.01% compared to 2005 and "Burning in the residential sector" generated higher emissions by 17.09% compared to 2005. (fig. 2.1.7).

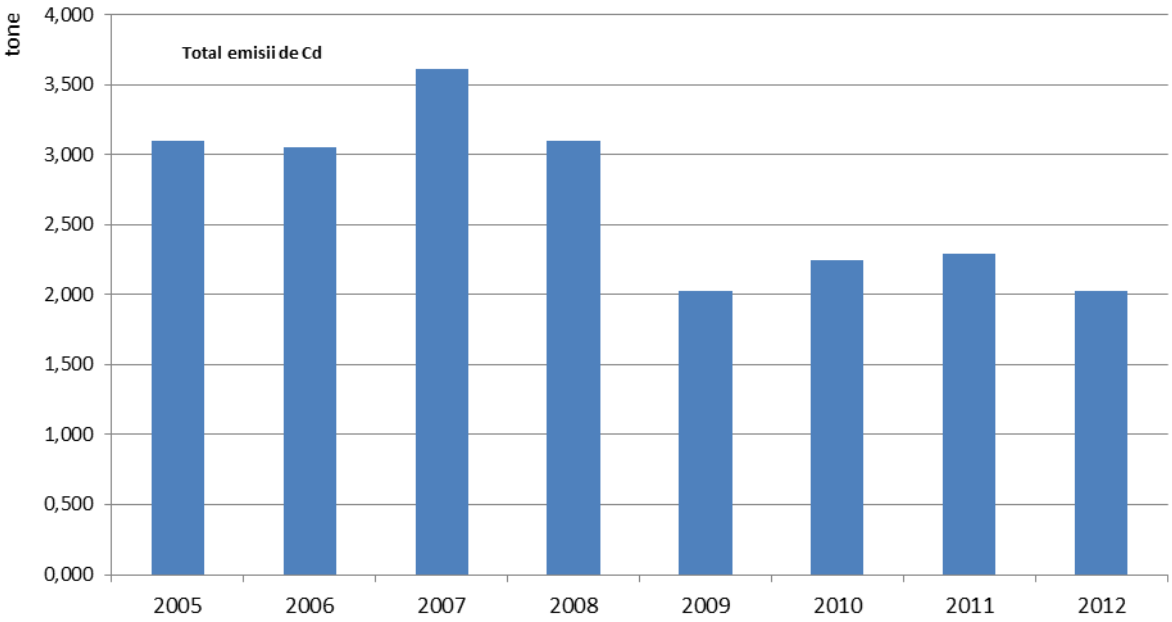
Graph 2.1.7 *Evolution of Pb emissions from major industrial sources, transport and burning processes*



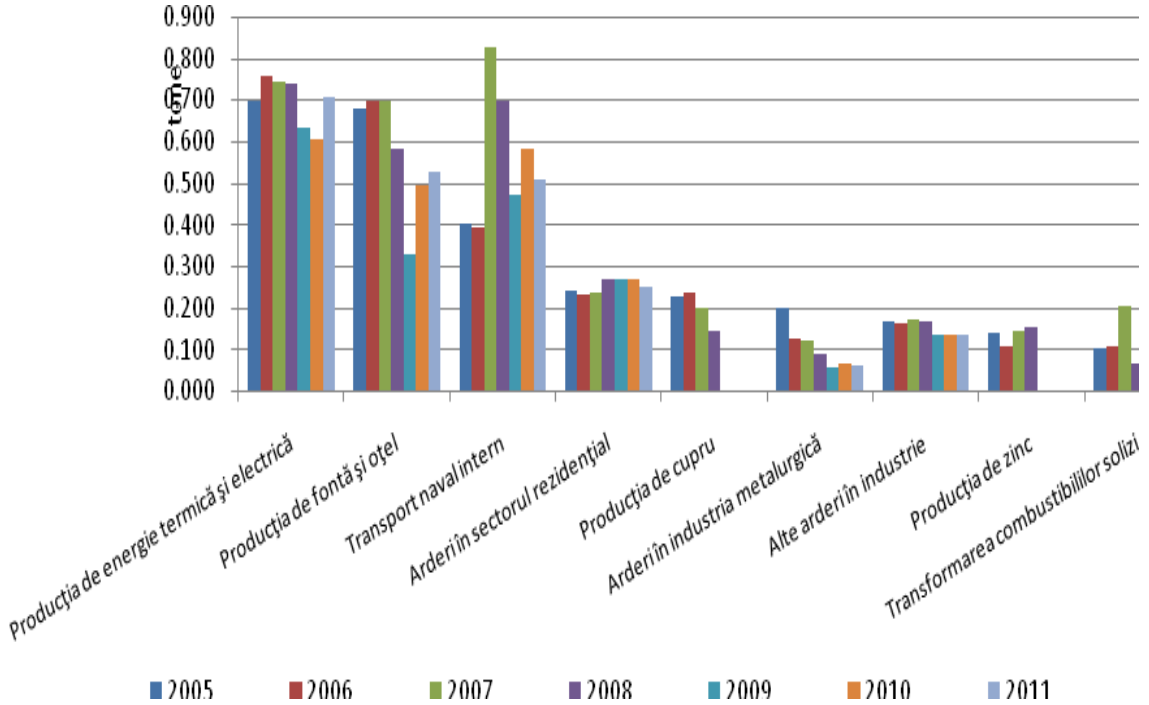
Total emissions of Cadmium (Cd) were of 2.022 tons in 2012. (Fig. 2.1.8).

The largest reductions in emissions of cadmium generally come from the metallurgic industry sector, namely the production of zinc (99.3%), from "Burning in the metallurgic industry" (75.62%), "Production of iron and steel" (30.98%). (Fig. 2.1.9). Activities with most significant contribution to emissions of Cd are "Production of heat and power" (28.49%), "Production of iron and steel" (23.24%) and "Domestic Shipping Transport" (20.77%).

Graph 2.1.8 *Evolution of the total emissions of Cd*



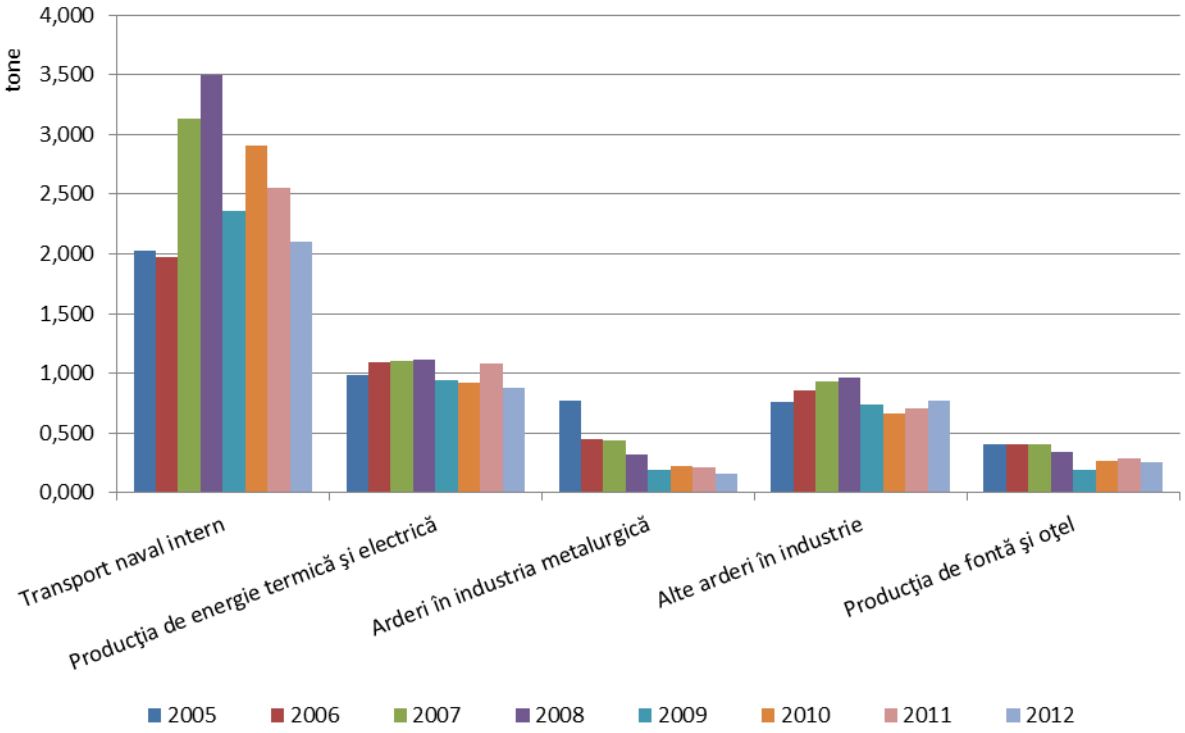
Graph 2.1.9 *Evolution of Cd emissions from industrial sources, transport and burning processes*



Total emissions of Mercury were of 4.325 tons in the year of 2012 and in 2005 of 7.405 tons.

Sectors with significant weights are "Domestic Shipping Transport" (48.55%), "Production of heat and power" (20.18%) and "Other burnings in industry" (17.85%), (Fig. 2.1.10).

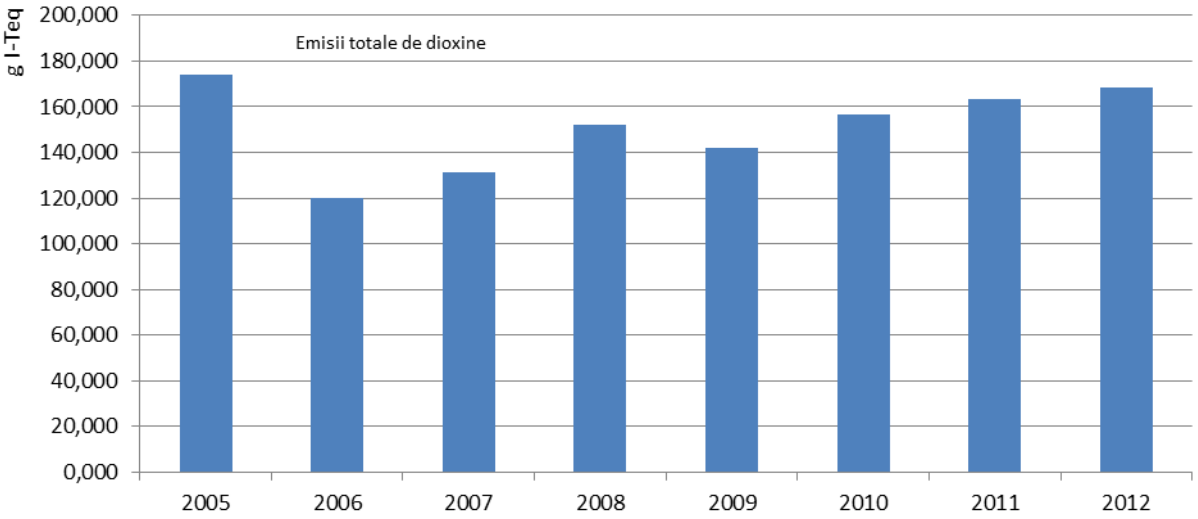
Graph 2.1.10 *Evolution of Hg emissions from industrial sources, naval transport and burning processes*



Emissions of persistent organic pollutants experienced a decrease in 2012 compared to 2005. The emissions of dioxin decreased with 3.28% from 174,307 g I–Teq, in 2005, to 168.597 g I–Teq, in 2012.

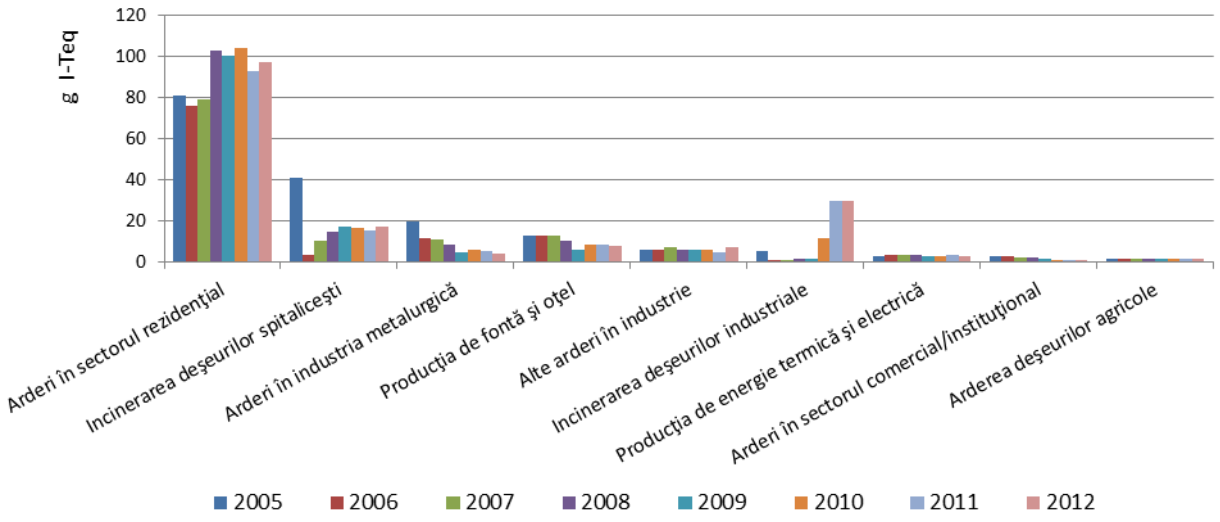
This decrease was due to decreasing quantities of burned industrial and hospital waste, as well as a decreased activity in the metallurgy sector.

Graph 2.1.11 *Evolution of the total emissions of dioxin*



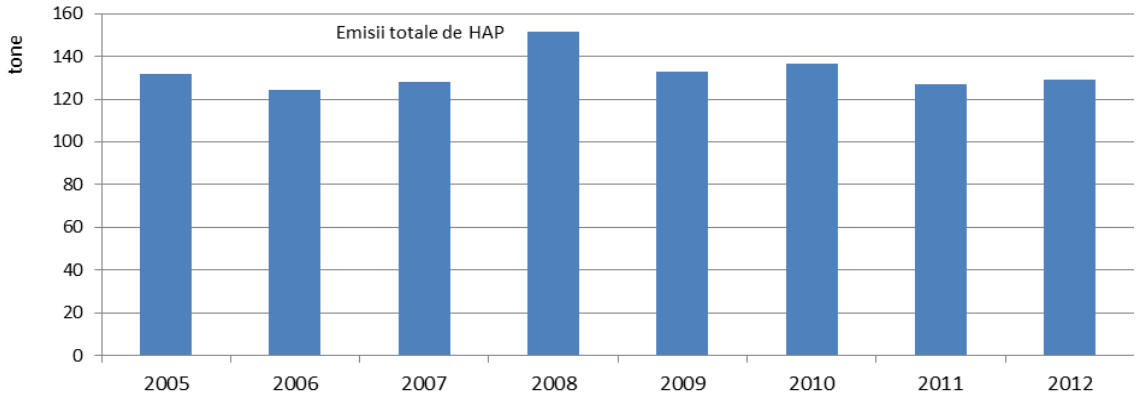
The main sources of dioxin emissions are represented by the sectors: "Burning in the residential sector" (57.64%), „Hospital waste incineration" (10.34%), "Production of iron and steel" (4.47%) and „Burning of industrial waste" (17.61%) (Fig. 2..1.12).

Graph 2.1.12 *Evolution of dioxin emissions from industrial sources, waste treatment and burning processes*



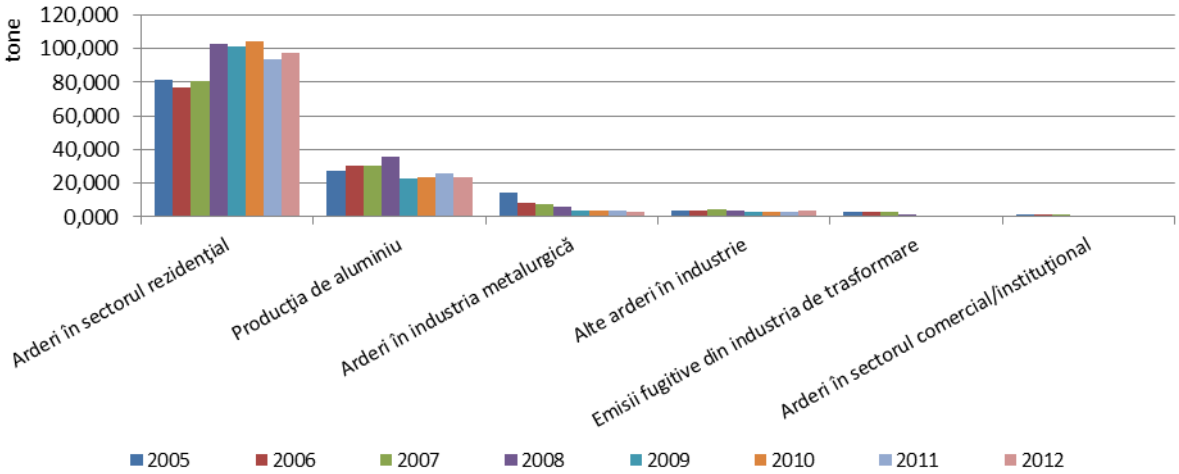
Total emissions of polycyclic aromatic hydrocarbons (PAHs) have decreased by 2.22%, from 131.93 tons in 2005 to 129.008 tons in 2012.

Graph 2.1.13 *Evolution of the total emissions of PAH*



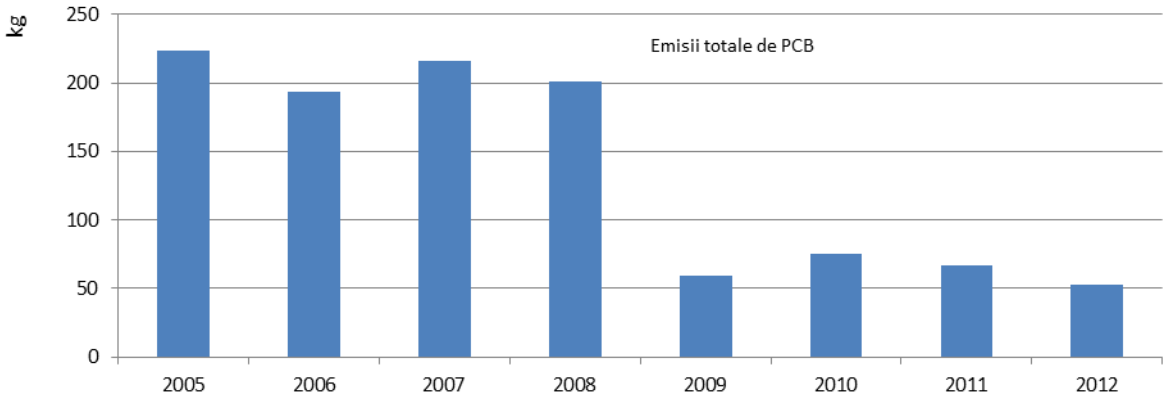
In 2012 the highest emissions' decrease came from the "Burning in the metallurgic industry" sector (79.74%) and the highest emissions came from the "Burning in the residential sector" (75.73%), "Production of Aluminium" (18.05%) and "Other burning in the industry" (Fig. 2..1.13).

Graph 2.1.14 *Evolution of PAH emissions from the major industrial sources and combustion processes*



The **emissions of polychlorinated biphenals** (PCB) present a decrease (of 76.34%), from 233,596 kg in 2005 to 52,898 kg in 2012. (Fig. 2.1.15).

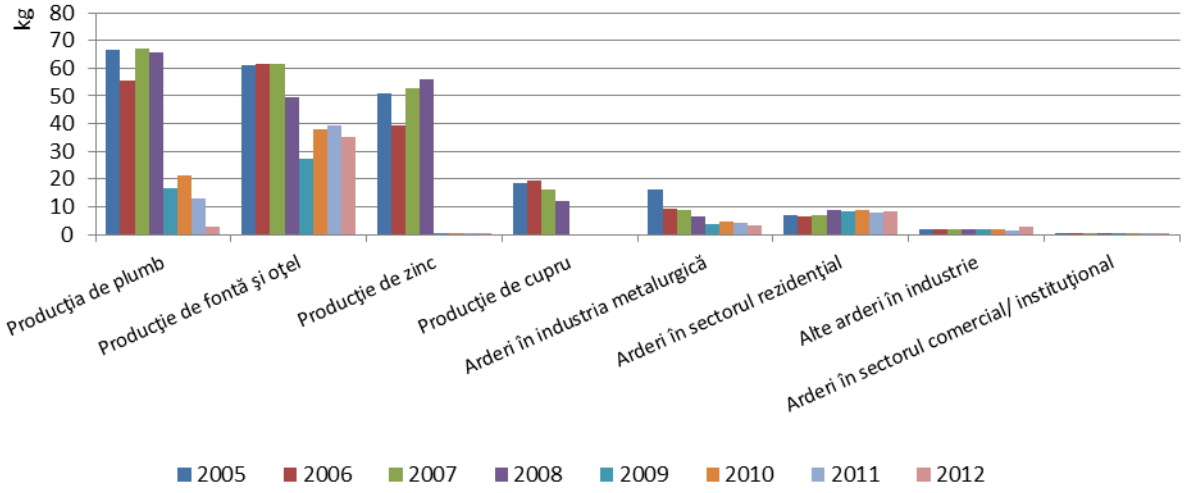
Graph 2.1.15 *Evolution of the total emissions of PCB*



The main reductions were in the sectors "Production of zinc" (99.42%), "Production of lead" (95.82%) the "Production of iron and steel" (42.75%) and "Burning in the metallurgic industry" (79.44%).

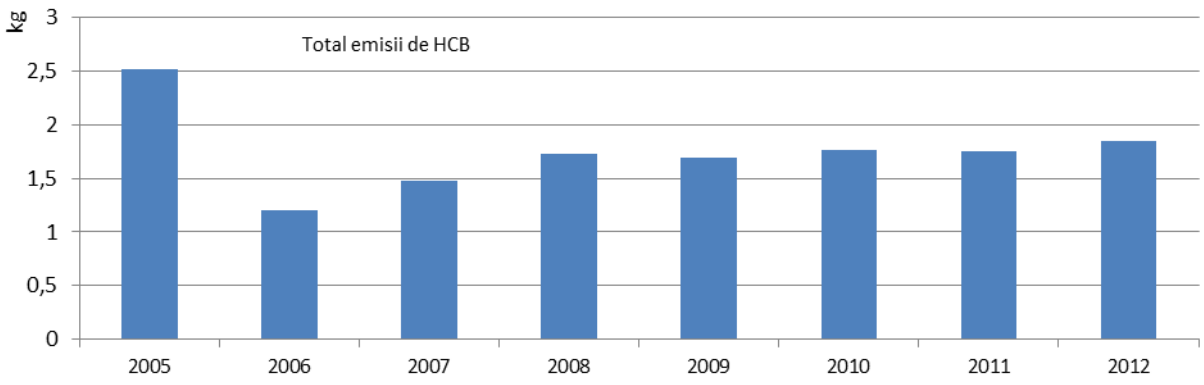
The weights of the main emission sources for polychlorinated biphenyls are: "Production of iron and steel" (66.24%), and "Burning in the residential sector" (15.91%), (Fig. 2.1.16).

Graph 2.1.16 *Evolution of PCB emissions from industrial sources and burning processes*



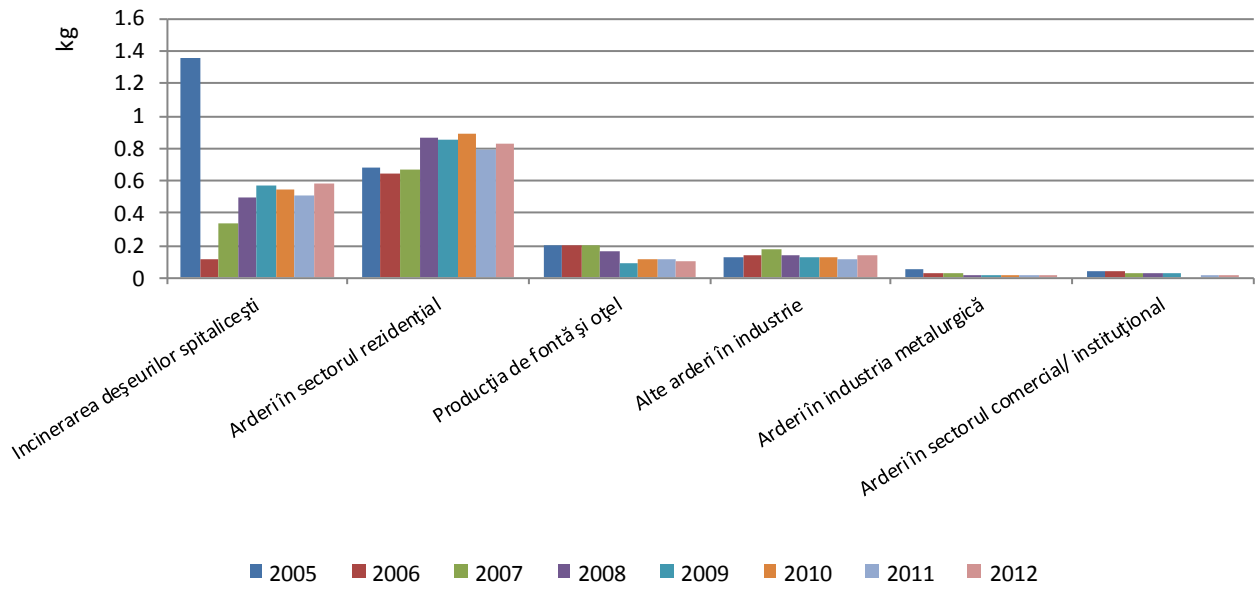
Emissions of hexaclorbenzene (HCB) show a downward trend, from 2,513 kg in 2005 to 1,852 kg in 2012, a 26.3% decrease. (Fig. 2.1.17).

Graph 2.1.17 *Evolution of the annual emissions of HCB*



The most significant decreases in HCB emissions come from the sectors "Burning in the metallurgic industry" (79.66 %), "Burnings in the trade/institutional sector" (65.96%) and "Hospital waste incineration" (57.12%). Sources with the largest shares in total emissions of HCB are: "Burning in the residential sector" (44.6 %) and "Hospital waste incineration" (31.37 %) (Fig. 2.1.18).

Graph 2.1.18 *Evolution of HCB emissions from industrial sources, waste treatment and burning processes*



2.2. AIR QUALITY

Ambient air quality assessment is governed by *"Law 104/2011 on ambient air quality",* which transposes the *Directive 2008/50/EC* adopted by the European Parliament and the Council on ambient air quality and cleaner air for Europe and Directive 2004/107/EC of the European Parliament and Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.

The following pollutants are taken into consideration when evaluating the air quality:

- sulphur dioxide (SO_2)
- nitrogen oxides (NO_2)
- nitric oxides (NOx)
- particulate matter (PM_{10} and $PM_{2.5}$)
- led (Pb)
- benzene (C_6H_6)
- carbon monoxide (CO)
- ozone (O_3)
- arsenic (As)
- cadmium (Cd)
- nickel (Ni)
- polycyclic aromatic hidrocarbures – (HAP)/benzopyrene (BaP)
- mercury (Hg).

In the year of 2013 the ambient air quality assessment in Romania was made permanently through 138 automated stations that are part of the National Network for Air Quality Monitoring (RNMCA) distributed throughout the country, as follows:

- **48** urban background stations and suburban background stations for the evaluation of the pollution background level in urban and suburban areas;
- **55** industrial stations for the evaluation of the contribution of emissions from industrial sources
- **27** traffic stations to evaluate the contribution of traffic emissions
- **8** rural background stations for the evaluation of the pollution background for rural areas.

The stations are equipped with automatic analyzers that continuously measure the ambient concentrations of the following pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO_2, NOx), carbon monoxide (CO), benzene (C_6H_6), ozone (O_3), particulate matter (PM_{10} and $PM_{2,5}$). Also included are laboratory equipment used to measure the concentrations of heavy metals: lead (Pb), cadmium (Cd), arsenic (As), nickel (Ni) of suspension particles and debris.

The sampling points are located according to the criteria set by the European Directives on air quality.
The sampling points dedicated to human health protection are located so that to provide data concerning the following aspects:

- areas inside zones and agglomerations with the highest concentrations to which population is susceptible to be exposed to directly or indirectly, for a significant period of time compared against the average periods of the value/ limit values /target;
- levels from other perimeters (areas) from zones and agglomerations representative for the level of population exposure;
- deposits representing indirect exposure of the population through the food chain.

Urban background stations are located so that the pollution level is influenced by the integrated contributions of all sources from the direction opposite to the wind.

Rural background stations are located so that the level of typical pollution is not influenced by the agglomerations or industrial areas in the vicinity.

When evaluating the contribution of the industrial sources, at least one of the sampling points is placed on the wind dominant direction from the source, in the nearest residential area. When the background concentration is not known, an additional sampling point is organized before the pollution source, on the wind dominant direction.

The compliance with the limit-values set for human health protection is not evaluated in the following situations:

a) in sites from areas where population has no access and where there are no permanent dwellings;
b) within the premised of industrial objectives for which the health provisions and safety at workplace apply, in conformity with art.3 (letter a) of Law 104/2011;
c) on the carriage way of roads, as well as on the areas separating the roads lanes, except for the cases when the pedestrians normally have access to the respective areas.

The sampling points dedicated to vegetation and natural ecosystems protection is located at over 20 km away from agglomerations or at over 5km away from other built areas, industrial installations, highways or roads with traffic exceeding 50,000 vehicles a day. The sampling point must be located so that the samples taken are representative for the air quality in a surrounding area of at least 1.000 km^2. A sampling point can be located at a smaller distance or be representative for air quality from a less extended area, for reasons related to the geographic conditions or the need of protecting some vulnerable areas.

Below you can find the synthetic data and information on air quality monitoring results in 2013, showing the air quality in relation to limit values, target values, alert thresholds or information set out in specific legislation for each pollutant

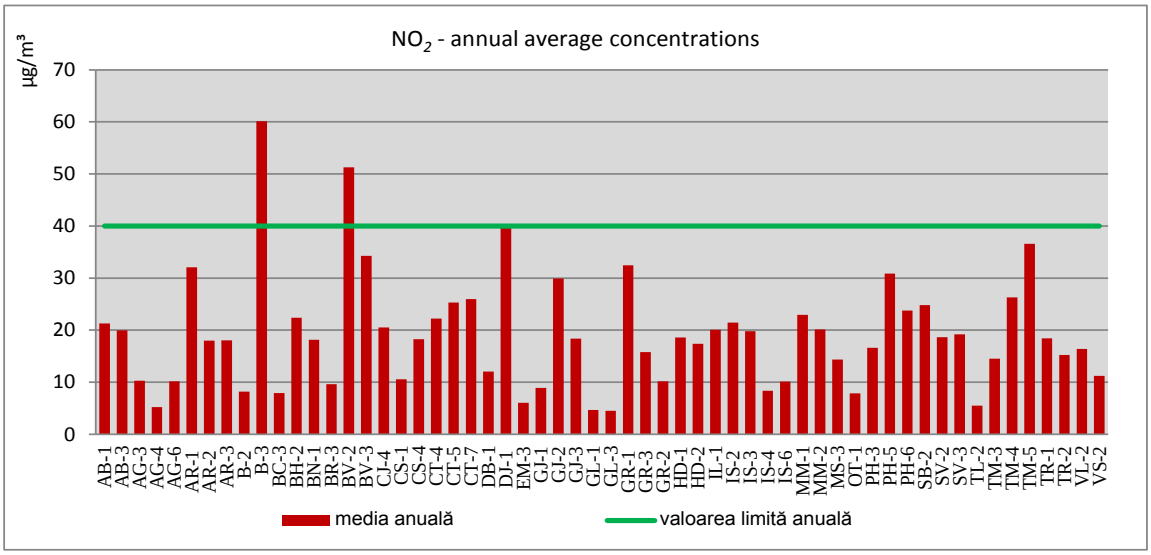
The graphs are based on measurements made in automatic monitoring stations of air quality meeting the quality objectives for the data established in Addendum 4 to Law 104/2011 and also using the criteria for aggregating and calculating statistical parameters, according to Addendum 3, B.1 and D.2 from Law no. 104/2011..

Nitrogen dioxide (NO_2) and nitrogen oxides (NO_x)

Nitrogen oxides come mainly from burning solid, liquid and gaseous fuels in various industrial, residential, commercial, institutional and road transport installations. Nitrogen oxides have an eutrophic effect on ecosystems and acidifying on many components of the environment, like soil, water, terrestrial or aquatic, and buildings and monuments. NO_2 is a gas that is transported over long distances and has an important role in atmospheric chemistry, including the formation of tropospheric ozone. Exposure to high concentrations of nitrogen dioxide causes inflammation of the airways and reduced lung function, increasing risk of respiratory diseases and worsening asthma.

Concentrations of NO_2 in ambient air is evaluated using *hourly limit value for human health protection (200$\mu g/m^3$)*, which must not be exceeded more than 18 times/year *and the annual limit value for human health protection (40$\mu g/m^3$).*

Graph 2.2.1 Nitrogen dioxide (NO_2)- annual average values – 2013



In 2013, annual average concentrations of nitrogen dioxide in ambient air show excesses of the annual limit value for human health (40µg/m^3) at the following stations in Bucharest Municipality and Brasov:

- Traffic station, B-3, annual average 60.12 µg/m^3;
- Urban background station BV-2, annual average 51,29 µg/ m^3.

The hourly limit value to protect human health (200 µg/ m^3) was not exceeded more than 18 times/year exceeded at any station.

There have been no excesses of the *threshold value recorded (400µg/m^3 concentration measured for 3 consecutive hours)* for nitrogen dioxide.

There have been no recorded excesses of *the annual limit value for vegetation protection (30µg/ m^3)* at rural background stations for nitrogen oxides (NO_x).

Sulphur dioxide (SO_2)

Sulphur dioxide is a highly reactive gas, originated mainly from sulphur fossil fuel burning (coal, fuel oil) for producing electricity and heat and liquid fuels (diesel) in internal combustion engines of road vehicles. Sulphur dioxide can affect both human health through its effects on the respiratory system and the general environment (ecosystems, materials, buildings, monuments) through its acidifying effect.

Concentrations of SO_2 in ambient air are evaluated using *hourly limit value for human health protection (350µg/m^3)* which must not be exceeded more than 24 times/year and the *daily limit value for human health protection (125µg/m^3)* which must not be exceeded more than 3 times/year.

In 2013, there were no exceedances of the hourly limit values for the protection of human health (350µg/m^3) more than 24 times/year, respectively there were no exceedances of the daily limit values for the protection of human health (125µg/m^3) of more than 3 times/year.

There were no exceedances of the alert threshold value *(concentration of 500 µg/m^3) measured for 3 consecutive hours)* for sulfur dioxide.

At the rural background stations no exceedances were recorded of *critical levels for vegetation protection (20 µg/m^3)* established for sulfur dioxide for a period of one year and during winter (October 1st – March 31st).

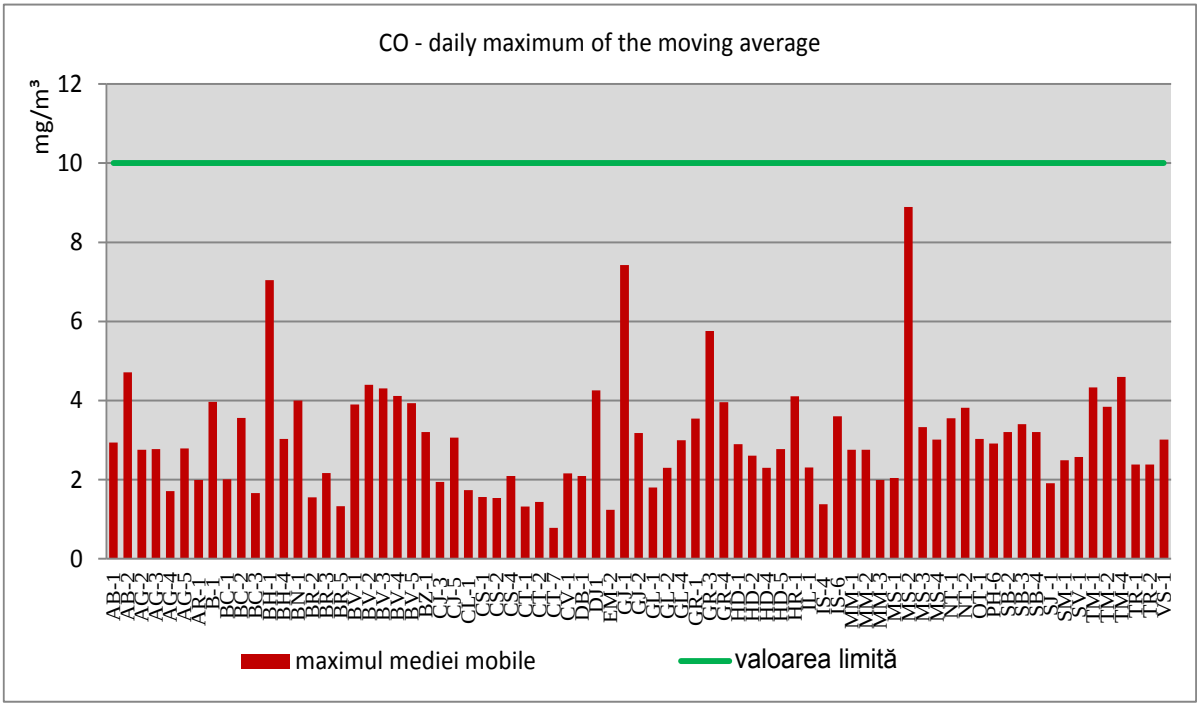
Carbon monoxide (CO)

Carbon monoxide is a toxic gas that affects the body's ability to retain oxygen, in high concentrations being lethal. It comes from anthropogenic or natural sources, involving incomplete combustion of any type of combustible material, both in power plants, industrial and residential facilities (furnaces, individual boilers), from open air burning (burning stubble, waste , fire, etc) and traffic.

The CO concentrations in ambient air are assessed using the *limit value for human health protection (10mg/m^3),* calculated as the maximum daily value of 8-hour averages (mobile average).

From the significant data analysis, obtained from monitoring CO in 2013, it is found that the maximum daily 8-hour concentration averages were well below the daily limit value for human health protection (10mg/ m^3).

Graph 2.2.2 *The carbon monoxide (CO) - daily maximum of the moving average*



Ozone (O_3)

Ozone is found naturally in very low concentrations in the troposphere (lower atmosphere). Unlike stratospheric ozone that protects life against UV radiation, tropospheric ozone (between ground and 8-10 km height) is extremely toxic, with a strong irritating action on respiratory ways, eyes and is potentially carcinogenic. Also, ozone has an adverse effect for vegetation, determining the inhibition of photosynthesis and producing foil lesions and necrosis.

Ozone is a secondary pollutant because, unlike other pollutants, it is not emitted directly from any source of emissions, but under the influence of UV radiations, chain photochemical reactions are formed between a series of primary pollutants (ozone precursors - NO_x, volatile organic compounds (VOC), carbon monoxide).

Ozone precursors originate from both anthropogenic sources (combustion of fuels, road traffic, various industrial activities) and natural sources (biogenic VOCs emitted by plants and soil, mainly isoprene emitted by forests, which, although difficult to quantify, can contribute substantially to the formation of O_3). Another natural source of ozone in the lower atmosphere is represented by small amounts of O_3 in the stratosphere which occasionally migrate, under certain weather conditions, towards the earth's surface.

Ozone photochemical formation depends mainly on meteorological factors and the concentrations of precursors, NO_x and VOC. In the atmosphere there are complex chain reactions occurring, many of them competing, in which O_3 is formed and consumed, so that O_3 concentration at a given time depends on many factors, such as the ratio between NO and NO_2 in the atmosphere, the presence of volatile organic compounds required for initiating reactions, but also meteorological factors. The high temperatures and increased sunlight intensity favour the formation of O_3 reactions, and precipitations contribute to lower O_3 concentrations in the air. As a result, ozone concentrations in the atmosphere of urban settlements with high NOx emissions are generally lower than in suburban and rural areas, due to consumption through reaction with nitrogen monoxide.

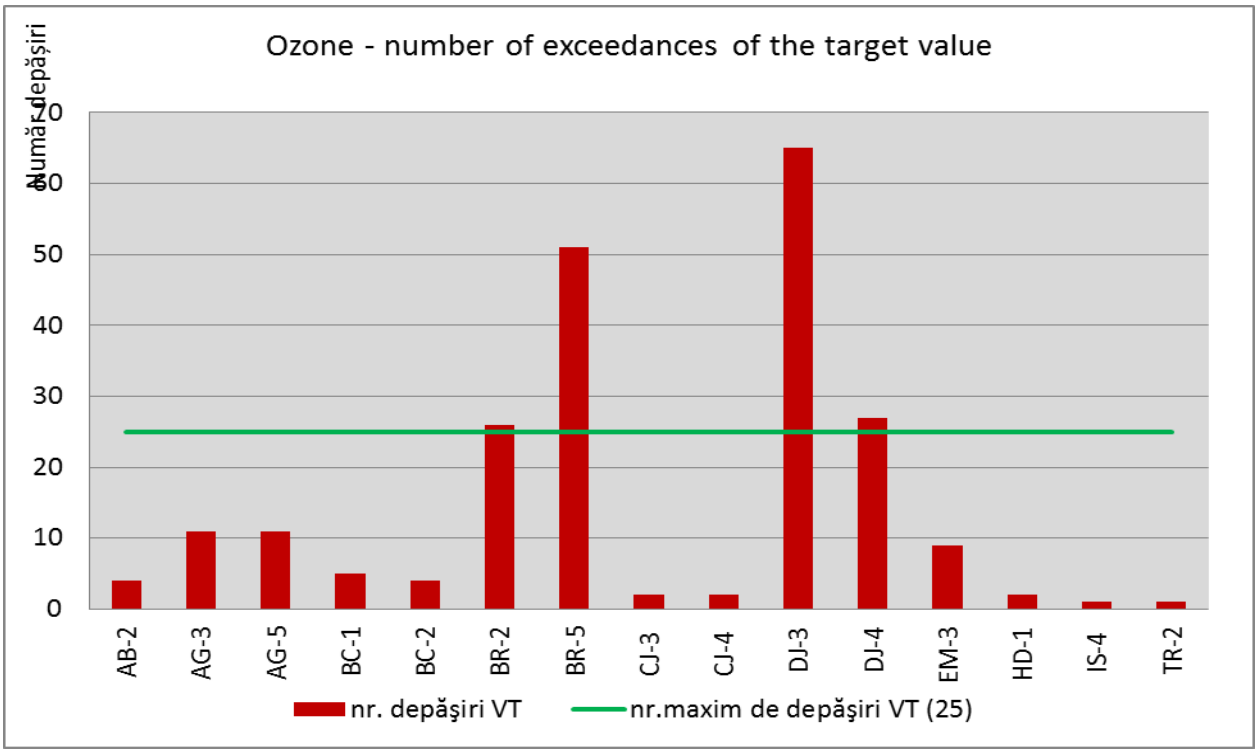
Due to the complexity of physical and chemical processes in the atmosphere and their close dependence on weather conditions, spatial and temporal variability in emissions of precursors, ozone and precursors increase on long-distance, including inter-continental scale in the northern hemisphere, and exchange between stratosphere and troposphere variability, low concentrations of ozone in the atmosphere are highly variable in time and space, while being difficult to control.

Ozone concentrations in ambient air are evaluated using the *alert threshold (240 $\mu g/m^3$* measured for 3 consecutive hours) calculated as hourly average concentrations, *information threshold (180 $\mu g/m^3$)* calculated as an average of hourly concentrations and the *target values for the protection of human health (120 $\mu g/m^3$)* calculated as the daily maximum 8-hour averages (mobile average), which must not be exceeded more than 25 times/year.

In 2013, there were no exceedances of the alert threshold value for ozone and the information threshold for ozone was exceeded only once at DJ-3 station (Craiova).

The number of exceedaces of the target value for the protection of human health in 2013 is represented in the chart below.

Graph 2.2.3 *Ozone (O_3) number of exceedances of the target value in 2013*



As one can notice from the figure, there were exceedances of the target value more than 25 times in a calendar year) at the following stations:

- Urban background station BR-2 (Braila) – 26 exceedances
- Industrialstation BR-5 (Chiscani) – 51 exceedances
- Traffic station DJ-3 (Craiova) – 65 exceedances
- Industrial station DJ-4 (Isalnita) – 27 exceedances.

The target value exceedances occurred amid favorable weather conditions for the production and accumulation of ozone (low dispersion of pollutants in the air).

Particulate matter (PM_{10} and $PM_{2.5}$)

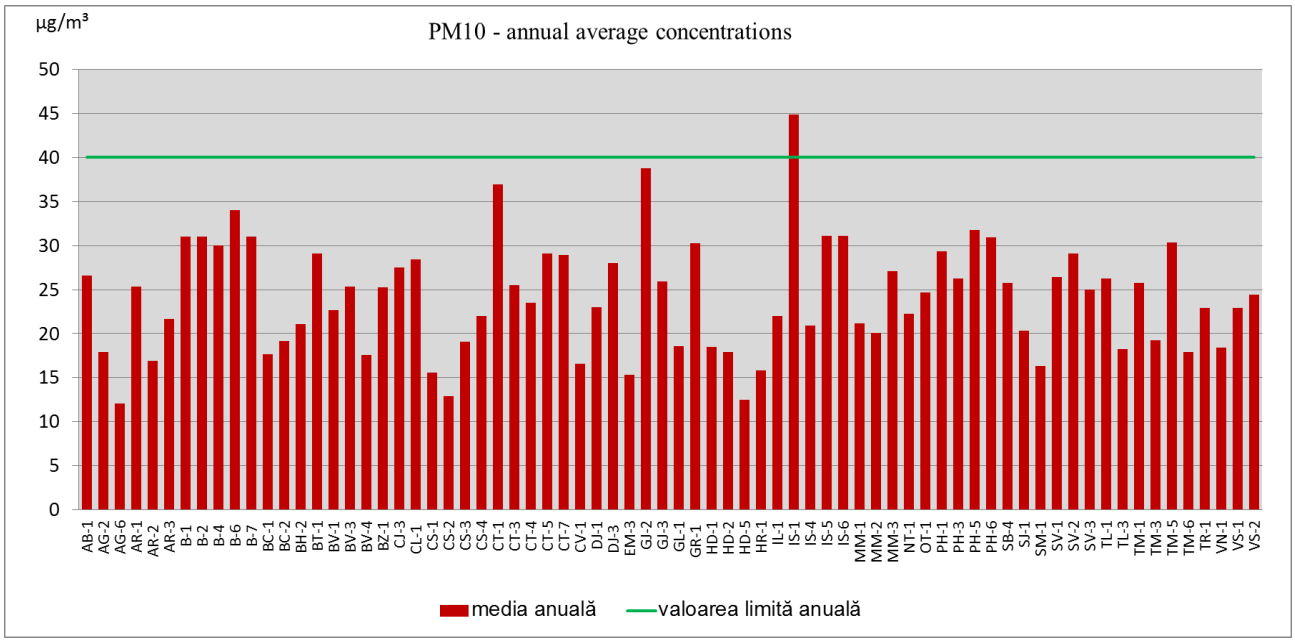
Particulate matter in the atmosphere are pollutants transported over long distances, derived from natural causes, such as particle entrainment from the soil surface by wind, volcanic eruptions, etc or anthropogenic sources such as: combustion in the energy sector, the production processes (metallurgical industry, chemical industry etc.), construction sites, road transport, industrial and municipal waste spoils and dumps, individual heating systems, especially those using solid fuels etc.

The nature of these powders is extremely diversified. Thus, they can contain carbon particles (soot), heavy metals (lead, cadmium, chrome, manganese etc.), iron oxides, sulphates, and also other toxic exhaust gases, some of them having cancer effects (as it is the case of the persistent organic pollutants PAHs and PCB polychlorinated biphenyls adsorbed on the surface of the particles of solid aerosols).

Particulate matter PM_{10}

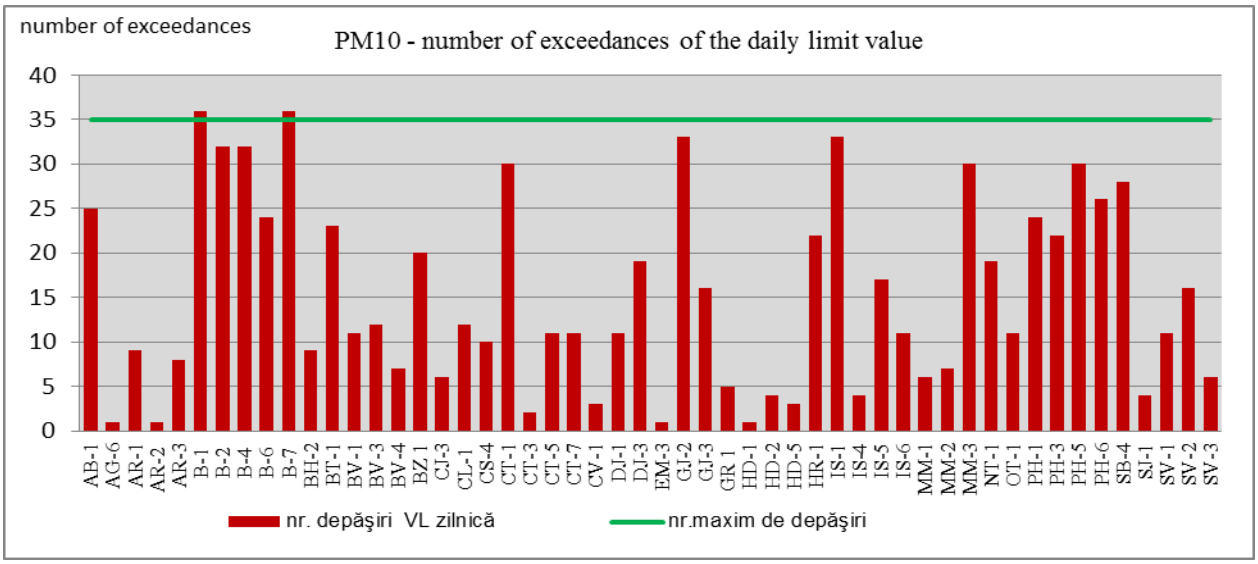
Concentrations of particulate matters with a diameter less than 10 microns in ambient air is assessed using *the daily limit value, determined gravimetrically (50µg/m³)* which allows no more than 35 exceedances/year, and the *annual limit value , determined gravimetrically (40µg/m³).*

Graph 2.2.4 particulate matter (PM_{10}) - annual average concentrations 2013



In 2013 the only exceedance of the annual limit value for the protection of human health (40 *µg/m³*) was recorded at the traffic station IS-1 (Iasi), with an annual average of 44.87 µg/m³.

Graph 2.2.5 Particulate matter PM_{10} - number of exceedances of the daily limit value 2013



In 2013 there were exceedances of the daily limit value, more than 35 times in a calendar year,at the following stations:

- urban background station B-1 (Bucharest) - 36 exceedances;
- suburban background station B-7 (Magurele, Ilfov County) - 36 exceedances.

Particulate matter $PM_{2.5}$

In 2013, monitoring particulate matters with a size below 2.5 microns in size (PM2.5) was achieved at 17 urban background stations, located throughout the territory of the country.

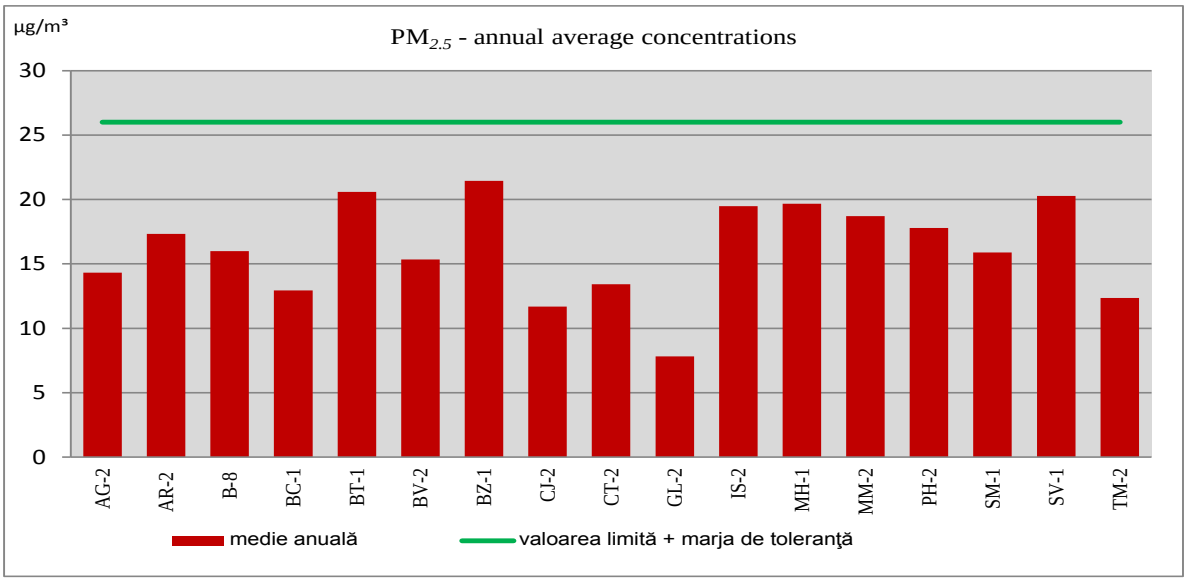
Monitoring of $PM_{2.5}$ particulate concentrations is required to comply with the requirements of *Directive 2008/50/EC* on air quality and cleaner air for Europe. Measurement results are used to determine average exposure indicator (IME) for the year 2015, determined nationwide, which calls for 3 years of continuous monitoring (2013, 2014, and 2015).

The average exposure indicator for the reference year of 2010 is the average density of the years 2009, 2010, 2011, the measured value being 18.42 µg/m³.

The annual limit for this pollutant is 25 µg/m³ , a value that must be reached on January 1, 2015.

For Romania, the limit annual value plus the tolerance margin for 2013 is 26 µg/m³, (the tolerance margin for 2013 is 1 µg/m³). During 2013 there were no exceedances of the annual limit value plus the margin of tolerance for PM2.5 at any station.

Graph 2.2.6 *Particulate matter $PM_{2.5}$ - annual average concentrations 2013*



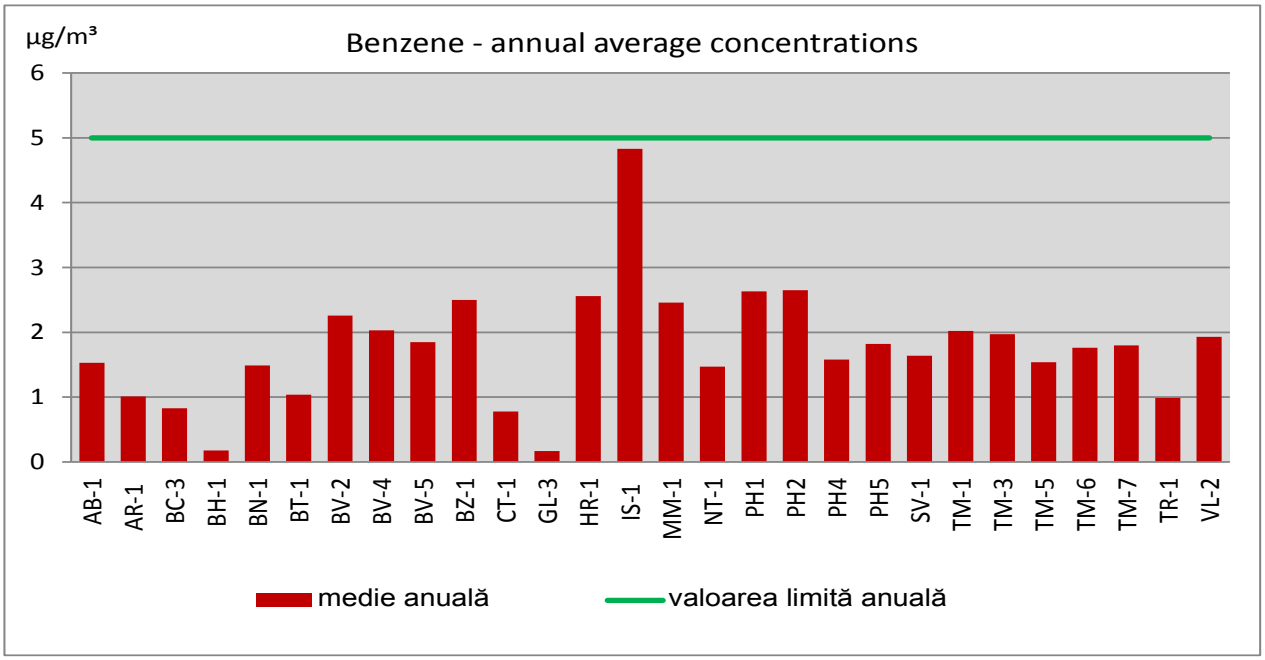
Benzene (C_6H_6)

Benzene is a toxic substance, potentially carcinogenic, derived mainly from traffic and from the storage, loading/unloading of benzene (warehouses, terminals, filling stations), and various other activities with solvent-based products (paint, lacquer, etc.) burning fossil fuels, wood and wood waste, controlled or in the outdoors.

Benzene concentrations in ambient air are assessed using a limit value for human health protection (5 µg/m3).

In 2013 the annual average concentrations did not exceed the annual limit value at any monitoring station.

Graph 2.2.7 *Benzene (C_6H_6) - annual average concentrations 2013*



Heavy metals in particulate matter PM_{10}

Heavy metals are emitted as a result of various combustion processes and industrial activities, which can be included or attached to dust particles emitted. They can deposit, thus accumulating on soil or sediments in the surface waters. Heavy metals are toxic and can affect many body functions due to their ability to accumulate in tissues.

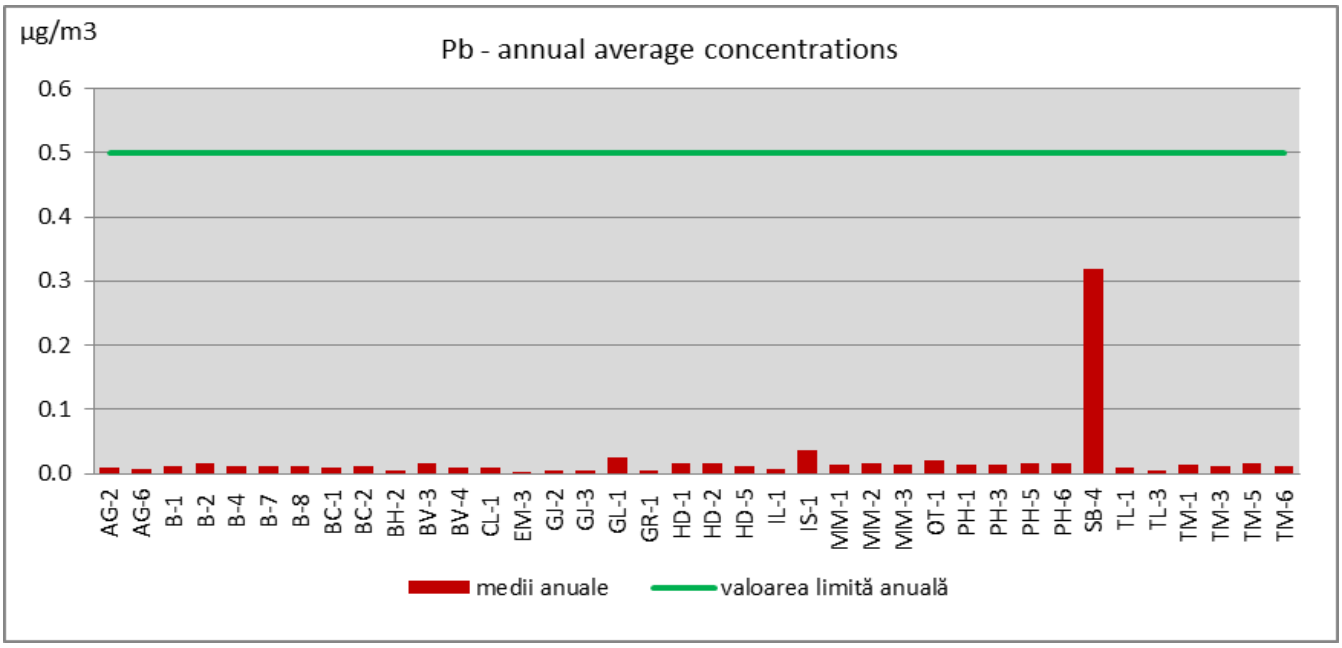
Heavy metals monitored in particulate matter are *lead (Pb), cadmium (Cd), nickel (Ni) and arsenic (As)*.

The law regarding ambient air quality regulates the standards for the assessment of heavy metals concentrations in PM_{10} fraction, to avoid and prevent the occurrence of harmful events and reduce their effects on human health and the environment as a whole:

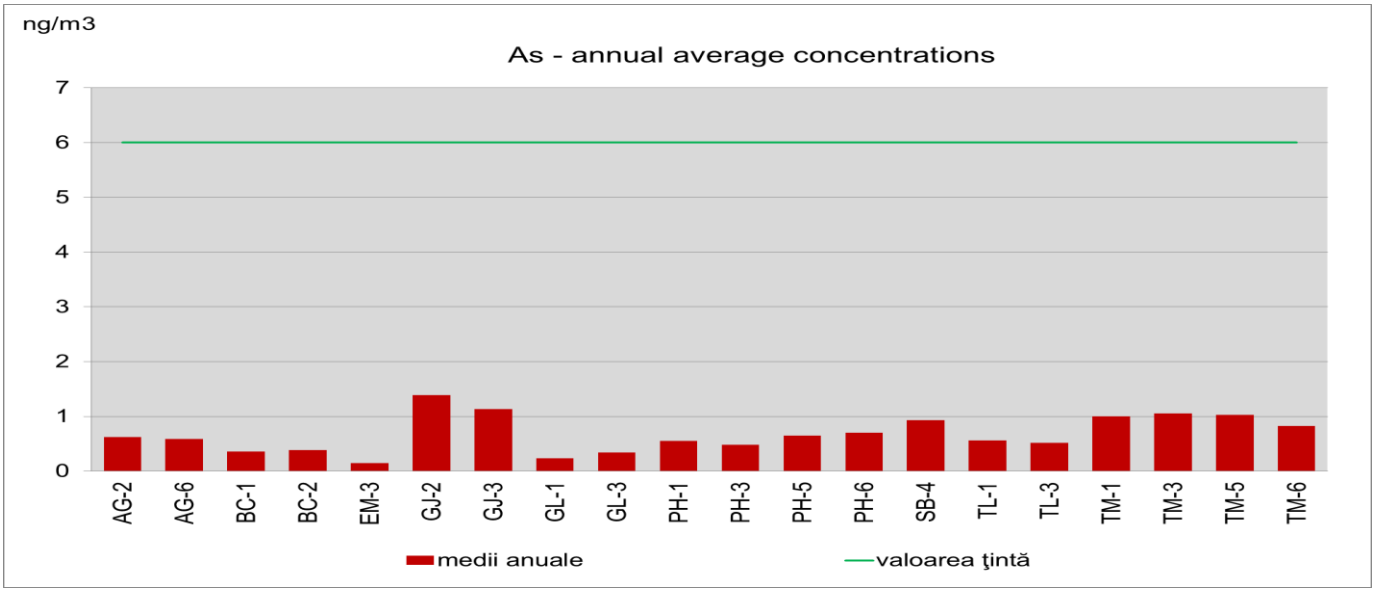
- *Annual limit value for health protection of 0.5µg/ m^3 for Pb*;
- *The target value of 6 ng/ m^3 for As;*
- *The target value of 5 ng/ m^3 for Cd;*
- *The target value of 20 ng/ m^3 for Ni;*

In 2013 the annual average concentrations for heavy metals monitored did not exceed the annual limit value / target value at any station.

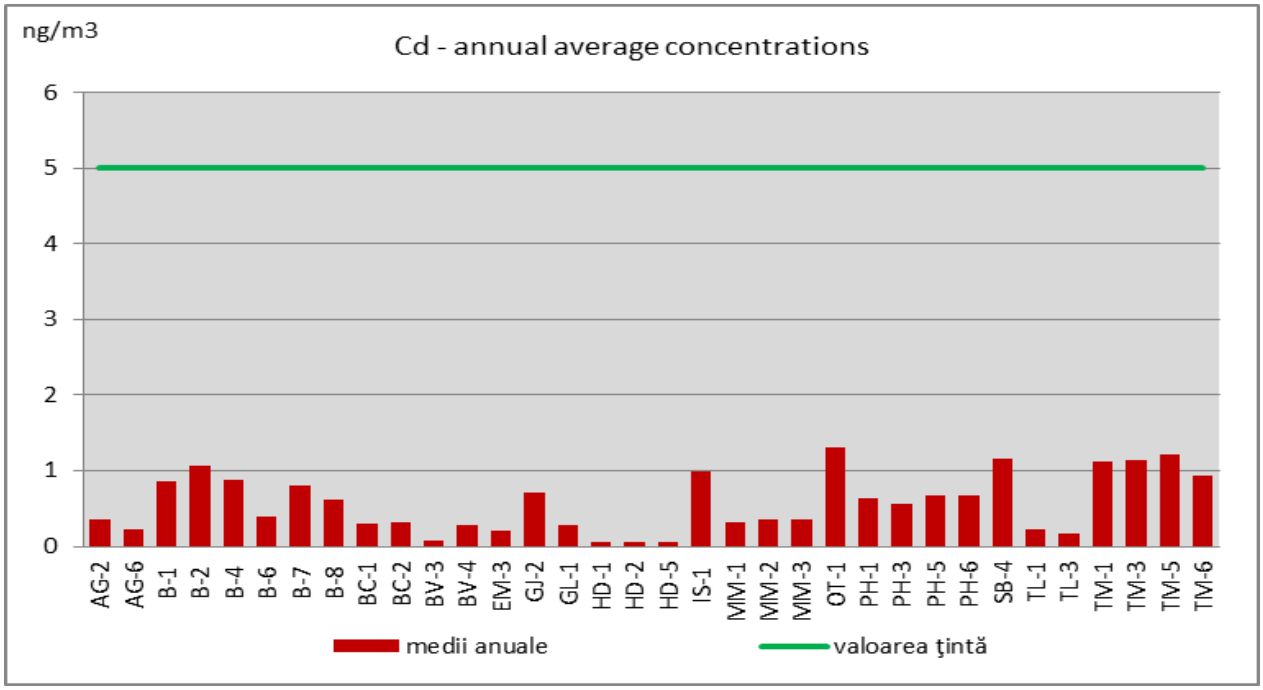
Graph 2.2.8 *Lead (Pb) - annual average concentrations for 2013*



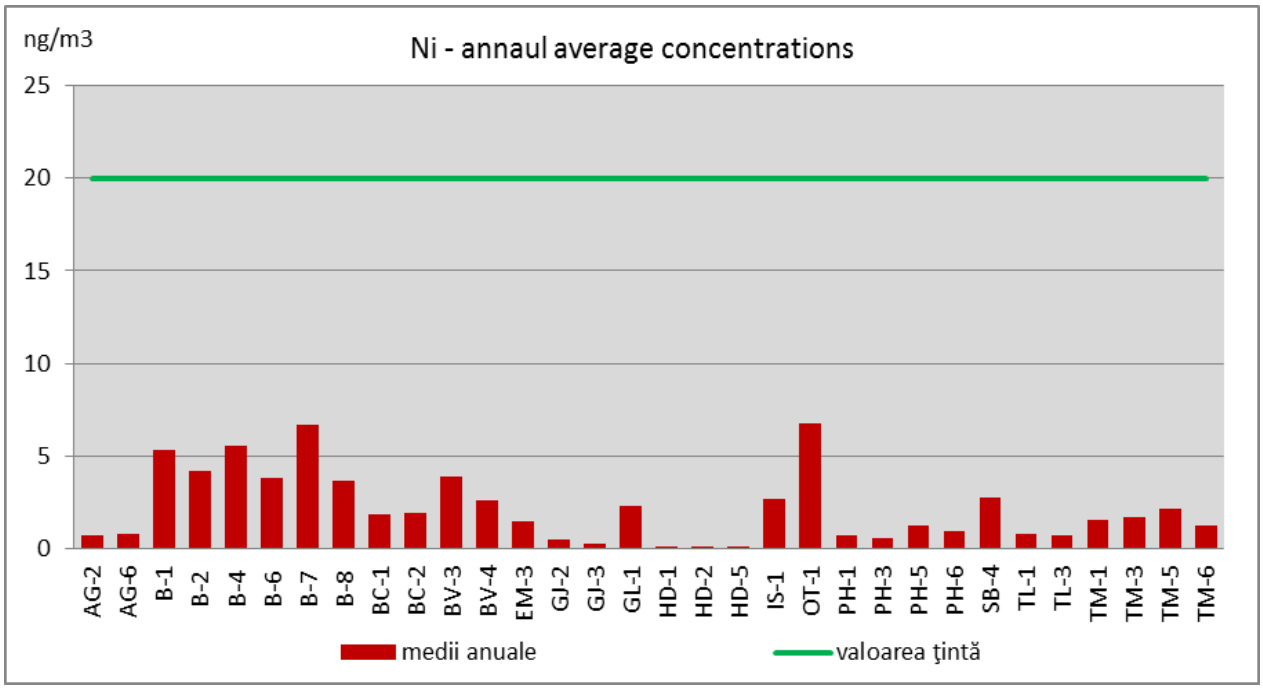
Graph. 2.2.9 *Arsene (As) – annual average concentrations 2013*



Graph. 2.2.10 *Cadmium (Cd) – annual average concentrations 2013*



Graph. 2.2.11 *Nickel (Ni) – annual average concentrations 2013*



Conclusions

By analyzing the trends in measurements evolution, one could find as follows:

- maintaining the quality of the ambient air in areas and agglomerations where the pollutant levels were below the limit values for protecting the peoples health;
- concentrations of particulate matter is still high in Bucharest and Iasi agglomerations where were recorded exceedances of the daily limit values more than 35 times the number provided in a calendar year and exceedances of the annual limit values at some urban and traffic background stations. For these agglomerations were developed air quality management programs with mitigation measures that have had a significant positive impact on particulate matter concentrations, decreasing the number of exceedances of previous years;
- concentrations of nitrogen dioxide remain high in Bucharest and Brasov.

2.3. AIR POLLUTION – LOCAL EFFECTS

Pollutants emitted from human activities are subject to changes that occur in the atmosphere such as distance atmospheric transport, physical and chemical transformations. Air pollution is a local, regional or even in the northern hemisphere problem, as the changes in air quality may occur close to the emission source and much further away, according to the air masses transport. Topography of human settlements and climatic conditions of atmospheric calm or thermal inversion may prevent dispersion of air pollutants, resulting in their accumulation over short periods of time.

In areas with significant sources of emissions from economic activity or areas with historical pollution, the air quality is further evaluated using the results of indicative measurements made in sampling points found near the emission sources.

Maximum allowable concentrations of chemical pollutants in ambient air are determined according to *STAS 12574-87 "Air in Protected Areas. Quality conditions"*, and the main pollutants referred to in this act are: ammonia, hydrogen sulphide, fluoride, formaldehyde as gaseous pollutants and cadmium and lead, heavy metals taken from the total particulate matter deposited in the vegetation.

2.3.1. Ammonia

For the concentration of ammonia in ambient air, the norm provides a maximum allowable concentration (MAC) of 0.1 mg / m3 for the daily average value.

In 2013, were carried out ammonia measurements in several counties, as follows:

Counties where there have been exceedances of the MAC are:

• Neamt County at 2 sampling points were made 381 measurements, and the number of exceedances of the MAC was 10;

• Prahova, at 5 sampling points were made 1247 measurements and the number of exceedances of the MAC was 29;

• Satu Mare, at 2 sampling points were made 557 measurements, and the number of exceedances of the MAC was 2.

Counties where there were no exceedances the MAC are:

• Bistrita Nasaud, at 3 sampling points were made 579 measurements;
• Bacau County, at 3 sampling points were made 565 measurements;
• Harghita County, at 1 sampling point were performed 365 measurements;
• Hunedoara, at 3 sampling points were made 604 measurements;
• Olt, at 2 sampling points were made 445 measurements;
• Vrancea County, at 4 sampling points were made 1251 measurements.

2.3.2. Formaldehyde

For the concentration of formaldehyde in ambient air, the norm provides a maximum allowable concentration of 0.012 mg / m3 for the daily average value.

In 2013, were carried out formaldehyde measurements in:

• Alba County, Sebes, at one sampling point were made 242 measurements, without exceedances of the MAC;
• Prahova, at 6 sampling points were made 1497 measurements and the number of exceedances of the MAC was 75.

2.3.3. Hydrogen sulphide

For hydrogen sulfide concentration in ambient air, the norm provides a maximum allowable concentration of 0.008mg/m^3 for the daily average value.

In 2013, were carried out formaldehyde measurements in two counties, namely:

• Mehedinti county, in two sampling points were made 292 measurements without exceedances of the MAC;
• Prahova County, at 6 sampling points were made 1497 measurements and the number of exceedances of the MAC was 9.

2.3.4. Fluorine

For the fluoride concentration in ambient air, the norm provides a maximum allowable concentration of 0.005mg/m^3 for the daily average value.

In 2013 were carried out fluorine measurements in Olt County, Slatina, at two sampling points were made 445 measurements without any exceedances of the MAC.

2.3.5. Phenol

For phenol concentration in ambient air, the norm provides a maximum allowable concentration of 0.03mg/m^3 for the daily average value.

In 2013, were carried out phenol measurements in Prahova County, town of Ploiesti, at one sampling were made 249 measurements, and the number of exceedances of the MAC was 2.

2.3.6. Total suspended particulates

For concentration of total suspended particulates in ambient air, the norm provides a maximum allowable concentration of 0.15mg/m^3 for the daily average value.

In 2013, were carried out total suspended particulates measurements in several counties, among which, **the counties where there have been exceedances of the MAC** are:

- Harghita County, at two sampling points were made 712 measurements, and the number of exceedances of the MAC was 48;
- Maramures County, at 2 sampling points were made 750 measurements, and the number of exceedances of the MAC was 28;
- Prahova, at 2 sampling points, were made 1497 measurements and the number of exceedances of the MAC was 9;
- Satu Mare, at two sampling points were made 169 measurements, and the number of exceedances of the MAC was 1.
- In Hunedoara County, at 5 sampling points, were carried out 2002 measurements, without any exceedances of the MAC.

2.3.7. Lead in total suspended particulates

For lead concentration of total suspended particulates in ambient air, the norm provides a maximum allowable concentration of 0.7mg/m^3 for the daily average value.

In 2013, were carried out lead of total suspended particulates measurements in two counties, as follows:

- Satu Mare County, at two sampling points were made 128 measurements, and the number of exceedances of the MAC was 7;
- Maramures County, at 2 sampling points were carried out 576 measurements, without any exceedances of the MAC.

2.3.8. Cadmium in total suspended particulates

For cadmium concentration of total suspended particulates in ambient air, the norm provides a maximum allowable concentration of 0.02mg/m^3 for the daily average value.

In 2013, were carried out cadmium measurements in two counties, namely:

- Satu Mare County, at two sampling points were made 128 measurements, and the number of exceedances of the MAC was 10;
- Maramures County, at 2 sampling points were made 572 measurements, without any exceedances of the MAC.

2.3.9. Sediment particles

For the concentration of sediment particles in ambient air, the norm provides a maximum allowable concentration of 17g/m^2 for the monthly average value (30 days).

In 2013, were carried out sediment particles measurements in several counties, as follows:

The counties where there have been exceedances of the MAC are:

- Brăila County, in 5 sampling points were made 60 measurements, and the number of exceedances of the MAC was 12;
- Caras-Severin County, at 13 sampling points were made 141 measurements, and the number of exceedances of the MAC was 10;

- Constanta County, at 14 sampling points were made 144 measurements, and the number of exceedances of the MAC was 5;
- Galati County, at 71 sampling points were made 562 measurements, and the number of exceedances of the MAC was 115;
- Harghita County, at a sampling point were made 2 determinations and the number of exceedances of the MAC was 6;
- Ialomita County, in 3 sampling points were made 36 measurements, and the number of exceedances of the MAC was 5;
- Mehedinti County, in 3 sampling points were made 34 measurements, and the number of exceedances of the MAC was 1;
- Salaj County, in 20 sampling points were made 230 measurements, and the number of exceedances of the MAC was 21;
- Timis County in 7 sampling points were made 84 measurements, and the number of exceedances of the MAC was 35.

The counties where there were no exceedances of the MAC, of all the measurements carried out, are:

- Arad County, in 11 sampling points were made 132 measurements;
- Bacau County, in 4 sampling points were made 48 measurements;
- Buzau County, in 17 sampling points were made 185 measurements;
- Gorj County, in 17 sampling points were made 185 measurements;
- Hunedoara County, in 25 sampling points were made 289 measurements;
- Sibiu County, in 4 sampling points were made 24 measurements;
- Vrancea County, in 3 sampling points were made 36 measurements.

2.4. ACCIDENTAL POLLUTION

During 2013 there were **38** events that generated accidental pollution of the **AIR** environmental factor.
The events that affected air quality are described below, grouped by counties:

❖ In 2013, in **Arges Alba County**, there were recorded the following special events:

On 18.05.2013 at SC Savini Due SRL in Sebes city there was a fire in the waste storage area. About 500 kg of paint waste burned. The environmental factor affected was air. A penalty worth 15.000 RON was applied.

On 30.07.2013, at 22:00, a resident of the Ocna Mures city reported, through the 112 system, the ignition of the city solid waste landfill. It was intervened to extinguish the fire and the warehouse was kept under observation. There are no known causes, possible self-ignition due to high temperatures.

On 31.07.2013, at 07:15, there was a short circuit, leading to a wiring ignition, in a section of the SC Pehart Tec SA, in Petreşti. The fire was extinguished in 20 minutes and was only local pollution. The incident was immediately notified at the NEG County Council Alba.

On 06.08.2013 and 07.08..2013, it was reported through the 112 system, the ignition of household waste landfills of the Aiud and Blaj towns, warehouses where storage was ceased on 16.07.2013. It was intervened to extinguish the fire and the warehouse was kept under observation. There are no known causes, possible self-ignition due to high temperatures.

Three other wild fires in the Blaj, Cugir and Rimetea area were reported on 08, 09 and 13.08.2013. They were small; it was intervened to extinguish them and the exact causes weren't established.

❖ In **Arges County** there were recorded 4 accidental pollution events that had an impact on the environmental factor air, caused by transport activities of polypropylene products - fire, collecting hazardous waste / non-hazardous.

Identified polluters are: Oltchim SA; SC Emeti Plast SRL; SC Global Eco Center SRL; SC Replast Prodplast SRL.

The incidents were recorded as follows:

• 31.01.2013, at 14: 00 / Albota commune, Arges County; (Oltchim SA);
• 29.09.2013, at 23: 01 / Lunca Corbului commune; (Replast Prodplast);
• 01.11.2013, at 03: 00 / Cateasca commune, Arges County; (Emeti Plast SRL);
• 02.11.2013, at 09: 45 / Campulung Arges; (Global Eco Center SRL).

The nature of pollution consisted in gas emissions into the atmosphere (propane-propylene) following a fire that broke out as a result of cracking a polypropylene pipeline. The fire destroyed 1000 sqm of the roof of the plastics production hall and 1500 sqm of sandwich plates walls (SC Emeti Plast SRL).

Another fire broke out at a waste oil tank located in the warehouse hall, affected the hazardous and non-hazardous waste warehouse hall, on a total area of 3525 sqm. From the preliminary data results that were

burned waste oils, paints, contaminated equipment, used accumulators and recycling waste (SC Global Eco Center SRL);

Also, a fire that swept some plastics waste, about 15 tons, affected a roof of a hall, a special vehicle, a conveyor belt, including equipment located in the hall (SC Replast Prodplast SRL);

Measures taken by the representatives of the economic operator and the Inspectorate for Emergency Situations of the (ISUJ) Arges County were to isolate the perimeter, to mount a hinge over the hole in the pipe, perform a leak test of the section, and the intervention of Arges ISUJ with fire trucks in order to extinguish the fires.

The following sanctions were applied:

• for the fire at SC Emeti Plast SRL and SC Replast Prodplast SRL were applied sanctions by ISUJ Arges;

• for the fire at SC Global Eco Center SRL sanctions were applied, both by NEG Arges County Council (cessation of activity and criminal referral) and by the ISUJ Arges;

❖ In **Bacau county** there were two accidental pollution events, as follows:

On 21.02.2013, at 9:40-10:10, in Bacau, on Narciselor Street and in the Prefecturii Park were recorded emissions of ammonia (NH3) into the atmosphere from urea production plant of SC AMURCO SRL Bacau, affecting the environmental factor air. The presence of these emissions was detected due to the specific smell and through measurements, resulted the exceedance of the maximum allowable concentration (MAC) in atmospheric air of ammonia, in samples of short duration (30 minutes), obtaining the value of 0.395 mg / Nmc, compared to the MAC of 0,300 mg / Nmc. A sanction was applied with a fine of 15.000 lei, according to Law. no. 104/2011, art. 79, para. (2), b). The phenomenon ceased after 10:30, when the ammonia smell was gone and measured concentrations had returned to normal. Please note that pollution with ammonia took place amid the existence, at the time, of weather conditions adverse to atmospheric dispersion.

Another event took place on 27.04.2013, at 15:20 in the Letea Veche commune, Bacau County, where there was recorded a drifting of dust from the ash and slag warehouse, due to weather conditions. The polluter has been identified as a legal entity - SC CET SA Bacau – the environmental factors affected were air and farmland. Particulate emissions in the atmosphere occurred on a length of 1 km from the deposit due to wind gusts and because the owner did not take all necessary prevention measures. A sanction was applied with a fine of 15.000 lei, according to Law. 104/2011, art. 79, para. (2), b).

The phenomenon ceased once the wind gust stopped. Please note that the deposit is to be closed (greened by binding topsoil and revegetation).

❖ In the area of **Bucharest Municipality** were recorded 2 accidental pollution events:

On 17.09.2013, 21:30 hours, on the site located in Fabrica de Glucoza street, no. 2-4, district 2, owned by the National Museum of Romanian Aviation, the administrator of the UM 01965 barracks called the emergency service 112, to signal the presence of unidentified gas containers (unmarked containers), which were discovered following certain excavations works carried out to errect the foundation for building an enclosure wall.

Representatives of IGPR, DGPMB and NEG - The Bucharest Municipality Commissariat identified 36 unmarked gas containers, which were in an advanced decoppering state and presented the risk of exhausting gaseous pollutants in the atmosphere.

Measures were taken in order to inform the specialized personnel within the Ministry of Defense, fencing and securing the area, covering the containers with a waterproof tarpaulin and in taking all environmental protection and health measures.

On 19.12.2013, at 15:00 hours, a fire broke out at the workplace of SC Romax Trading & Marketing SRL, Splaiul Unirii, no. 313, district 3 (industrial site ICPE), which operates the collection, transport, storage, recovery and waste neutralization for precious metals, residual solutions, radiological chemical and printing waste, photo films waste recovery, storage and selling of chemical products.

The fire caused emissions of pollutants into the atmosphere resulting from the combustion of plastics, including storage containers of used developer and fixer solutions.

The probable source of ignition, identified by ISU Bucharest was: static electricity, the mean which could cause the ignition being the materials and substances processing machinery, which is charged electrostatically.

The Bucharest ISU team worked to extinguish the fire, the intervention was completed in two hours.

The water used to extinguish the fire percolated in the workshop installations and materials, then drained through the storm water drainage system inside the ICPE S.A. industrial platform.

The public sewerage network administrator, SC Apa Nova Bucuresti SA, through its own laboratory, collected water samples from the wastewater to carry out laboratory analyzes. Test reports revealed exceedances of the maximum allowable concentration for the CCO-Cr indicator.

❖ In **Brasov County** were recorded in 9 accidental pollution events:

On 17.04.2013, at 16:00, in the Apata commune, near the Military Unit, at 16:50, in the Beclean commune, Hurez village and at 5:10 p.m. in Brasov, Bastionul Alb area there were three dry vegetation fires, whose polluters remained unidentified. The phenomena resulted from the burning smoke from dry vegetation and were spread on the surfaces of 3 and 1.5 ha, respectively of 100 sqm and were "closed" by ISUJ Braşov.

Also, on 23.04.2013 at 20:00, inside the protected area of Situl Natura 2000 ROSPA0037 Dumbrăviţa-Rotbav-Magura Codlei, on the western shore of the accumulation lake Dumbrăviţa, of Dumbrăvita commune, was recorded a fire of dry vegetation and stubble, the polluter being unknown. The phenomenon spread on an area of 7 hectares and was extinguished by SVSU Dumbrăviţa on the same day. Also in Dumbrăvita commune, a fire of dry vegetation broke out on 29.04.2013, 16:30, and was spread on an area of 5 hectares and was extinguished by ISUJ Brasov, SVSU, and Măieruş Forest Department.

On 02.05.2013, at 16:50 p.m. and on 04.05.2013, in the town of Zarnesti, in the „Barsa lui Bucur" area, nearby the Plaiul Foii chalet from the Piatra Craiului National Park broke out a fire of dry vegetation. The fire spread on an area of 2.1 ha and was extinguished by ISUJ Brasov and employees of the Zarnesti Forest Department, on the same day.

In the town of Fagaras, Ciocanului street, no. 16, at the site Gangal Ciprian I.I were recorded on 12.06.2013, at 22:30, chlorine emissions into the atmosphere due to improper handling of a container of chlorine which resulted in cracking a valve. The ISUJ Braşov team intervened with a water curtain in order to absorb the chlorine and then with lime to neutralize the formed acid. The polluter was identified in the person of Mr. Ioan Ciprian Darus and was sanctioned with a fine of 500 lei.

Another fire of dry vegetation was recorded on 07.08.2013, at 16:05, in Fagaras, on Plopului street, spreading on an area of 3 ha. The fire was extinguished by ISUJ Brasov and employees of the specialized service of Fagaras Cityhall, on the same day. On the same day at 16:20 in Rasnov, on Campului street a fire of dry vegetation broke out that covered an area of 0.2 ha. The fire was extinguished by employees of the specialized service of the Rasnov Cityhall.

❖ In **Caras Severin County** there were 3 events which had an environmental impact of which we mention an accidental pollution event and two major environmental accidents, which consisted in the burning of a large area in Domogled National Park - Cerna Valley and the overthrow of a LPG gas tank.

On 02.06.2013, at 11:42, on the NR6 between the localities Plugova-Cornea, Km 396 + 670m, on the serpentine of the Ciregau hill in Caras-Severin County, occured a traffic accident that resulted in the overthrow of a tank containing LPG - Bultrans - Bulgaria. The pollutant substance was LPG, flammable gas, hazard class 23, UN no.: 1965; quantity 19.220 kg and with a specific odour, on a distance of approx. 200m, depending on the direction of the wind. The polluters were identified in the person of a Bulgarian citizen, driver of the tank registration no. C8975EP, belonging to the transport company Bultrans - Bulgaria. The tank entered the country through Halmeu customs on 01.06.2013 from Ukraine having as final destination Sofia. The environmental factor affected was air. No analyzes were performed as Caras Severin EPA does not have the necessary equipment. A team from the Caras Severin CJ NEG and Caras Severin EPA went to the scene during 02-03.06.2013, in order to assess the environmental impact. The environmental impact was not significant and the population was not affected. ISUJ Mehedinti has taken the measure to evacuate the area within a radius of 800 m and to stop traffic in the area. Representatives from the Drobeta Turnu Severin Fonte Gas went to the scene of the accident and ordered the tank is not to be moved until the evacuation of all the gas. Moving the gas in another tank was not possible because of the position in which was the overturned tank. At 18:00, on 03.06.2013, ISUJ Mehedinti calculated that in the tank remained about 25% of the total quantity. At the same time, the discharge of gas was slowed down due to obstruction of the exhaust valve and the crack due to the formation of ice. The recorded event can be considered an environmental accident and not an accidental pollution.

❖ In **Constanta County** were recorded 3 accidental pollution events. Thus, on 06.07.2013,, at 0:30, there were recorded emissions of sulfur dioxide (SO_2) in the area of Navodari city at Navodari Rompetrol Refinery. The cause of pollution was the mechanical failure of an electric engine which led to the accidental stopping of the NEW SRU installation. The polluter, SC Rompetrol Rafinare SA was sanctioned, according to Law no. 104/2011.

On 09.07.2013, at 21:14, in Mamaia was recorded a dry vegetation fire, vegetation which had been stored in a concrete enclosure of the Hotel Histria area.

Another fire occurred on 19.12.2013 at 06:30 in Constanta, on Aurel Vlaicu Boulevard, no.163B, in the area of the Commercial Complex Histria Constanta.

❖ In **Dâmboviţa County** there were 3 events with impact on the environment, as follows:

On 12.08.2013, at 10:30, there was a fire in Gaesti city to the waste repository (rigid metallic and plastic polyurethane foam) belonging to SC Ada Metal Internaţional SRL Găeşti. The company was fined 100.000 lei due to violation of Law no. 104/2011 on ambient air quality. The fire was extinguished by representatives of ISUJ Dâmboviţa, after which it was carried out the waste sorting and handing to specialized operators.

On 09.11.2013, at 14:00, in Bucşani commune, at about 350 m distance from the Bucşani treatment plant, was recorded a release into the atmosphere of about 150 Nmc methane gas belonging to OMV Petrom - ASSET VI Central Muntenia, caused by the corrosion of the pipeline with a diameter of 3 inches from the Concordia Park 2 to the Bucşani treatment plant. The company was fined 100.000 lei due to violations of the provisions of Law 104/2011 on ambient air quality. The pipe was isolated and closed by applying a metal spade.

In Moreni town, Teisa street, on 10.11.2013, at 15:00, there was a release into the atmosphere of about 15 Nmc gas belonging to OMV Petrom - ASSET VI Central Muntenia, due to corrosion of the gas pipeline with a diameter of 12 inches from the 70 AR Park, Compressor Station 9 Moreni. The company was fined 100.000 lei due to violations of the provisions of Law 104/2011 on ambient air quality. The pipe was isolated and closed by applying a metal spade and later was set another route to the construction of a new pipeline.

- In **Hunedoara County**, in 2013, one accidental pollution event was registered.

On 05.21.2013, at 16:00, a fire broke out at the waste landfill from Orastie, which lasted around 21 hours, from 21st of May, at 16:00, until May 22nd, at 13:00. The fire affected about 400 square meters of the municipal waste landfill of SC Activitatea Goscom SA Orăştie, the fire source remaining unidentified. The operator of the SC Activitatea Goscom SA Orăştie landfill was sanctioned, according to Law. 211/2011 - on waste regime, Article 61, para. (1), a), with reference to article 19, para. (2), d), with a fine of 40,000 lei for failing to observe the technology on final storage of waste, through regular ground and leveling coatings with specific equipment. On 22.05.2013, at 13:00 the fire was considered extinguished by ISUJ Hunedoara teams. In order to limit and extinguish the fire, took action teams from ISUJ Hunedoara, through the Orastie Fire Brigade (2 special vehicles, a motor pump 7 NCOs and two officers) and the operator of the SC Activitatea Goscom SA Orăştie landfill (with crawler bulldozer and a motor pump).

- **In Harghita County** there were recorded 2 events.

Thus, in the Lunca de Sus commune, on 19.04.2013, at 21:00, a fire broke out in the forest owned by the Composesoratul Madaras and Composesoratul Carta, natural persons respectively. The fire occurred in forests and because of the smoke were affected the environmental factors air and soil on an area of about 1 ha of grassland and wooded grassland of 3 hectares. ISUJ Harghita and SVSU Lunca de Sus teams proceeded to extinguish the fire. There were no life-threatening situations and there was no animal death or damages to households.

In Harghita county there was recorded one event of accidental pollution.

On 25.04.2013, at 14:30, in Miercurea Ciuc Municipality, Ret area, a fire broke out, the polluter and source remaining unknown. Because of the smoke, air and soil were affected on an area of about 15 ha (dry vegetation). ISUJ Harghita teams proceeded to extinguish the outbreaks, and the area was monitored for a longer period due to the ignition of peat in the 8 spots. The outbreaks were completely extinguished on 07.05.2013. There were no lives threatened and the environmental factor affected was the air.

- In **Neamt County**, in 2013, there was one accidental pollution, as follows:

On 02/01/2013, between the hours 6:00-7:30, there was registered pollution with ammonia. The phenomenon of pollution affected three localities in Neamt County, respectively Săvineşti village, Roznov town and Piatra Neamt, where there were recorded exceedances of the MAC = 300 μg NH_3/mc air (for short time average samples, 30 min) 3.3 times (Piatra Neamt) to 14 times (Săvineşti village).

The cause of pollution was an uncontrolled emission of NH_3 in the atmosphere, due to a technical fault to the synthesis column of the granulated urea production plant of C Ga-Pro-Co Chemicals SA Săvineşti (damage to the gasket of the synthesis column cover). The pollutant released into the atmosphere, ammonia gas, is classified as a hazardous substance - toxic by inhalation, irritating to mucous membranes and respiratory system, corrosive and dangerous for the environment. The amount accidentally eliminated in the atmosphere, according to estimates from the date of the incident and subsequent data taken out of the reports from the polluting unit was up to 0.5 t. The maximum concentration values of NH_3 in the athmosphere in these three localities were: 990.98 μg / m in Piatra Neamt, 1243.79 g / cm in Roznov and 4245.96 mg / m in Săvineşti – compared to the MAC = 300 μg / m^3, samples of 30 minutes, according to STAS 12574-1987. Was immediately proceeded to the isolation of the production line and were initiated the proceedings for intervention (urea solution processing, and depressurization of the synthesis column and opening of the cover to replace the damaged gasket). The intervention was conducted between the hours 7:30-12:30. The retention period of the pollution phenomenon which occurred on 01.02.2013 manifested until around 22.01.2013, the Neamt EPA laboratory recording exceedances of the NH3 concentrations in the area of Savinesti, Roznov, Piatra Neamt localities until the dates of 7, 10, 22 January 2013 amid weather conditions adverse to the dispersion of pollutants, characteristic of the lower third of the Bistrita valley and Cracau-Bistrita depression, which occur mainly in the period from November to February: relative high humidity, low air flow speed (atmospheric calm accompanied by deep thermal inversions in duration and intensity), persistent fog.

SC Ga-Pro-Co Chemicals SA was fined 100.000 lei for failure to observe the provisions of Law no. 104/2011 on ambient air quality, art. 79, para. (4), letters a) and c).

- In **Olt County** there were 2 events.

On 22.05.2013, at 13:19 at the landfill of household and street waste of Bals city, Fratii Buzeşti street, a fire broke out by self-ignition of household waste from the landfill, on its northern side. ISUJ Olt Bals, through The Intervention Guard Bals, acted to limit the spread of the fire. The polluter, SC SALUBRIS SA, took action with

its own auto fire sprinkler and acted to cover with soil the areas where waste smoked. This was done with two machines found in the operator's warehouse equipment (1 front loader Wolla type and one Poluator bulldozer);

On 13/08/2013, at 9:10, in Slatina, at SC Sovecord International SA Slatina, Pitesti street, a fire broke out, caused by the occurrence of an electrostatic spark at the faulty contact of a container frame ground connection and the existence of solvent vapors at the time of the tapping. The atmosphere was affected due to pollution with smoke from the burning roof, solvents and packaging for solvents and other materials.

For failing to comply with the provisions set out in art. 79, paragraph (2), lit. b) of Law no. 104/2011 on ambient air quality, SC Sovecord International SA was sanctioned with a fine amounting to 15.000 lei.

- In **Prahova County** there were four accidental pollution events, as follows:

On 01.02.2013, 7:30, in Ploiesti, at SC Petrotel Lukoil SA was registered a fire that started at the top of column C1 of the Coking Unit at the compression flange of the column and the vapor pipe, due to vapour leakage of petroleum fractions which condensed on the heat insulation (mineral wool), after which it self-ignited.

SC Petrotel- Lukoil SA was sanctioned according with Law 104/2011, with a fine of 15.000 lei, for failing to apply the legal requirements and measures to prevent, eliminate or reduce the impact on ambient air.

On 18.07.2013, at 20:30, at SC Termoelectrica SA Rampa Ecologică Vălenii de Munte from Vălenii de Munte, was found a minor fire with smoke emissions that affected the air. The fire occurred in a lowland of the banister, around the two drain homes located on the left side of the landfill. Household waste was burned on an area of 70 square meters, and the fire was extinguished in about 30 minutes.

No sanctions were applied.

On 22.08.2013, at 20:10, at SC Cameron SA in Campina, when unloading the liquid ammonia from a tanker, that belonged to SC TRAC SRL, in the storage facility located on the premises of the company, the decoupling hose connection between the tanker and the storage unit was done poorly, which led to the elimination in the atmosphere of ammonia remaining in the hose - about 2 liters.

SC Cameron SA was sanctioned under Art. 96, paragraph 1, section (3) of GEO 195/2005, approved with amendments by Law no. 265/2007 as amended and supplemented.

On 25.10.2013, at 19:30, at SC Astra Oil Prod SRL, in Ploiesti, in the south of the city, was recorded an emanation of heavy hydrocarbons odors due to the unloading from wagons and loading in tankers of waste liquid fuels; were carried out operations of transfer with covers and open manlocks and fluidization of waste.

SC Astra Oil Prod SRL was sanctioned for noncompliance with art. 59, para. (1) of Law 104/2011, as well, was ordered the cessation of the transfer process.

- In **Salaj county**, one incident occurred:

On 13.07.2013, at 15:23, a fire outbreak was announced at a municipal landfill in Zalau municipality, located in Crişeni, Salaj County. The announcement of the incident was made by the landfill operator SC Ave Salaj ECOSERV SRL.

The fire was due to the self-ignition of waste and has spread over an area of 3500 square meters, on the S-SW side of the landfill. ISUJ Salaj intervened with water in order to limit the spread of fire and employees of SC Ave Salaj ECOSERV SRL covered with soil for fighting possible outbreaks. Following the intervention with a large amount of water the capacity of the leachate collection tank was exceeded and measures were taken to empty the basin.

On 17.07.2013, at 14:00 the fire was declared extinguished. No samples were taken to measure the emissions of air pollutants.

For failing to comply with the obligations on self-monitoring technology of the landfill, the operator SC Ave Sălaj ECOSERV SRL was given a sanction as "Warning" in accordance with GD. 349/2005, art. 18, in conjunction with GO no. 2/2001, approved with amendments by Law no.180/2002, as amended and supplemented, art. 5, para. (2) letter a).

Major environmental accidents

During 2013, no major environmental accidents took place at the sites falling under the provisions of G.D. no 804/2007, according to the notification criteria stipulated in Annex 6 of G.D. no 804/2007 concerning the control over major accident hazards involving dangerous substances, further amended and supplemented.

2.5. PRESSURES ON THE STATE OF AIR QUALITY IN ROMANIA

2.5.1 INDUSTRY

Industrial activities play an important role in a country's economic welfare, while contributing to sustainable development. However, industrial activities may also have a significant environmental impact.

Sustainable development strategy aimed at boosting industrial competitiveness, pursuing steady, sustainable economic growth and environmental protection.

Emissions from the largest industrial plants are a significant part of total emissions of key air pollutants and also have other important impacts on the environment including water and soil emissions, to which are added waste generation and careful use of natural resources and efficient use of water and energy.

The ability to control the activity of industrial installations so that emissions, waste generation and energy consumption are as low as possible, has undergone reform legislation at EU level, leading eventually to the emergence in 2010 of Directive 2010/75/EU on industrial emissions (IED Directive).

Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (recast) aims at the prevention and integrated control of pollution from industrial activities, by establishing conditions for prevention, and if that is not possible, reducing emissions to air, water and soil and waste prevention, to achieve a high level of environmental protection considered as a whole. It is also important to use energy efficiently, to prevent accidents and incidents and limit their possible consequences. To prevent, reduce, eliminate pollution from industrial activities, in accordance with "the polluter pays" principle, the precautionary principle in environmental decision-making and the principle of pollution prevention, principles overlapping best over the concept of sustainable development, has been established by the IED Directive a general framework for the control of industrial activities, ensuring the effective management of natural resources, giving priority to taking measures directly at the source and taking into account, where necessary, the economic situation, local environmental conditions or geographical location and technical characteristics of the installation. In addition, IED Directive promotes public access to information, public participation and access to justice in connection with the procedure for issuing the integrated environmental authorization.

Romania, as an EU Member State has implemented, at national level, the Pollutant Release and Transfer Register in accordance with Regulation (EC) no. 166/2006 of the European Parliament and of the Council, establishing the European Pollutant Release and Transfer Register and amending Council Directives 91/689 / EEC and 96/61 / EC (E-PRTR Regulation).

E-PRTR Regulation establishes a register of emissions and transfers of pollutants at Community level (hereinafter "the European PRTR / E-PRTR") as a publicly accessible electronic database and lays down rules for its functioning, in order to implement the UNECE Protocol on Pollutant Release and Transfer Registers and facilitate public participation in environmental decision-making, and to help prevent and reduce environmental pollution.

Directive 2010/75 / EU on industrial emissions (IED) replaces the following seven directives, thus incorporating into a single clear and coherent legislative instrument a set of common rules for the authorization and control of industrial installations based on an integrated approach and the application of best available techniques:

- Directive 2008/1 / EC concerning integrated pollution prevention and control (IPPC);
- Directive 2001/80 / EC on the limitation of emissions of certain pollutants from large combustion plants (LCP);
- Directive 2000/76 / EC on the incineration of waste;
- Directive 1999/13 / EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations;
- Directive 78/176 / EC on waste from the titanium dioxide industry;
- Directive 82/883 / EC on procedures for the surveillance and monitoring of environments in which waste from the titanium dioxide industry;
- Directive 92/112 / EC on procedures for harmonizing the programs for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry.

Romania has implemented the provisions of Directive IED by Law no. 278/2013 on industrial emissions, which entered into force on 1 December 2013.

Chapter II of the new Directive contains provisions applicable to the activities listed in Annex 1 and reaching as appropriate, the capacity thresholds set out in the Annex. As regards the activities listed in Annex I, the provisions of Directive 2010/75 / EU on industrial emissions are based on several principles, namely:

- an integrated approach that takes into account the environmental performance of the entire installation, including emissions to air, water and soil, waste generation, use of raw materials, energy efficiency,

noise, accident prevention, and restoring the site to a satisfactory condition when closing it, to ensure a high level of environmental protection considered as a whole;
- *application in operating industrial installation of the Best Available Techniques (BAT)* and setting the authorization conditions and emission limit values (ELVs) for pollutants in compliance with BAT conclusions (documents adopted by the European Commission through Implementing Decision, containing information on emissions associated with the Best Available Techniques);
- *flexibility in setting authorization conditions* by the competent authorities for environmental protection;
- verifying compliance of industrial installations by implementing a system of environmental inspections and inspection plans that include checking the site at least once every 1 or 3 years;
- *public participation* in decision-making for the granting of integrated environmental authorizations and information about the environmental performance of industrial installations.

The most important categories of industrial activities referred to in Chapter II of Directive 2010/75/EU represented in Romania are:

Metallurgy is represented by major units of the steel industry and the ferroalloys industry. The main environmental factor influenced is the air through emissions resulted from preparing raw materials, final processing of the products, transport and storage of raw materials and of the auxiliary products. Also, metal non-ferrous industry has an impact on the environment through emission in the atmosphere (burning gases and dusts), through the evacuation of technological used waters, waste storage etc.

The industry of building materials is represented by important units for the production of cement, limestone, refractory bricks etc., activities which release great quantities of dust and emissions of gases (especially CO_2, SO_2 etc).

The chemical industry is represented by the installations for the production of the basic organic and inorganic chemical substances, of chemical fertilizers, products for phyto-sanitary usage, basic pharmaceutical products and explosives. These activities are associated with the generation of emissions from the storage of chemicals used as raw materials and products, with potentially significant impact on air, soil and groundwater.

The food industry holds an important place in the economy of many regions, being represented by the installations for food and drinks manufactured from animal and vegetal raw materials. This type of activity can have a significant impact on the environment through emissions of pollutants in the atmosphere, emissions of substances derived from refrigerating plants, through the evacuation of technological waste waters with great organic loading, production of solid wastes specific for these types of activities. Therefore, the operators paid a special attention to the elimination of these problems through the establishment of treatment stations, purchasing ecological incinerators for animal wastes, etc.

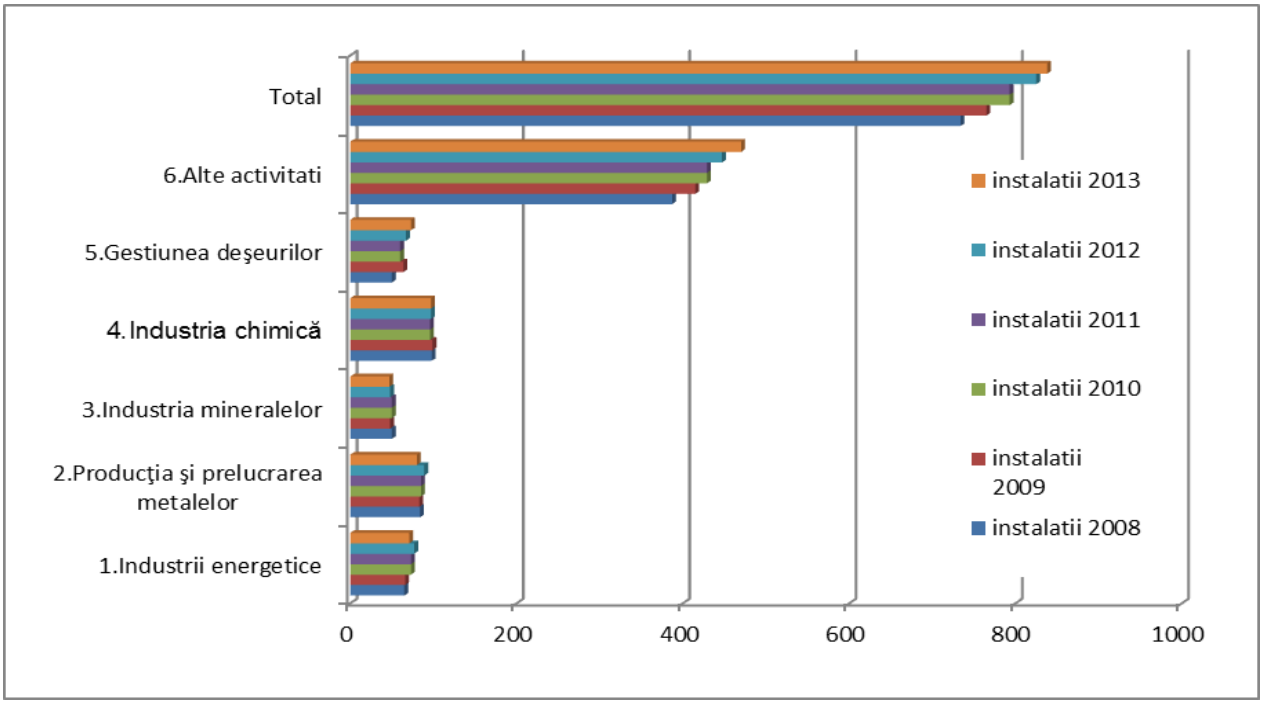
The intensive breeding of animals is represented by poultry or pig farms generating a great quantity of pollutants mainly affecting the air (through emissions of ammonia and other gases that generate olfactory discomfort), soil and water (generally from manure storage and spreading it on agricultural land as organic fertilizer)..

Vehicle construction industry has a significant impact on the environment through metallic wastes resulted from serial production and specific pollutants released from the treatment of metallic surfaces, objects and products, using organic solvents, or products manufactured in this industrial field.

Light industry is represented by pre-treatment stations (operations such as washing, whitening, steeping) or dyeing fibres or textiles, activities which are sources of generating waste and waste water.

The number of industrial plants where are carried out activities in Annex 1 to Directive 2010/75 / EU inventoried under the IPPC Directive had a slight upward trend in 2013 (838 plants) than in 2012 (825 plants), 2011 and 2010 (793 plants) with 2009 (765 plants) and 2008 (734 plants).

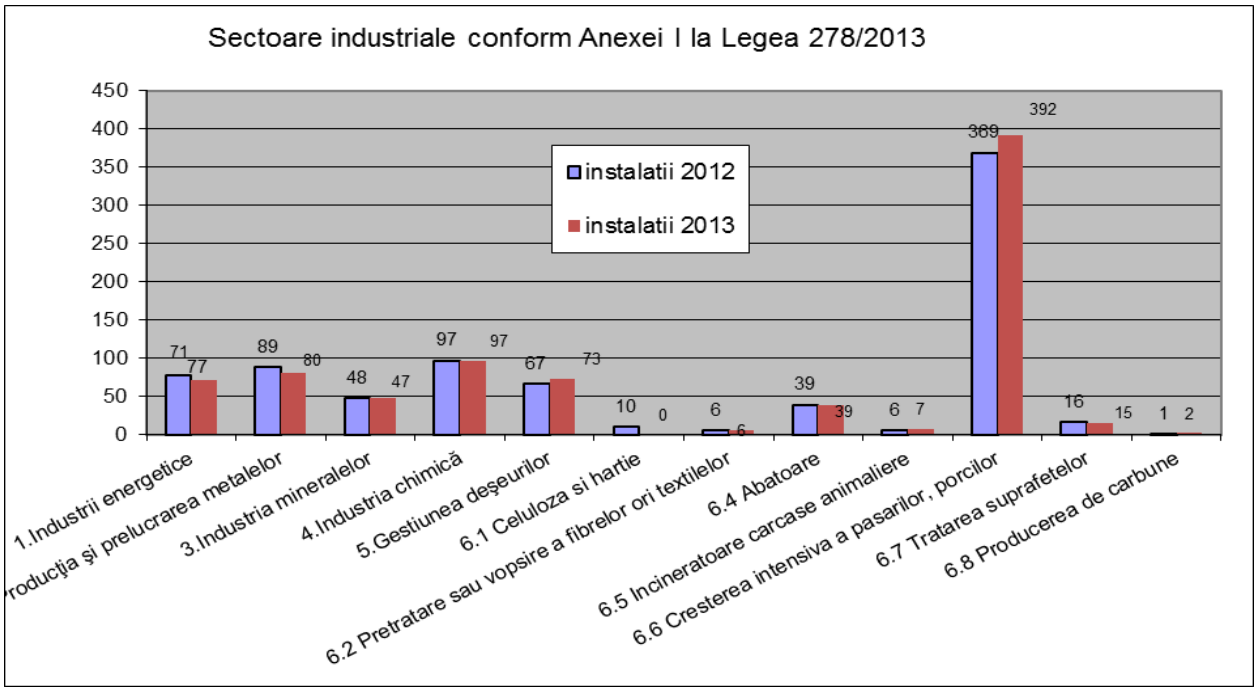
Graph 2.5.1.1 *Industrial activities subject to the provisions of Chapter II of Directive 2010/75 / EU on industrial emissions*



Industrial activities subject to the provisions of Chapter II of Directive 2010/75 / EU on industrial emissions

The situation of authorized facilities on national areas of industry is presented below.

Graph 2.5.1.2



Out of the total number of industrial installations, the largest share is represented by installations in the field of intensive animal breeding (351 installations).

Chapter III of Directive 2010/75/EU on industrial emissions (IED)

Chapter III of the Law no. 278/2013 on industrial emissions presents special provisions for combustion plants whose total rated thermal input is greater than or equal to 50 MW, irrespective of the type of fuel used (solid, liquid or gaseous).

The provisions of **Chapter III** of the Law no. 278/2013 on industrial emissions shall apply from 1 January 2016 to combustion plants authorized before the entry into force of the law (12/01/2013) or the operators of which had submitted a complete application for a permit before that date, provided that such facilities have been put into operation no later than January 7, 2014. Integrated environment permits issued for these combustion plants include *less restrictive* emission limit values for air emissions.

Combustion plants commissioned after January 7, 2014 must comply with *much more restrictive* emission limit values.

By 1 January 2016 for large existing combustion plants (LCPs) (with a rated thermal input exceeding 50 MW) are applied the provisions of Directive 2001/80/EC (LCP) which refers to the limitation of emissions of certain pollutants into the air from large combustion plants: mainly CO_2, SO_2, NOx and dust in the energy industry.

Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants is transposed into the national legislation by GD 440/2010 laying down measures to limit emissions of certain pollutants into the air from large combustion plants, which will be repealed as from 1 January 2016 by Law no. 278/2013.

Of the 176 large combustion plants – 41 are exempted from compliance with the emission limit values (will operate up to 20,000 hours between 01.01.2008 -31.12.2015) and then will be closed or authorized under art. 30 para. (4) of the Law 278/2013.

Specific pollutants emissions from large combustion plants recorded in 2013 are as follows:

- 161 951 t sulfur dioxide;
- 42 049 t of nitrogen oxides;
- 10029 t powder.

Chapter V of the IED is destined for specific provisions for installations and activities using organic solvents.

With the issuance of the European Parliament Directive 2010/75/EU on industrial emissions, Directive 1999/13/EC establishing measures to reduce emissions of volatile organic compounds (VOCs) due to the use of organic solvents in certain activities and installations is part of it. Chapter V is for specific provisions applicable for installations and activities using organic solvents, activities listed in Annex VII, Part 1, and which reach, where applicable, the consumption thresholds set out in Part 2 of the Annex. These provisions are designed to prevent or reduce the effects of direct and indirect emissions of volatile organic compounds (VOCs) into the environment, mainly in the air and the potential risks to human health, by providing measures and procedures to be implemented in some industrial activities whose solvent consumption is at a level higher than the threshold set.

Businesses that operate installations covered by Chapter V, are required to enforce the measures and techniques associated with the best available techniques to ensure compliance with operating conditions with one of the following requirements:

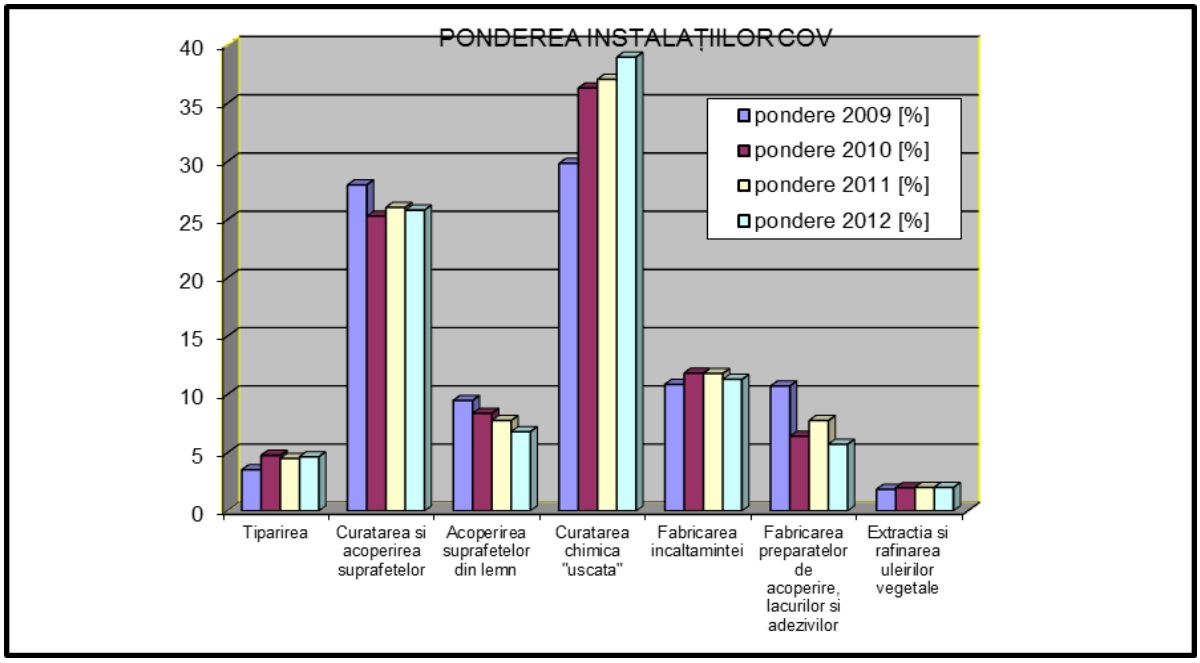
- compliance with the VOC emission limit values by using the equipment of collecting and treatment of VOC emissions;
- applying VOC reduction schemes to reduce solvent consumption by suitable techniques or replacement VOC solvent based with water-based solvent, or with substances having low VOC content, that provides the possibility to reduce the source emissions, reduction equivalent to that which would be achieved by applying the emission limit values.

Number of installations whose activities are subject to the provisions of Chapter V of the *Directive IED* inventoried in 2013 for 2012 was 647 (46 plants fall under Chapter II - special provisions for installations and activities listed in Annex I - *IPPC*), of which the following activities have a significant share:

- printing, with a share of 4.64%;
- cleaning and surface covering, with a share of 25.81%;
- wood surface covering, with share a of 6.8%;
- dry cleaning, with share a of 38.95 %;
- footwear manufacture, with a share of 11.28%;
- manufacture of paint, varnish, inks and adhesives, with share a of 5.72%;
- extraction and refining vegetable oils and animal fat, with a share of 2.01% of total inventoried activities.

Evolution of the number of facilities by type of activity is shown in the figure below:

Graph 2.5.1.3



2.5.2 European pollutant release and transfer register (E-PRTR Register)

The *European pollutant release and transfer register (E-PRTR Register)* follows the *European Pollution Emission Register (EPER Register)*.

It is designed as an electronic database accessible to the public at the following address *http://prtr.ec.europa.eu.*

At European level, according *(EC) Regulation no. 166/2006 of the European Parliament and the Council establishing a European register of emissions and transfers of pollutants and amending Directives 91/689/EEC and 96/61/EC of the Council (E-PRTR Regulation),* which was adopted on January 18, 2006. The Register contains data on emissions of pollutants into air, water, land, transfers of hazardous and non-hazardous waste, waste water pollutants transferred off-site from all the member states of the European Union, which exceed the established thresholds.

Romania implemented at the national level the provisions of the E-PRTR Regulation through *GD no. 140/2008 that establishes measures for the application of the provisions of Regulation (EC) of the European Parliament and Council no. 166/2006 on establishing the European Pollutant Release and Transfer Register and amendment of Council Directives 91/689/EEC and 96/61/EC,* which establishes the institutional framework necessary for the direct application of the E-PRTR Regulation.

In accordance with the E-PRTR regulation, the National Environmental Protection Agency has achieved the national web site of Pollutant release and transfer register (E-PRTR) which will allow public, from the country and abroad, access to environmental information regarding industrial compounds in Romania and can be accessed at http://prtr.anpm.ro. According to the European Commission request, the link is sent at European level to be integrated in the European Register, under section „Links – National Registers".

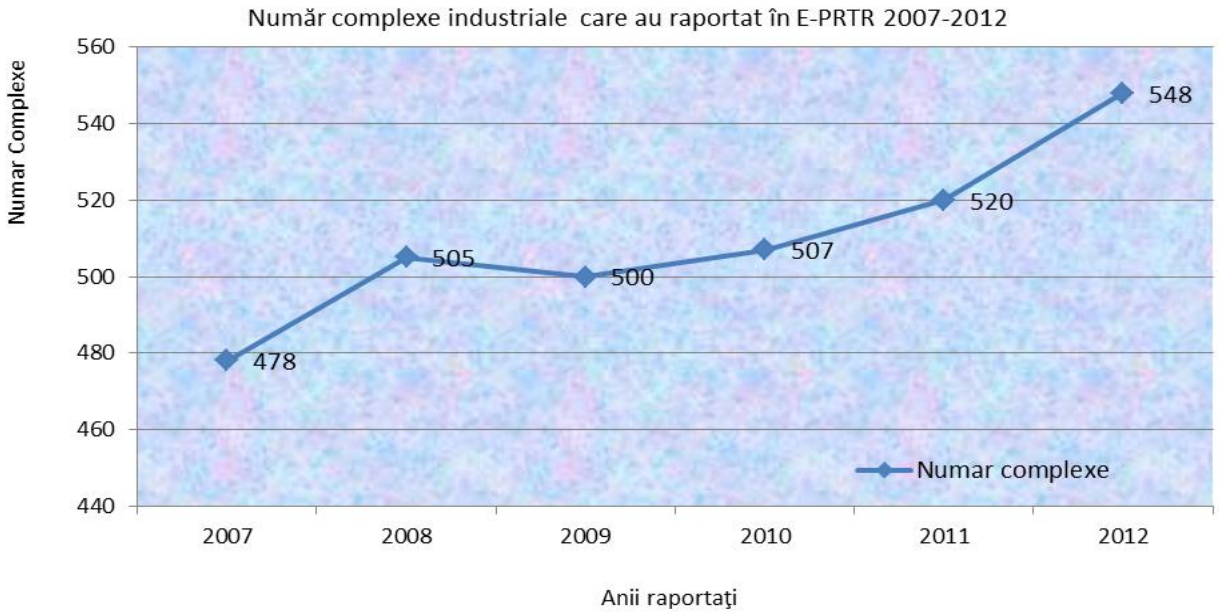
Both the E-PRTR European register and the national register include information for the period (2007 – 2012), the data collections related to the latter year being reported by the member states to the European Commission until March 30, 2014.

The E-PRTR Regulation established new requirements, additional to those established by EPER Decision extending the reporting for industrial sectors included in the scope of IPPC Directive to a series of non IPPC activities, in total 66 such activities, grouped in 9 industrial sectors including underground mining activity and oil and gas deposits exploration/exploiting activity.

Collection for 2012 at national level has a number of 548 industrial compounds, facilities respectively, which recorded exceedances of threshold values established in Annex II of the E-PRTR Regulation, with 70 industrial compounds more than in 2007 (478), 43 industrial compounds more than 2008 (505), 48 industrial compounds more than 2009 (500), 41 industrial compounds more than 2010 (507) and 28 industrial compounds more than 2011 (520).

The evolution of the number of industrial compounds registered in the E-PRTR Register is presented in the figure below:

Graph 2.5.2.1.



Their distribution within the areas of development is as follows:

- Region 1 North-East - **83** industrial compounds
- Region 2 South-East - **66** industrial compounds
- Region 3 South - Muntenia - **109** industrial compounds
- Region 4 South West, Oltenia - **30** industrial compounds
- Region 5 Vest - **95** industrial compounds
- Region 6 North West - **57** industrial compounds
- Region 7 Central - **83** industrial compounds
- Region 8 Bucharest - Ilfov - **25** industrial compounds

Pollutants reported by the industrial compounds registered in the sixth round of European reporting are presented as follows.

2.5.2.1 Air. Emissions from sites

For the year 2012, as well as for 2011, there were reported emissions in the air of 21 pollutants exceeding the threshold values representing only 34.42% of the total pollutants established by Annex II of the Regulation, 3 pollutants more than in 2010, respectively 1 pollutant more than in 2009, 3 pollutants less than in 2008, respectively 2007.

Here is the pollutants list: carbon dioxide (CO_2) including carbon dioxide without biomass (CO_2 exclusively the biomass), carbon monoxide (CO), nitric oxides (NO_x), nitrous oxides (N_2O), sulphur oxides (SO_X), powders (PM_{10}), ammonia (NH_3), methane (CH_4), perfluorocarbons (PCF), dioxins and furans (PCDD), non-methane volatile organic compounds (COV), Cadmium (Cd), Mercury (Hg), Nickel (Ni), Lead (Pb), Zinc (Zn).

The emissions in the air resulted from 22 industrial activities, 8 industrial activities less than in 2007 (30 industrial activities), with one industrial activities less than in 2009 (23 industrial activities) and 4 industrial activities less than in 2008, 2010 and 2011 (26 industrial activities).

The significant contribution to the total national emissions for the pollutants listed above is as follows:

CO_2, total quantity nationwide of 3255000000kg/year, was issued by 12 industrial sectors, and the maximum contribution, approximately 65.98%, generated by the thermal plants and other burning installations, followed by the activities for the production of cement clinker and lime, with about 10.9%, pig iron production installations, approximately 9.19%, and fertilizers based on phosphor, azoth or potassium, approximately 6.76%, refineries for oil and gases, with about 4.89%. A number of 5 installations from 2 industrial sectors contributed to this total quantity of emissions, as follows: 3 thermal plants and 2 production installations for primary wooden products.

NO_X, total quantity nationwide of 70041000 Kg/year, was issued by 11 industrial activities. The highest quantity is released by 4 industries, each contributing with approximately 75.15%, generated by the thermal

plants and other combustion installations, followed by 7.46% from the industry of fertilizers based on phosphor, azote or potassium, 9.34% from cement or lime production, and cement in rotary ovens, and 2.81% from oil and gas refineries. The remaining activities barely sum-up 5.24%.

SO_X, total quantity nationwide of 220021000 Kg/year, was issued by 4 industrial activities. The highest quantity is released by the energy sector as follows: approximately 96% by the thermal plants and other burning installations and approximately 2.53% by oil and gas refineries. The remaining 2 activities (installations for the production of pig iron and steel and production of cement clinker) barely sum-up 1.04%.

PM_{10}, total quantity nationwide of 13080000Kg Kg/year, was issued by 6 industrial activities. The highest quantity is released by the thermal plants and other burning installations with approximately 84.68%, followed by pig iron production installations with around 1.09%, followed by the industry of fertilizers based on phosphor, azoth or potassium with approximately 7.85%, by oil and gas refineries with approximately 4.73%, the balance of approximately 1.65% being issued by the cement and lime production and by the intensive breeding of poultry and pigs.

CH_4, total quantity nationwide of 75506000 Kg/year, was issued by 4 industrial activities. The highest quantity is released by waste storage facilities, approximately 76.22%, followed by the underground mining exploitation with approximately 14.65%, intensive aviculture and pig breeding with approximately 7.75%, and urban waste water treatment stations, approximately 1.38%.

NH_3, total quantity nationwide of 17867900 Kg/year, was issued by 2 industrial activities. The highest quantity is released by intensive aviculture and pig breeding with approximately 89.81% followed by the industry of fertilizers based on phosphor, azoth or potassium with approximately 10.19%.

NMVOC, total quantity nationwide of 4523000 Kg/year, was issued by 5 industrial activities. The highest quantity is released by the oil and gas refineries with around 44.15%, followed by the a surface treatment industry with around 38.01%, the industry manufacturing substances by biological or chemical procedures with around 8.40%, underground and above ground mining exploitations with around 5.24%, and paper and cardboard production, with around 4.2%.

Emissions of heavy metals in the air were as follows :

Hg, total quantity nationwide of 279,2 Kg/year, was issued by 3 industrial activities. The highest quantity is released by the thermal plants and other burning installations with approximately 82.99%, followed by the the cement industry with approximately 11.64%, and the oil and gas refineries with approximately 5.37%.

Ni, total quantity nationwide of 2195 Kg/year, was issued by 3 industrial activities. The highest quantity is released by the oil and gas refineries with approximately 89.98%% followed by the the iron and steel industry, with approximately 7.11% and the cement industry with approximately 2.92%.

Cd, total quantity nationwide of 32,4 Kg/year, was issued by 2 industrial activities, in the following percentages: approximately 35.19% from thermal plants and 64.81% from oil and gas refineries.

Zn, total quantity nationwide of 5052 Kg/year, was issued by 3 industrial activities, contribution being 88.88% of the iron and steel industry, 6.79% of gross non-ferrous metal production and 4.33% of oil and gas refineries.

Cr, total quantity nationwide of 922 kg/year, was issued by by 1 industrial activity, the contribution being of 100% from the production of cement clinker in rotary kilns.

Evolution of airborne pollutants during 2007-2012

The analysis of the evolution of quantities of pollutants released in the air countrywide, in the period 2007-2012, showed the following trends:

CO_2 - in 2010 recorded a maximum decrease by about 32% compared to 2007 and by 20.18% compared to 2008, the emission of CO_2 in 2011 representing a slight increase compared to 2010 and in 2012 presented a decrease with approximately 8.2% compared to 2011;

CO - recorded the lowest value in 2009, with around 60% less than 2007, with around 43% less than 2008 and around 3% less than 2010,with around 3.1% less than 2011 and in 2012 persented a drop with almost 12.57% compared to 2011;

NOx - recorded the lowest value in 2012, with around 46.66% less than 2007, with around 42.4% less than 2008 and around 22.07% less than 2009, and with 9.85% compared to 2011.

SOx – records a continuous decrease, the national total in 2012 being around 55.7% lower than 2007, with around 55.3% lower than 2008, around 46.46% lower than 2009,with around 29.53% lower than 2010, with around 22.09% lower than 2011;

CH_4 - shows a continuous decrease from 2007, the national total in 2012 being around 50.83% lower than 2007, with 32,13% lower than 2008, with 12,9% lower than 2009 and with 10,1% lower than 2011;

NH_3 - shows a continuous decrease from 2007 until 2010 (with around 40% lower 2007) in 2012 being recrder a slight increase with around 11,93% compared to 2010 and with 6,08% compared to 2011;

Ni - increased during 2007-2010 followed by a decrease in 2011 (around 32% less) compared to 2010 and in 2012 the total nickel records an increase with 23,17% compared to 2011;

Cr - decreased in the period 2007-2010, from 937 kg / year to 0 kg / year in 2010, in 2012 the nickel quantity reaches 922 kg/year;

PFC - decreased in 2007-2009, registering in the latter year the lowest value of, about 83% lower compared to 2007, followed by a slight increase in 2010 and 2011, while keeping the approximate 72% gap less than the value of 2007 and followed in 2012 by a decrease of around 41.42% compared to 2011;

Zn - decreased in the period 2007-2009, with a minimum value in 2009 with about 95% less than the value of 2007 followed by a slight increase in 2010, 2011 and 2012 respectively, amount that is about 92% lower than 2007;

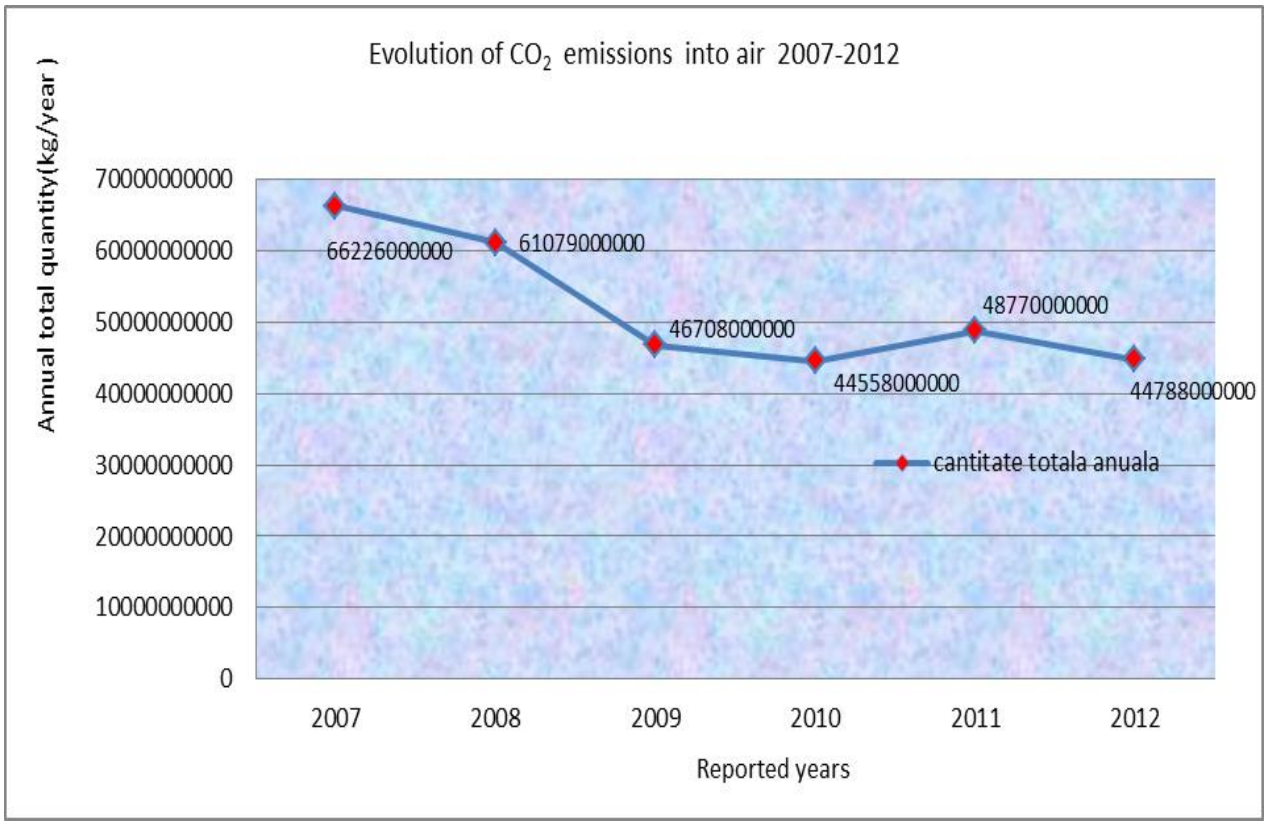
Cd - decreased continuously between 2009 - 2012, the lowest value being reported in 2012, 93% lower than 2009, with 85.22% lower than in 2010 and 72.36% lower than by 2011;

Hg had a general downward trend, with a slight increase of 2% in 2008 followed by a fall of 47% in 2009 compared to 2007 and a slight increase in 2010. The amount reported in 2012 is 78.02% lower than 2011, 76.59% lower than in 2010, 79% lower than in 2009 and 88.93% lower than in 2008;

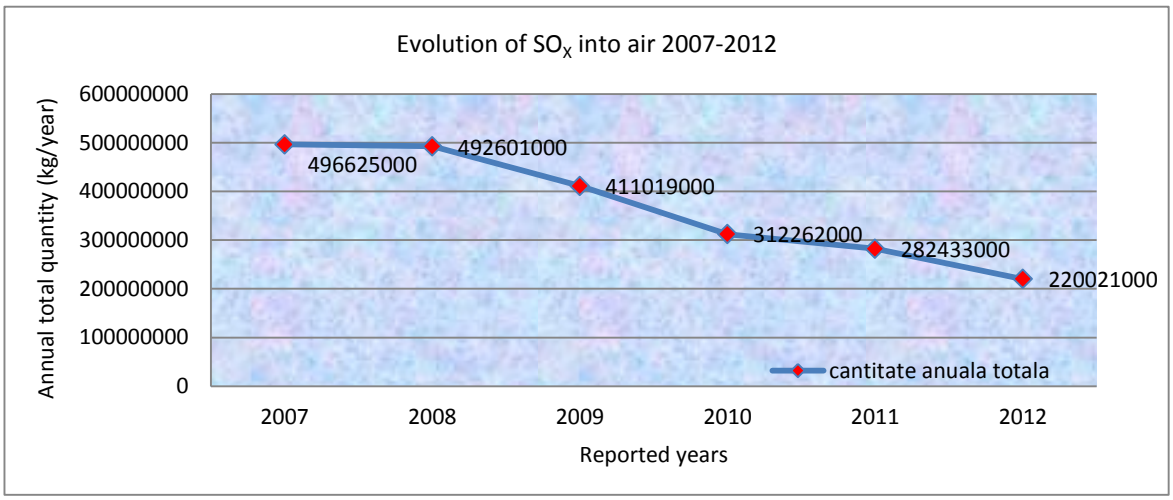
NMVOC - in the period 2007 - 2012 has been a steady downward trend in 2012, registering the lowest value reported by 75.2% less than in 2008, with 57.4% from 2009, with 43.4% compared to 2010 and 2% compared to 2011;

PM_{10} - recorded in 2008 a slight decrease of 6% compared to 2007 followed by a significant decrease of approximately 42% in 2009. Between 2009-2011, the variation was considerably constant. The national total amount reported in 2011 is 3% higher than in 2010, 7% lower than in 2009, with 42% lower compared to 2008, with 42% lower compared to 2008 and by 46% lower than 2007.

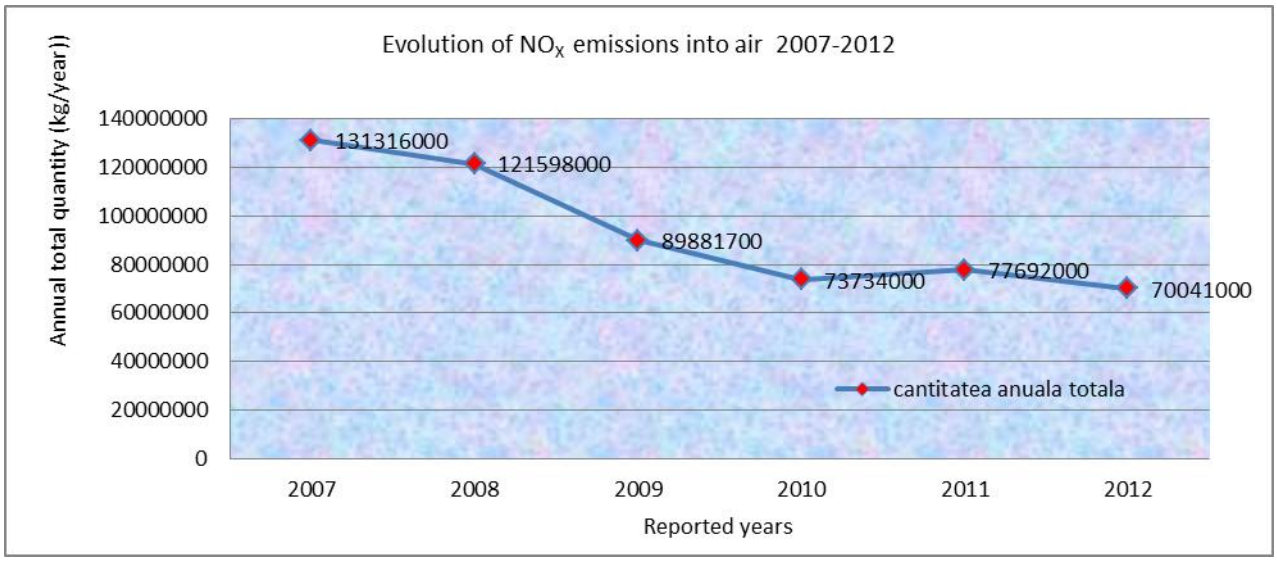
Graph 2.5.2.1.1



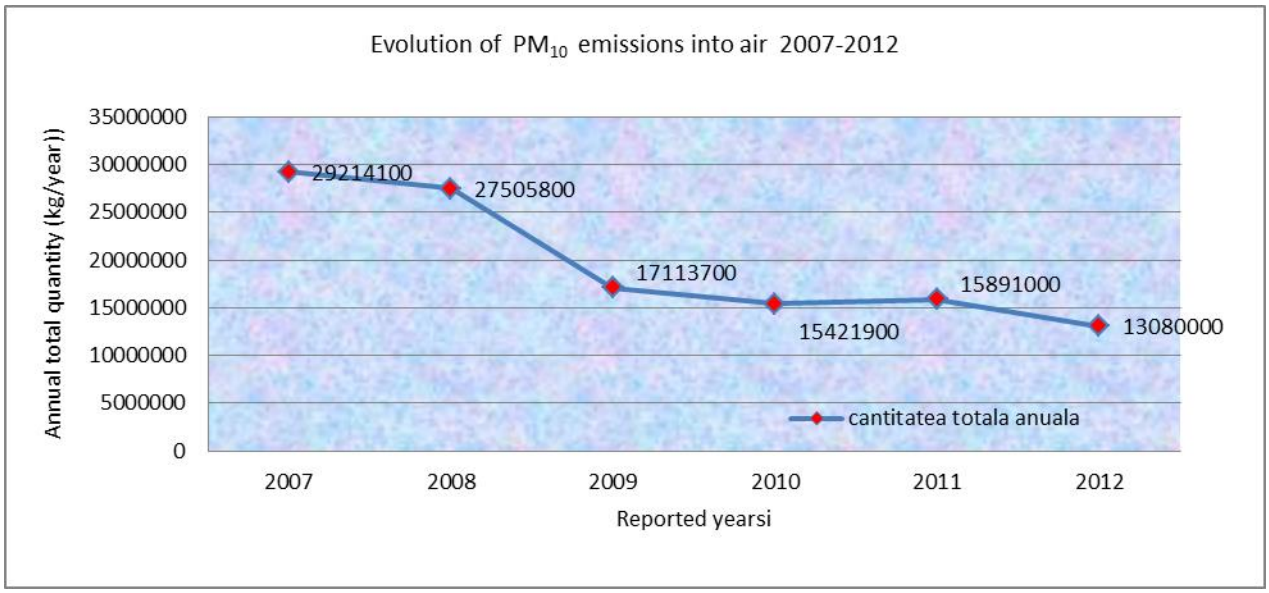
Graph 2.5.2.1.2



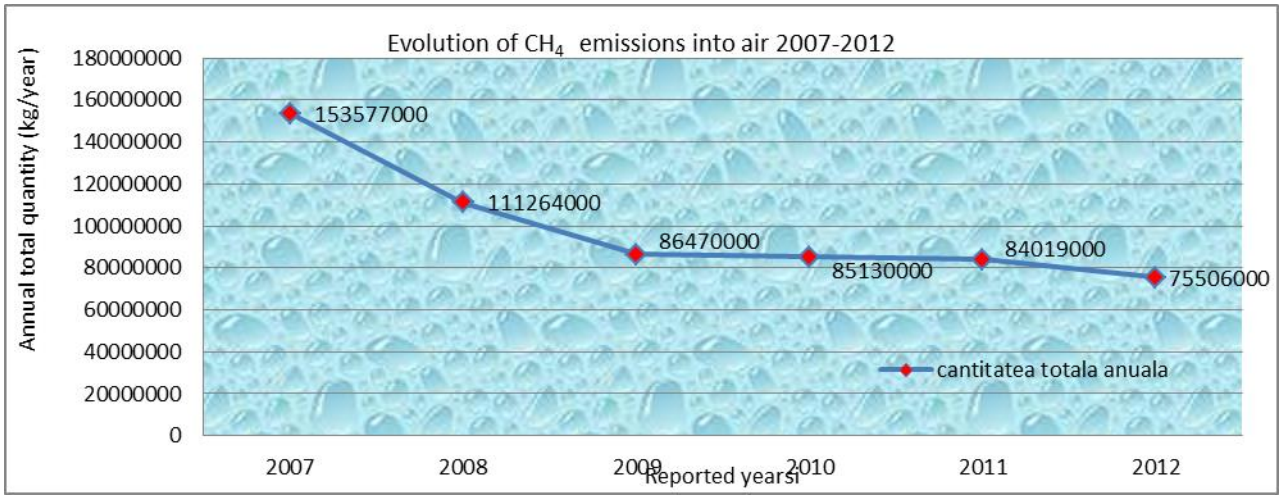
Graph 2.5.2.1.3



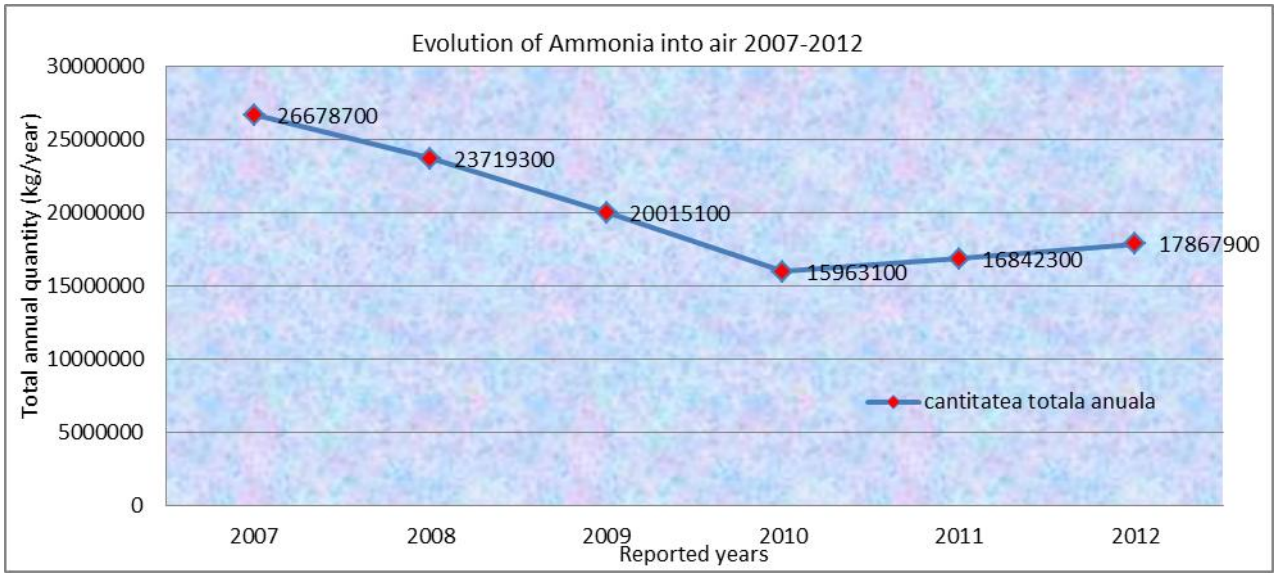
Graph 2.5.2.1.4



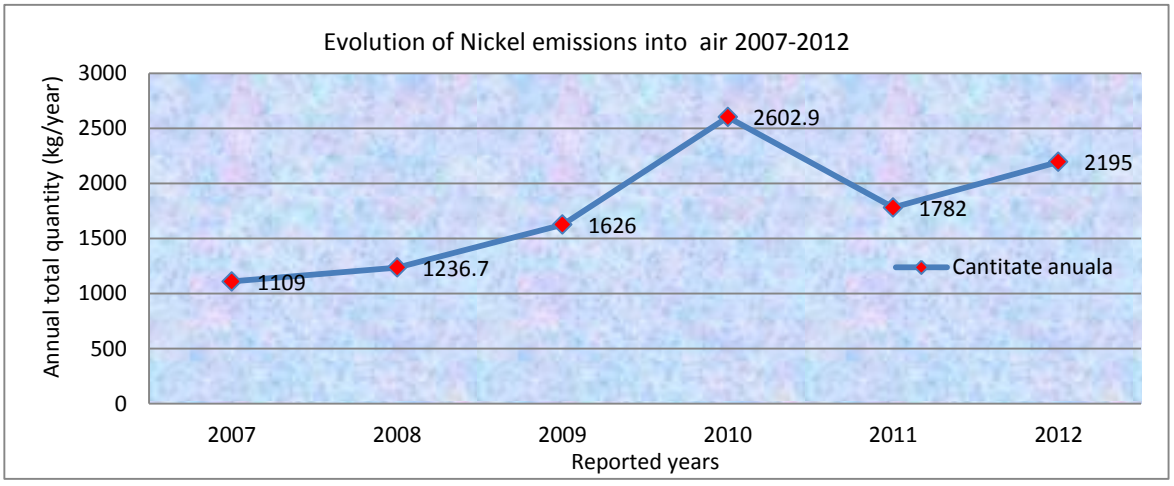
Graph 2.5.2.1.5



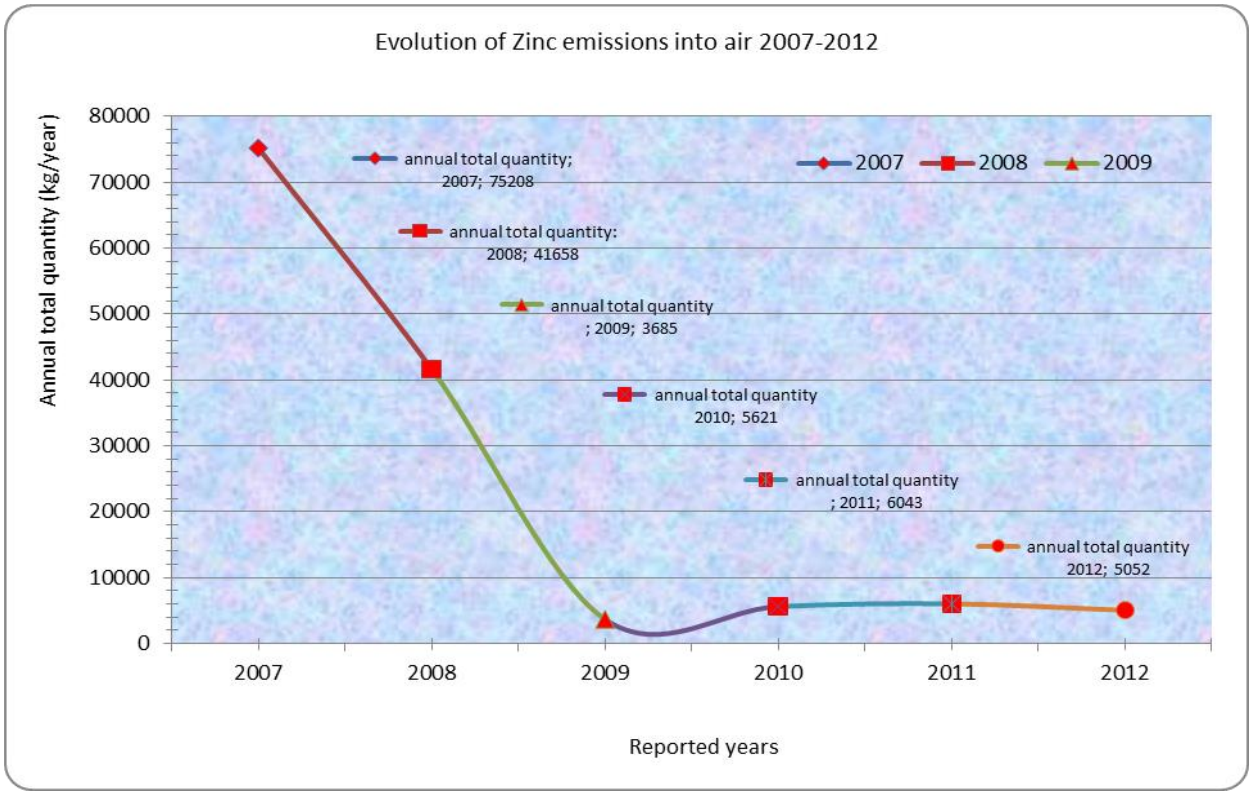
Graph 2.5.2.1.6



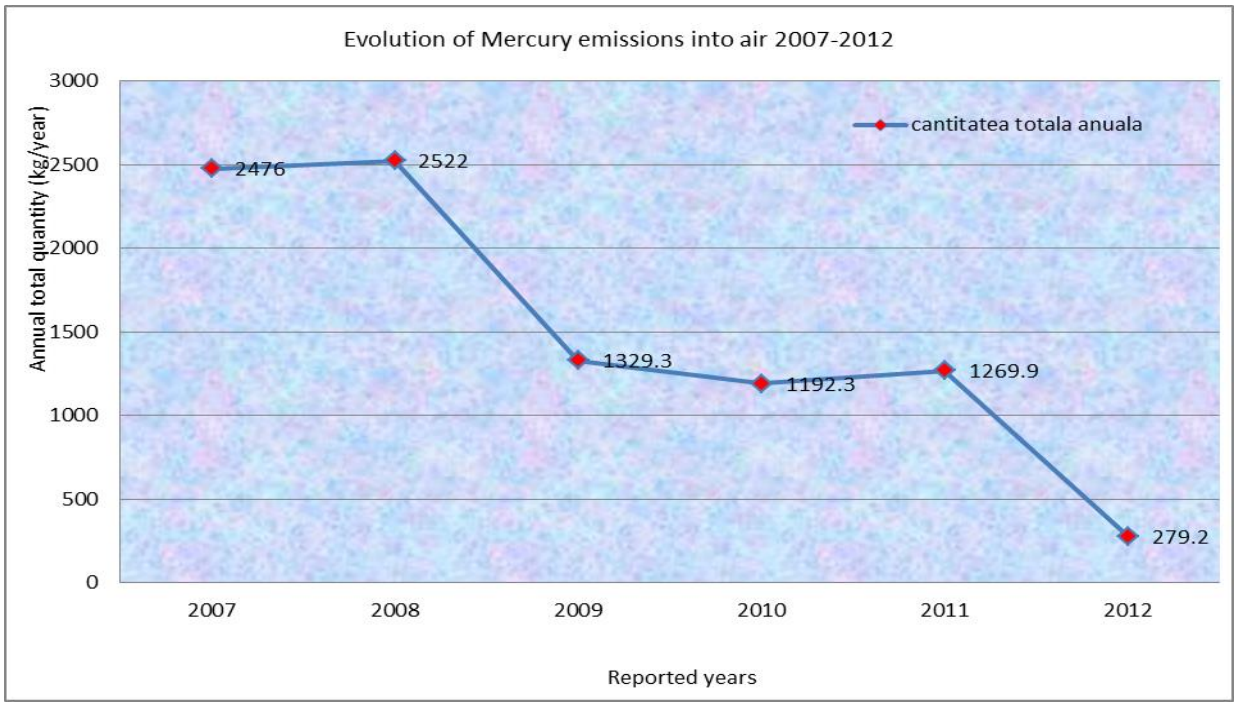
Graph 2.5.2.1.7



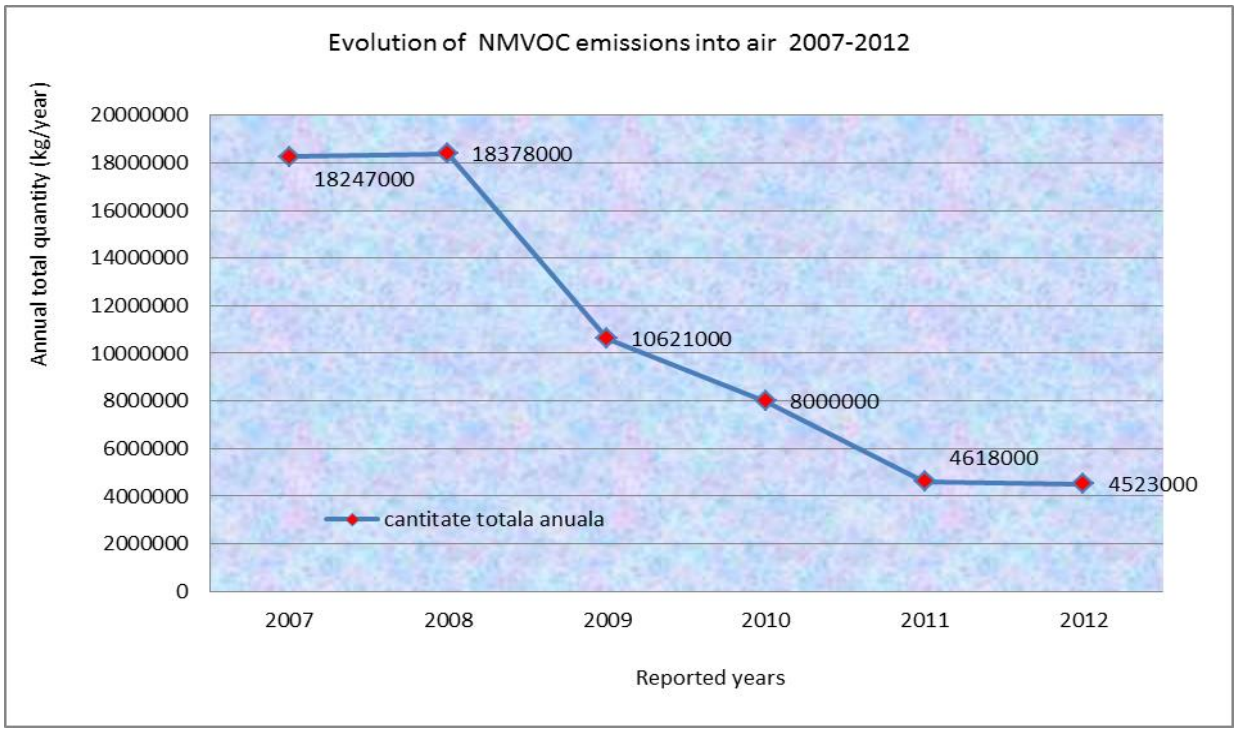
Graph 2.5.2.1.8



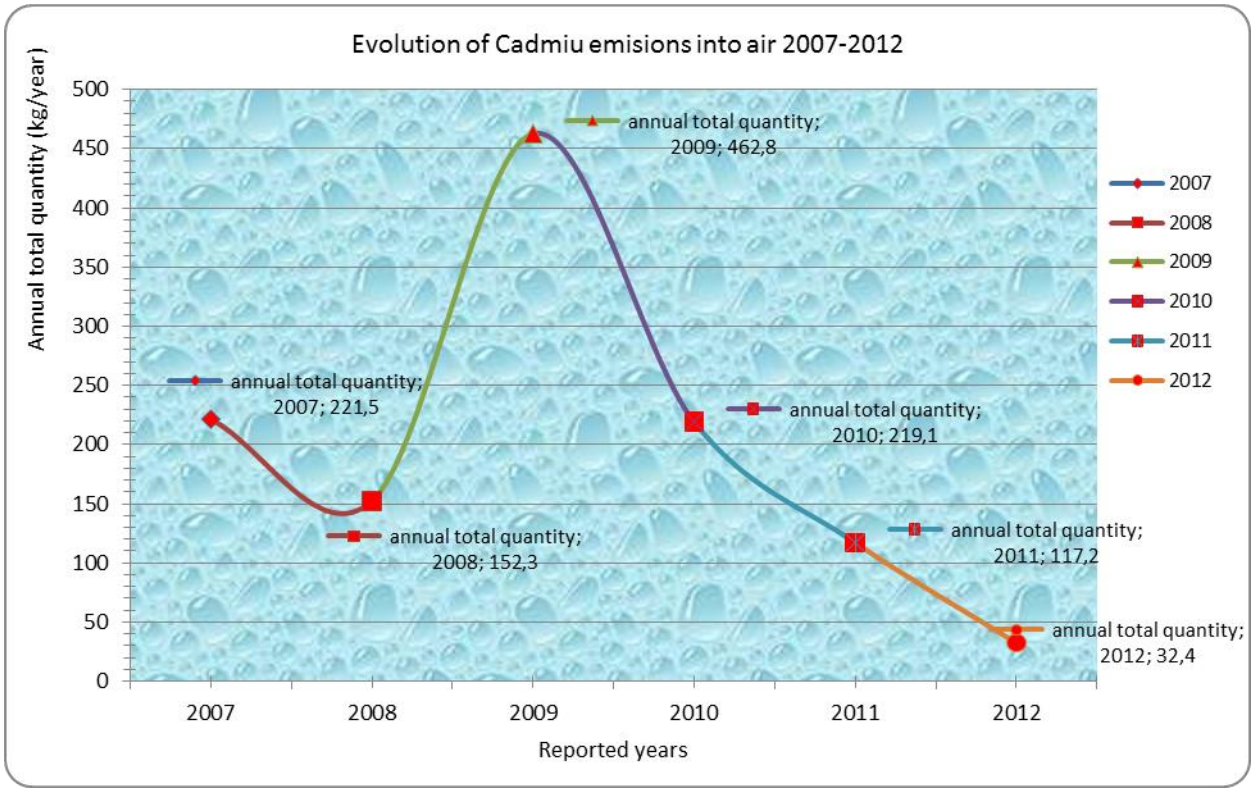
Graph 2.5.2.1.9



Graph 2.5.2.1.10



Graph 2.5.2.1.11



2.5.3 TRANSPORT

Transport activity pressures on the environment are translated at the environmental atmosphere level in the form of air pollution, as a result of emissions from combustion processes in internal combustion engines and noise and vibration - the major intersections, along roads, near railway hubs and airports.

In transports, Romania has a key position in the enlarged European Union's eastern border as a transit area on the east-west direction (the connection with Asia through the Black Sea) and north-south (from the Baltic to the Mediterranean). Construction of the TEN-T Trans-European Transport Network represents a major factor in boosting economic competitiveness and sustainable development of the European Union to which Romania can bring its contribution by modernizing the transport sector, in particular by implementing projects related to infrastructure development and modernization of intelligent traffic management.

Types of transport in Romania are:

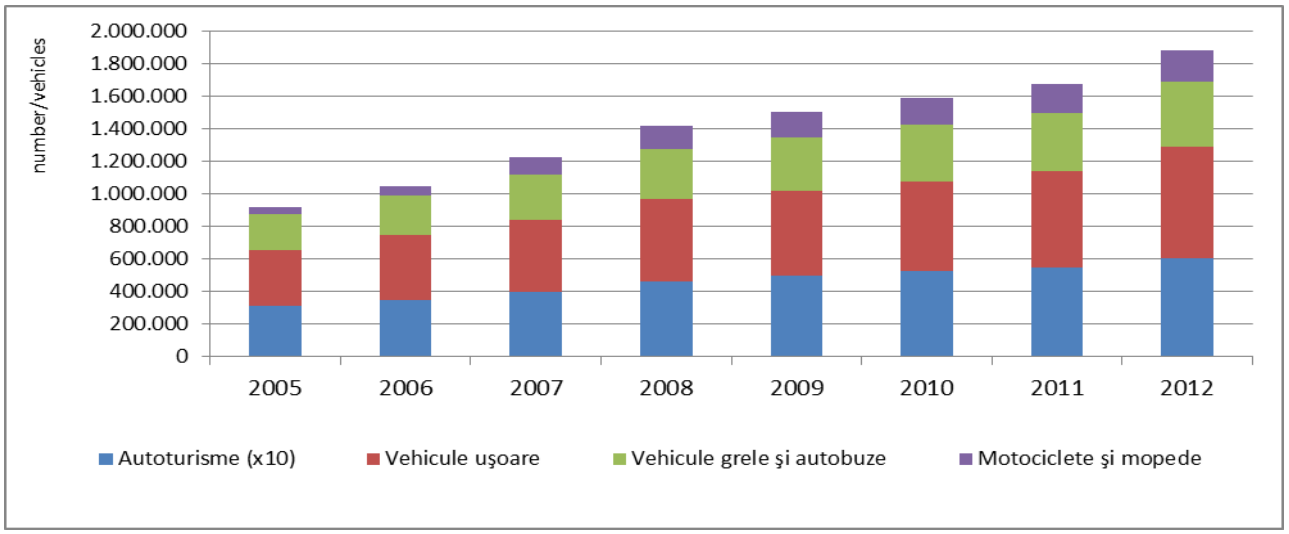
- road transport;
- rail transport;
- water transport (inland and maritime waterways);
- air transport;
- non-motorized transport;
- special transports (by pipeline and electric air transport).

In terms of environmental impact, there is a wide range of factors influencing changes in pollutant emissions from transport activities, such as:

- supply and demand for cars;
- the need for individual mobility;
- availability / unavailability of public transport;
- costs associated with having a personal car;
- the cost of fuels.

Regarding road transport, from the data provided by the Romanian Auto Register, one can notice the numerical growth of the fleet in all 4 large inventory sectors of emissions generated, namely: auto vehicles, light vehicles, heavy vehicles and buses, mopeds and motorcycles, the significant increase being in the auto vehicles and light vehicles sectors.

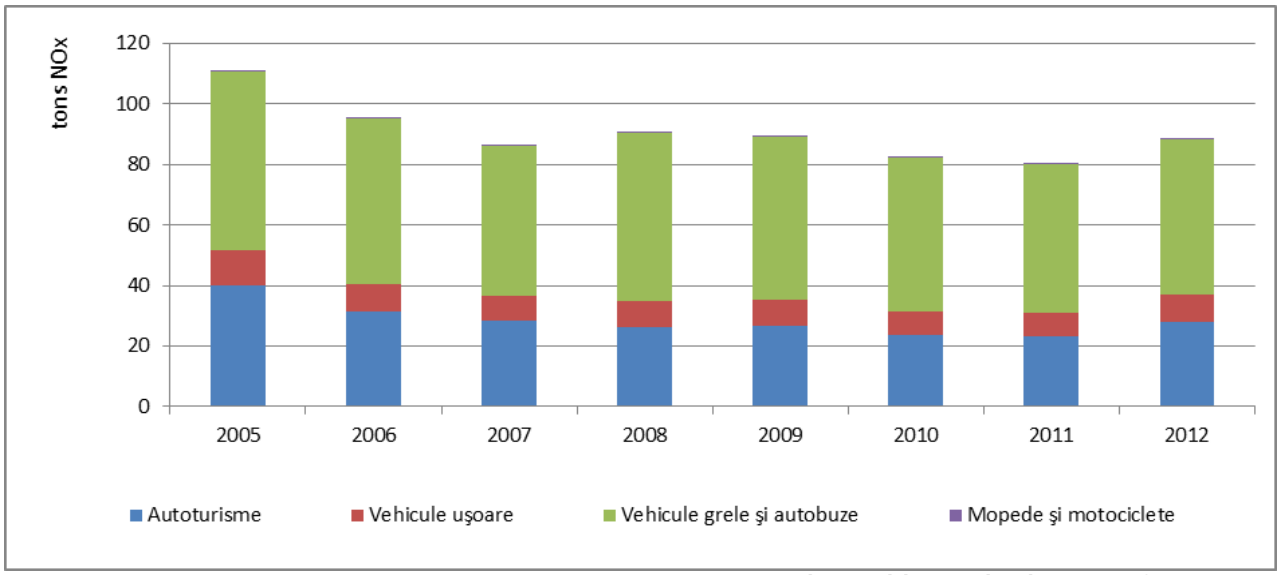
Graph 2.5.3.*1* *Auto fleet evolution during 2005 – 2012*



Sursa: Registrul Auto Român

Although vehicle efficiency and that of catalysts has been and is still improving, this is negatively offset by the increase of average length of travel, numerical growth of the fleet and other variables, such as driving style, traffic jams, lack of adequate transportation infrastructure, which translates into an increase in the intensity of emissions of nitrogen oxides.

Graph 2.5.3.2 *The evolution of NO_x emissions depending on the evolution of the total number of vehicles, during 2005 - 2012*



Sursa: Inventarul național de emisii de poluanți atmosferici

In the "*National Strategy for Sustainable Development of Romania Horizons 2013-2020-2030",* in the section Sustainable Transport is outlined the general objective of sustainable development strategy of the European Union in respect of transport, to ensure that transport systems meet the economic, social and environmental aspects of society, while at the same time minimizing their undesirable impacts on the economy, society and environment.

The incentive program for renewing the National car park (the "Rabla" program) was established under G.E.O no. 217 of 4th of December 2008, with the subsequent amendments and completions and has the following objectives:

- reducing the negative effects of air pollution on human health and the environment in urban areas due to exhaust emissions from cars, with very high levels of pollution;
- classification of emission limit values allowed at European level for ambient air;
- prevention of waste as a result of abandoning used cars and achieve targets set by EU environmental acquis on waste recovery and recycling of used vehicles.

One way to reduce the pressure of freight activities on air quality is represented by improving the routes and fuel consumption in freight transport, through the development and use of intermodal transport system.

The aforementioned idea is found in "Intermodal transport strategy in Romania in 2020" (May 2011), the paper stating that: "The overall objective is the development of the national intermodal system for the transport of goods, in order to improve freight transport and improving the environmental impact of transport and traffic safety in Romania." To achieve this general objective, the strategy proposes the following specific objectives:

- upgrading and / or construction of intermodal terminals and related infrastructure;
- achieving quality intermodal services;
- implementing a tracking system, planning and management of intermodal freight transport, using intelligent transport systems available on the market;
- stimulating the national system to promote intermodal transport.

In G.D. no. 454 of 28 May 2014 regarding the Additional Act no. 1 for 2014 in the Activity Contract of the National Railway Company "CFR" - S. A. for 2012-2015, approved by Government Decision no. 73/2012, Annex 3, Section 6 is mentioned the Program to promote intermodal transport (ongoing projects, projects in preparation or projects in the proposal stage).

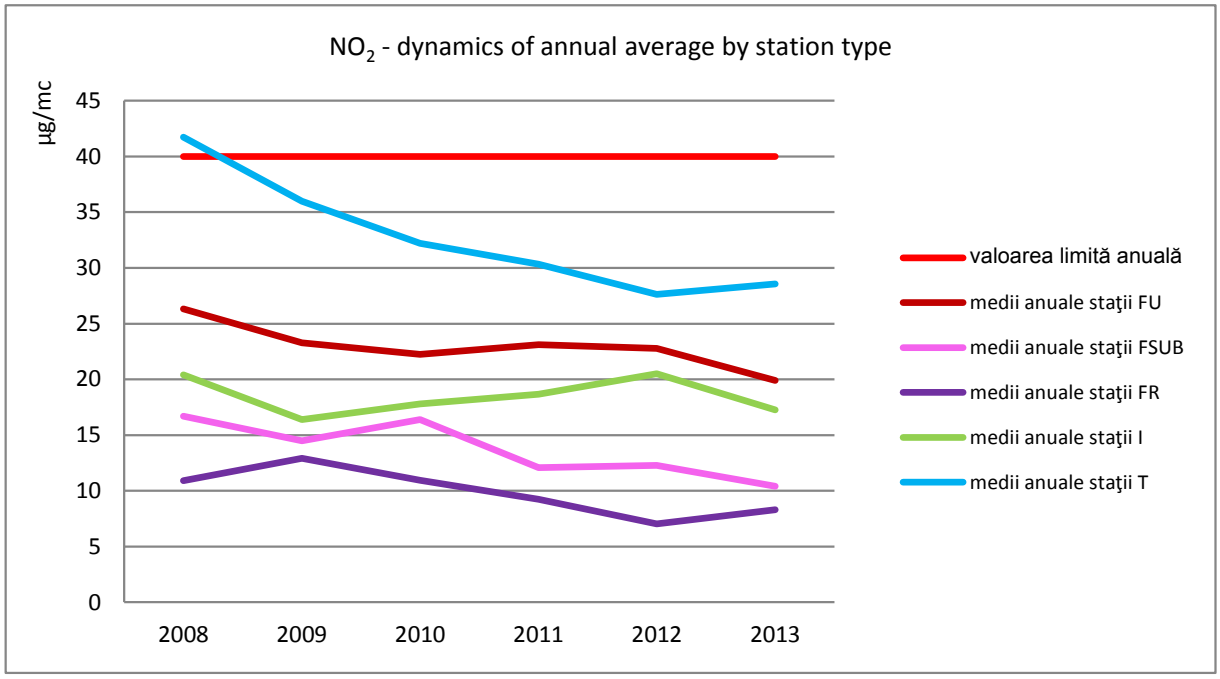
Given the significant impact of transports on air quality, it is necessary to act quickly and effectively in order to reduce it, by aligning with EU standards, both in terms of transport infrastructure and regulatory standards on vehicles' emissions, all with incentive programs for fleet renewal.

2.6. TRENDS

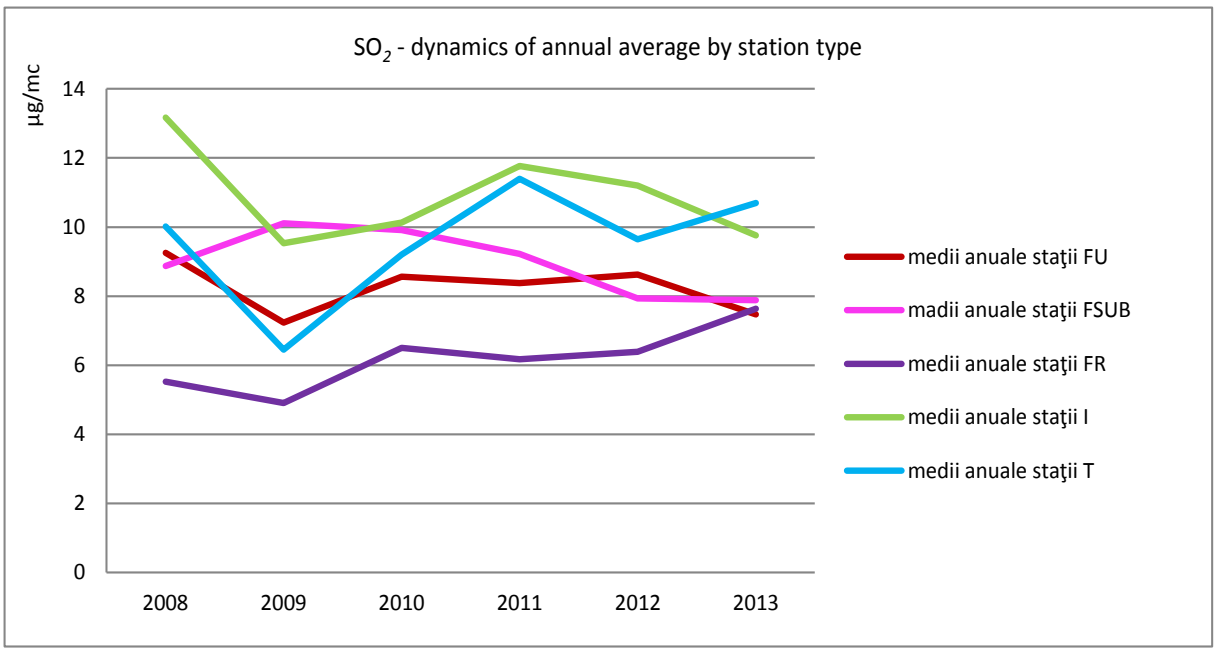
The trends in annual average concentrations of main pollutants in ambient air - NO_2, SO_2, CO, O_3 , benzene, particulate matter, heavy metals - during 2008-2013, 2009-2013 respectively, are represented in the graphs below, by type of stations:

- Urban background stations (UB);
- Suburban background stations (SubB);
- Rural / regional background stations (RB);
- Industrial stations (I);
- Traffic stations (T).

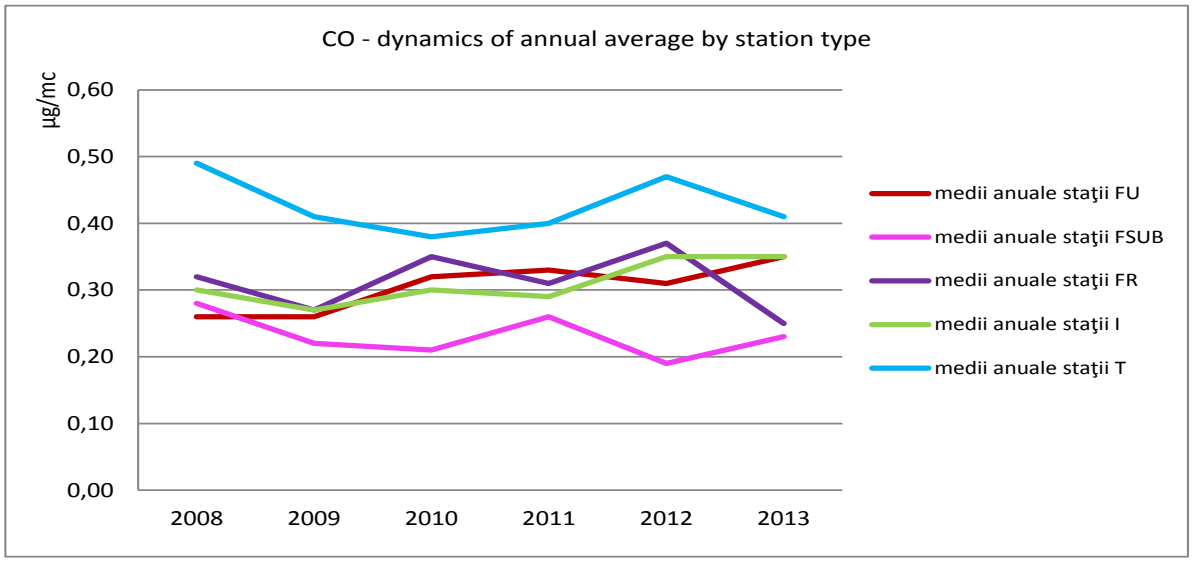
Graph 2.6.1 NO_2 – *Dinamics* of *annual averages 2008-2013*



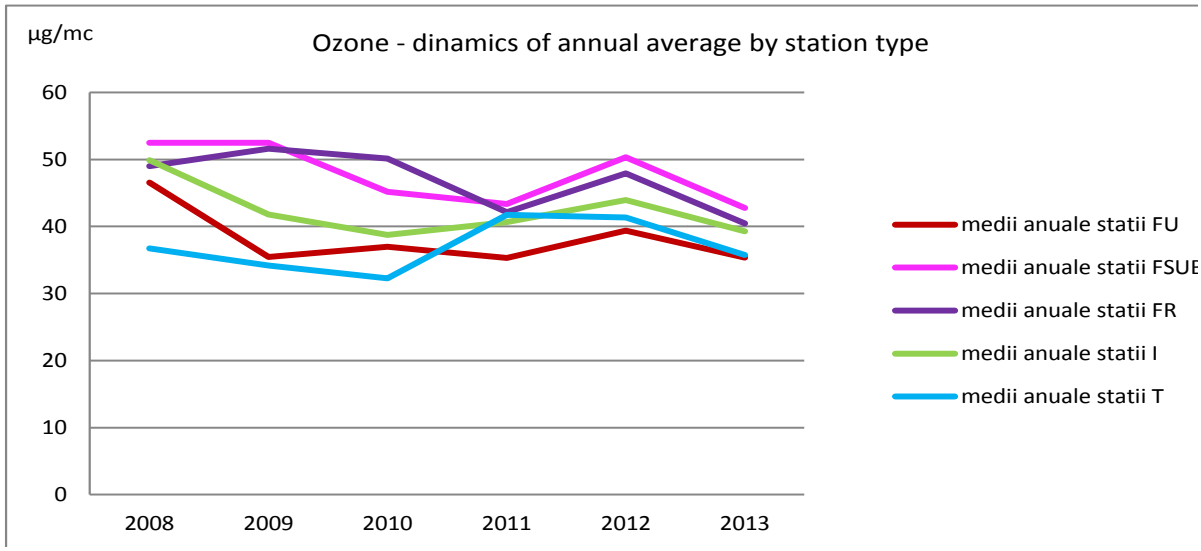
Graph 2.6.2 *SO_2 - Dynamics* of *annual averages 2008-2013*



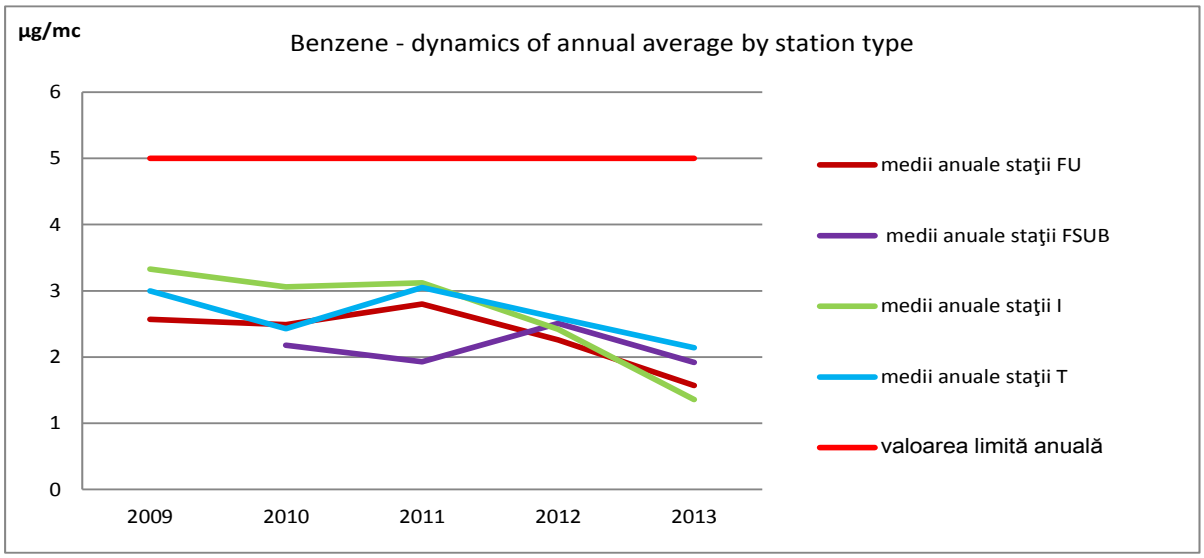
Graph 2.6.*3* *CO - Dynamics of annual averages 2008-2013*



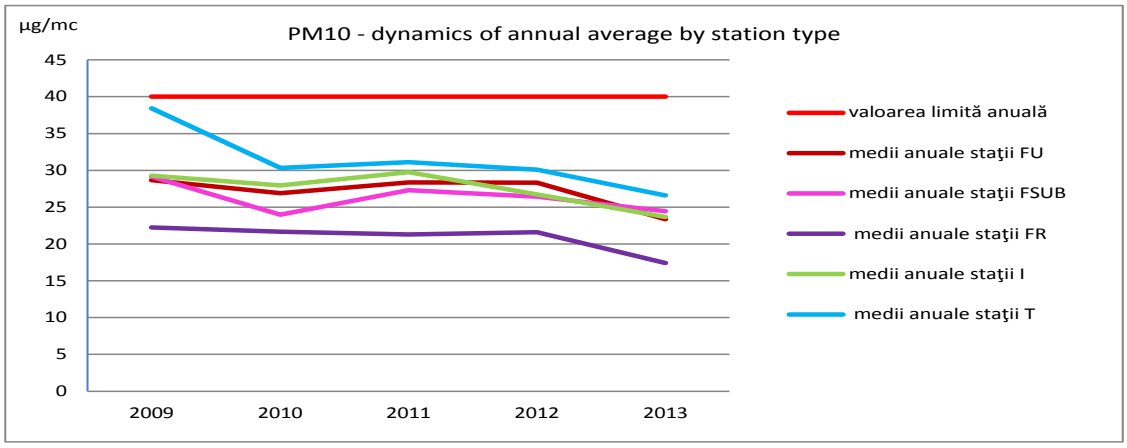
Graph 2.6.4 *O_3 - Dynamics of annual averages 2008-2013*



Graph 2.6.5 *Benzene - Dynamics of annual averages 2009-2013*



Graph 2.6.6 *PM_{10} – Dynamics of annual averages 2009-2013*



Graph 2.6.7 *$PM_{2,5}$ - Dynamics of annual averages 2009-2013*

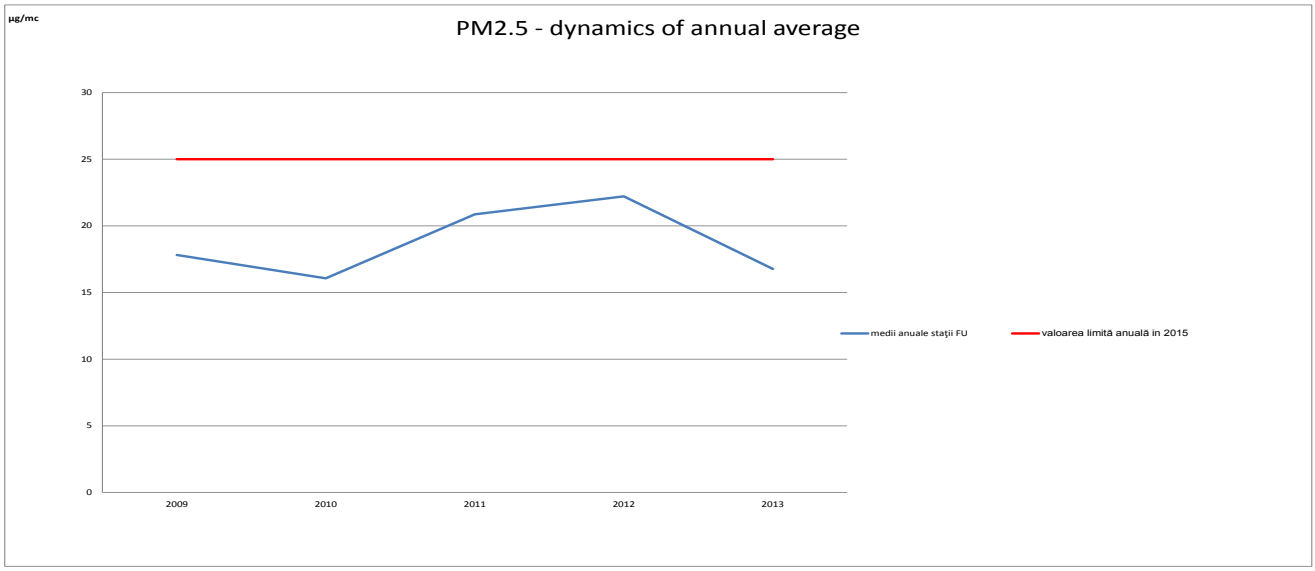
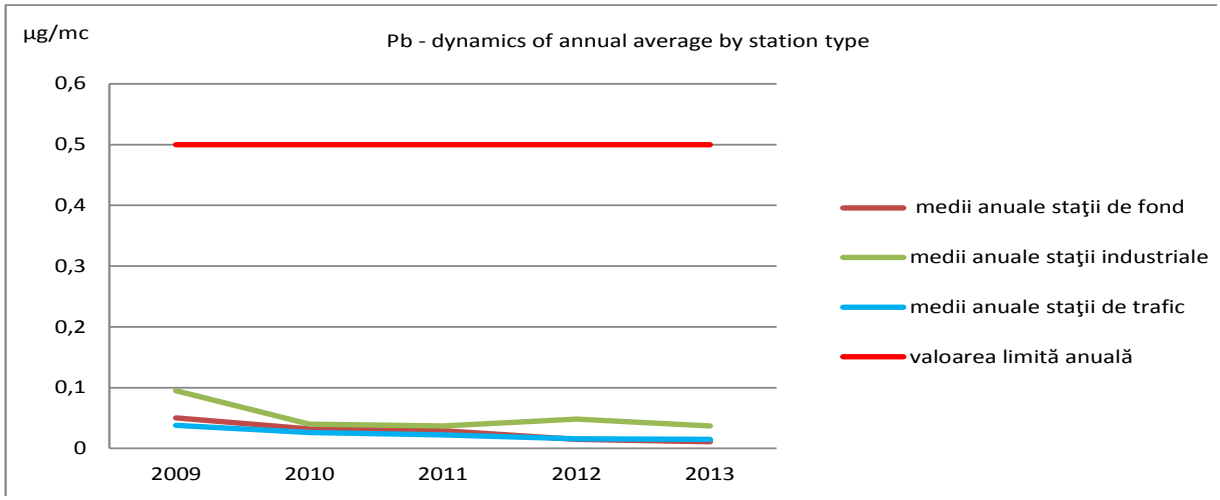
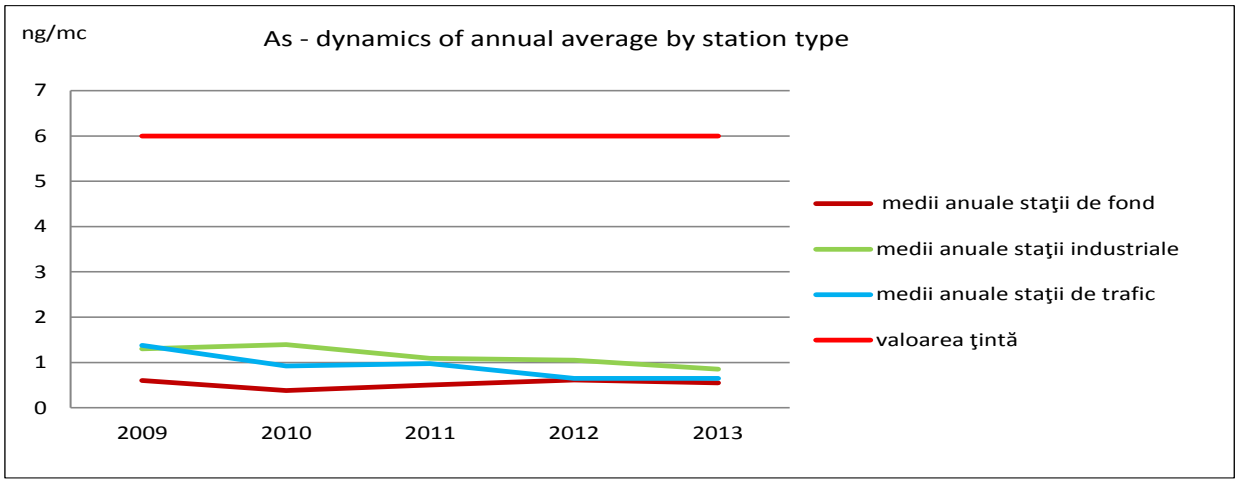


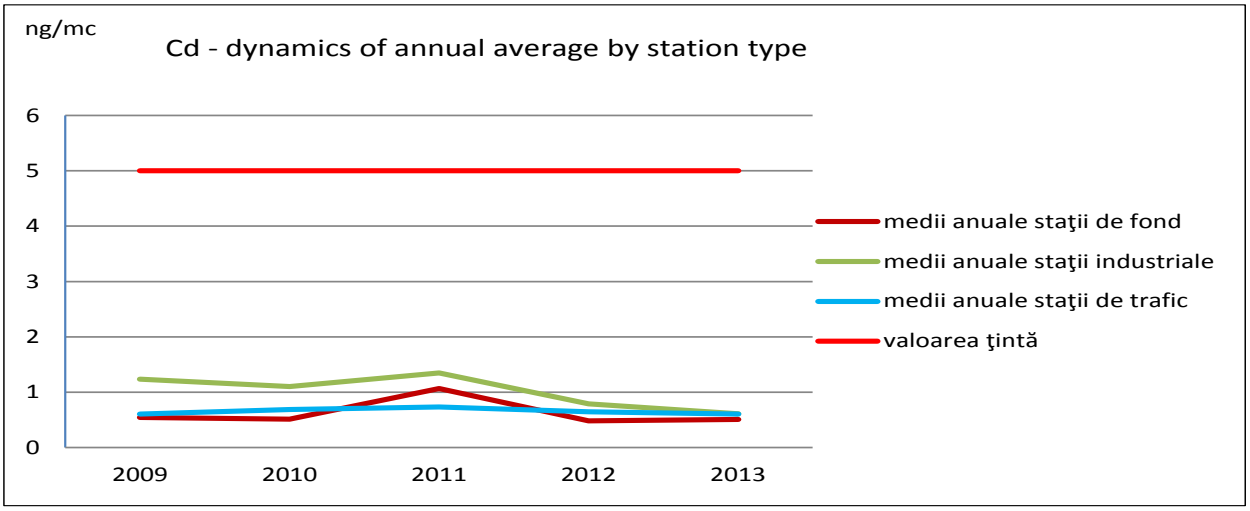
Figura 2.6.8 *Pb - Dinamica mediilor anuale 2009-2013*



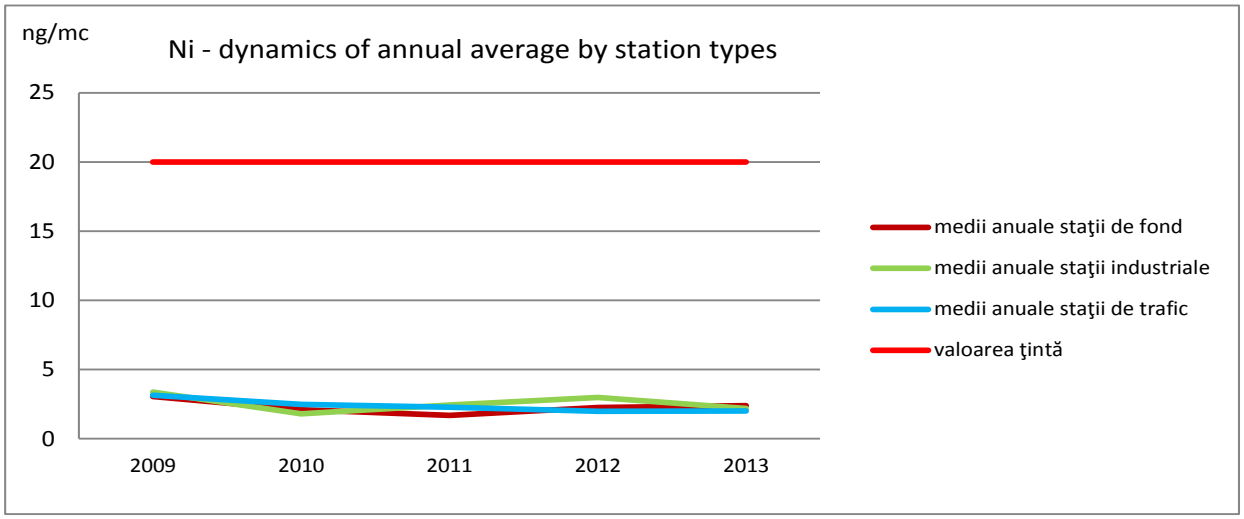
Graph 2.6.9 *As - Dynamics of annual averages 2009-2013*



Graph 2.6.10 *Cd - Dynamics of annual averages 2009-2013*



Graph 2.6.11 *Ni – Dynamics of annual averages 2009-2013*



As shown in the graphs above, during 2008-2013, 2009-2013 respectively, the general trend for annual averages is decreasing for all major pollutants at all stations, which is below the limit values/target annual values corresponding for the pollutants that have provided such values.

3. WATER

2013 - "International Year of Water Cooperation"

According to the Resolution adopted by the General Assembly of the United Nations, 2013 was named "International Year of Water Cooperation". The topic considered the uneven and slow progress in achieving the target of halving the proportion of people without access to basic systems of water supply and sanitation, and that global climate change can seriously affect water quantity and quality. Thus, 2013 was meant as a plea for peace, sustainable and equitable management of water resources of the states by strengthening the dialogue and international cooperation. In this context, Romania has given great importance to regional cooperation, especially cooperation in the Danube Basin and the Black Sea and at European level. With regard to the bilateral cooperation with the neighbouring countries namely: Moldova, Ukraine, Hungary, Bulgaria and Serbia this focused on the following areas: protection and sustainable use of water, flood risk management, cross-border water quality, data exchange and information.

Nationally, Romania's water resources are relatively poor and unevenly distributed in time and space. These total in theory about 134.6 billion cubic meters, being formed by the surface waters, respectively rivers, lakes, the Danube River and groundwater, of which the usable resource, according to the degree of arrangement of hydrographic basins, is about 40 billion cubic meters. The water demand in Romania decreased in 2013 to 7.48 billion cubic meters, representing less than half than in 1990, namely 20.4 billion cubic meters of water. It can be stated that since 2001 the water demand decreased by almost half compared to 1990. The largest decrease was recorded in industry, from 9.06 billion cubic meters to 4.91 billion cubic meters of water as it is in 2013. Thus, compared to 1990, the water demand in Romania decreased by 12.92 billion cubic meters from 20.4 billion cubic meters to 7.48 billion cubic meters of water in 2013, being broken down by three categories of such users: population - 1.16 billion cubic meters of water (16%), agriculture - 1.41 billion cubic meters of water (19%) and 4.91 billion cubic meters of water (66%) for the industrial sector. Compared to the water demand in 2013, which was of 7.48 billion cubic meters, the volume of water sampled (used) was of 6.59 billion cubic meters, decreasing by 11 billion cubic meters of water compared to 1990, when the volume of water was of 17.51 billion cubic meters of water. Broken down by three categories of users (population, industry, agriculture), the most dramatic decrease in the volume of water sampled was recorded in the agricultural sector, which dropped from 6.93 billion cubic meters of water (in 1990) to 1.07 billion cubic meters of water (as it was in 2013). The industrial sector consumed 4.55 billion cubic meters in 2013, representing 92.67% of water usage for this sector. *(Statistics conducted according to data provided by the National Administration "Romanian Waters").*

3.1 WATER RESOURCES, QUANTITIES AND FLOWS

Romania's water resources are made of the surface waters - streams, lakes, the Danube River - and of the underground waters. The potential and technically usable water resources for year 2013 (Water Balance – Requirements for year 2013) is shown in Table 3.1.1.

Tabel 3.1.1 *The potential and technically usable water resources for 2013*

Water Source / characterization indicator	**Total thousands m³.**
A. Inner streams	
1. Theoretical resource	40.000.000
2. Existing resource according to the facility degree of the hydrographic basins*	13.679.121
3. The water demand of the utilities, according to the operational intake capacities	3.373.794
B. Danube (directly)	
1. Theoretical resource (in the section where it enters the country)**	85.000.000
2. Usable resource in the current facility regime	20.000.000
3. The water demand of the utilities, according to the operational intake capacities ***	3.430.580
C. Underground	
1. Theoretical resource, of which:	9.600.000
-ground waters	*4.700.000*
-internal waters	*4.900.000*
2. Usable resource	4.667.639

Water Source / characterization indicator	Total thousands m³.
3. The water demand of the utilities, according to the operational intake capacities	665.615
D. Black Sea	
The water demand of the utilities, according to the operational intake capacities	9.027
Total resources	
1. Theoretical resource	134.600.000
2. Existing resource according to degree of the hydrographic basins	38.346.760
3. The water demand of the utilities, according to the operational intake capacities	7.479.016

Source: „Romanian Waters" National Administration

Note **Contains also the lakes from the seaside, as well as the resource ensured by direct external reuse along the river.*
*** ½ of the average annual discharge, into the country*
**** including volumes transferred into the Seaside Basin*

Compared to the current population of the country, it results:

- a specific source, usable in natural condition, of approx. 2660 m³/inhabitant and year, taking into account also the share of the Danube;
- a specific, theoretical resource, of approx. 1770 m³/ inhabitant and year, taking into account the intake of the interior rivers, placing this country in terms of water resources on the category of countries with relatively low resources compared with other countries.

Inner rivers *are the main water resource of Romania.* A basic characteristic of this water resource category consists in a higher variability in space: •mountains, bringing half the volume drained •the specific average flow varies from 1 l/s and km² in low areas, to 40 l/s and km² in high areas. Another feature is represented by the very pronounced variability over time, so spring determines important floods, causing major flowing followed by droughts. **The Danube**, the second longest river in Europe (with a length of 2,850 km, out of which 1,075 km on Romania's territory) has an average stock at the point where it enters the country of 174x 10^9 m3.

Groundwater resources consist of existing water storages in groundwater aquifers and deep layers. The repartition of the underground leaking varies on the country's great tectonic units as follows:

- 0.5 -1 L/s and km $^{2\ in}$ North Dobrudja;
- 0,5 - 2 l/s and km² in Moldavian Plateau;
- 0,1 - 3 l/s and km² in Transylvanian Depression and Pannonic Depression;
- 0,1 - 5 l/s and km² in North Dobrudja and Danube Platform;
- 5 - 20 l/s and km² in Carpathian area, especially in the Meridional Carpathians and in the Karst areas in Jiu and Cerna basins

Water samplings

In 2013 the total raw water samples represented 6,59 billion *m³ of which:*

- population – 0,97 billion m³
- industry - 4,55 billion m³.
- agriculture - 1,07 billion m³.

Water samples decreased from 10,3 billion m³ in 1995, to 6,59 billion m³ in 2013, because of:

- reduction of industrial activity;
- reducing water consumption in technological processes;
- reducing losses;
- application of the economic mechanism in water management.

For 2013, the requirement/sampling ratio for water resources is presented in Table 3.1.2.

Table 3.1.2 *The requirement/sampling ratio for water resources is presented in 2013*

Water demand		***Water samplings***		***Degree of use***
Activity	*Value/ (billion m ³)*	*Activity*	*Value/(billion m ³)*	*%*
Population	1,16	Population	0,97	83,62
Industry	4,91	Industry	4,55	92,67
Agriculture	1,41	Agriculture	1,07	75,89
Total	**7,48**	**Total**	**6,59**	**88,10**

Sursa: Administrația Națională Apele Române

Table 3.1.2 it is noted that the utilization of water resources and the share of water requirement for utilities (*according to the capture capacity in operation*) is of 88.10% of the total annual volume of water sampled.

3.2. SURFACE WATERS

In Romania, the surface waters are the main source for human needs, including drinking water and the evaluation of the quality of surface waters, *based on biological, chemical and hydromorphological elements*, is made in accordance with the *Water Framework Directive 2000/60/CEE*, *transposed into Romanian legislation by Law no. 310/2004,* per water body, which is the basic element that is used for establishing, reporting and verifying the achieving of the environmental objectives of the Water Framework Directive. "*Surface water body*" means a discrete and significant element of surface water such as: river, lake, canal, river sector, sector channel, transitional waters, part of coastal waters.

The evaluation of the ecological condition for the surface water categories takes into account 5 quality states, respectively: very good, good, moderate, poor and bad, with the correspondent colour code (blue, green, yellow, orange and red). The environmental objective for surface water body is considered to be achieved when the water body falls into the good ecological status or good ecological potential, respectively.

The quality elements analysed to assess the ecological status / ecological potential of surface water bodies are:

- *Biological elements*: aquatic flora - phytoplankton and phytobentos; macrozoobentos (composition and abundance of benthic invertebrate fauna); fish fauna (composition, abundance and age structure);
- *Physical and chemical support elements*: thermal conditions: water temperature; oxygenation conditions: dissolved oxygen, CBO_5 ,CCO-Cr; acidification status: pH; nutrient conditions: $N\text{-}NO_3$, $N\text{-}NO_2$, $N\text{-}NH_4$, $P\text{-}PO_4$, P_{total} , salinity conditions ;
- *Specific pollutants* – other substances identified as being discharged in significant quantities in water bodies Cu, Zn, As, Cr, xylenes, PCBs, toluene, acenaphthene and phenols.

In 2013 assessment of the ecological status / ecological potential of water courses was based on the results obtained in the monitoring sections and by applying the evaluation methodologies that comply with the Water Framework Directive 2000/60 / EC. *In 2013 were monitored and evaluated in terms of ecological status / ecological potential a total of* ***908 water bodies*** *(of which for 8.37% of water bodies was assessed the status / potential only in terms of physical-chemical elements) with a total length of* ***31,892.6 km****,.*

Surface water radioactivity data are presented in Chapter 8 "ENVIRONMENT, HEALTH AND QUALITY OF LIFE" section 8.6.1.2 "Water Radioactivity" within the " Standard National Program on monitoring the radioactivity of environmental factors ".

3.2.1. ECOLOGICAL CONDITION/POTENTIAL OF WATER COURSES ON HYDROGRAPHIC BASINS

The following presents the status of watercourses monitored and evaluated, in 2013, in terms of ecological status / ecological potential, on river basins. *(Source: "Romanian Waters" National Administration).*

Tisa hydrographic basin

The ecological condition of surface water bodies –rivers monitored in Tisa Hydrographic Basin

Based on the principle of monitoring, 16 natural water bodies – rivers, within the Tisa hydrographic basin - rivers totalling 989 km, were evaluated. From the total length of 989 km monitored, 914 km (92.42%) were in a good ecological condition, 49 km (4.95%) in moderate ecological condition and 26 km (2.63%) in bad ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Tisa hydrographic basin. Within the Tisa hydrographic basin, 2 highly modified water bodies were evaluated - rivers totalling a number of 104 km. The assessment revealed that the 2 highly modified water bodies in Tisa hydrographic basin – 104 km – reached the quality target regarding the good ecological potential.

Someş hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Someş hydrographic basin. Within the Somes hydrographic basin, 42 natural water bodies were evaluated - rivers totalling a number of 2,394,36 km. From the total length of 2,394,36 km monitored for ecological condition, 1.599 km (66,78%) were in a good ecological condition, 785 km (32,79%) in a moderate ecological condition and 10 km (0,42%) were in a bad ecological state.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Somes hydrographic basin. Within the Somes hydrographic basin, 5 highly modified water bodies were evaluated - rivers totalling a number of 302 km. Of the 302 km monitored for ecological potential, 738 km (12,58%) were in a good ecological potential and 264 km (87,42%) in a moderate ecologic potential.

Cris rivers hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Cris hydrographic basin. Within the Cris hydrographic basin, 52 natural water bodies were evaluated from an ecological point of view - rivers totalling a number of 1.399,13 km. From the total length of 1.399,13 km monitored for ecological condition, 1011,47 km (72,29%) were in a good ecological condition and 387,66 km (27,71%) in a moderate ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Cris hydrographic basin. Within the Cris hydrographic basin, 8 highly modified water bodies were evaluated - rivers totalling a number of 258.66 km. Of the 258.66 km monitored for ecological potential, 243,54 km (94,15 %) were in a good ecological potential and 15,12 km (5,85 %) in a moderate ecologic potential.

Mures hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Mures hydrographic basin. Within the Mures hydrographic basin, 41 natural water bodies were evaluated from an ecological point of view - rivers totalling a number of 1.489,08 km, the distribution on lengths in relation to the ecological condition being as follows: 1.170,07 km (78,58 %) were in a good ecological condition, 251,91 km (16,91%) in a moderate ecological condition and 67,10 km (4,51 %) were in bad ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Mures hydrographic basin. Within the Mures hydrographic basin, 55 water bodies highly modified were evaluated - rivers totalling a number of 1.998,94 km. Of the 1.998,94 km monitored for ecological potential, the distribution on lengths in relation to the ecological condition being as follows: 1.509,06 km (75,49 %) were in a good ecological potential (FEB) and 489,88 km (24,51 %) in a moderate ecologic potential (PEM_O).

The ecological potential of the highly modified artificial surface water bodies - monitored in the Mures hydrographic basin. Within the Mures hydrographic basin, 5 artificial water bodies were evaluated - rivers totalling a number of 147,60 km. Of the 147,60 km monitored for ecological potential, the distribution on lengths in relation to the ecological condition being as follows: 51,02 km (34,57 %) were in a good ecological potential and 96,58 km (65,43 %) in a moderate ecologic potential.

Aranca hydrographic basin

In 2013, the basin Aranca was assessed using monitoring data from 1 water body in the category of rivers - heavily modified water body (Aranca + tributaries), with a length of 126.82 km, water body categorised as moderate ecological potential class.

Bega – Timiş – Caraş hydrographic basins

Ecological condition of natural bodies of surface water - rivers monitored in the Bega – Timiş – Caraş Basins. In Bega – Timiş - Caraş hydrographic basins, 30 natural water bodies were evaluated – rivers, in total 1.105,60 km. Of the 1.105,60 km monitored for ecological potential, the distribution on lengths in relation to the ecological condition being as follows: 1.019,15 km (92,18 %) in good ecological condition and 86,45 km (7,82 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Bega – Timiş – Caraş hydrographic basin. Within the Bega – Timiş - Caraş hydrographic basin, 15 highly modified water bodies were evaluated - rivers totalling a number of 563,95 km, the distribution on lengths in relation to the ecological condition being as follows: 257,551 km (45,67 %) were in a good ecological potential (FEB) and 306,395 km (54,33 %) in a moderate ecologic potential (PEM_O).

The ecological potential of the highly modified artificial surface water bodies - monitored in the Bega – Timiş – Caraş Basins. Within the Bega – Timiş - Caraş hydrographic basin, 1 artificial water body (CAA) with a length of 43.98 km, was evaluated. From the point of view of ecological potential, all the 43.98 km (100%) fit the moderate ecological potential.

Nera - Cerna hydrographic basins

Ecological condition of natural bodies of surface water - rivers monitored in the Nera - Cerna hydrographic basins. Within the Nera - Cerna hydrographic basins, 10 natural water bodies were evaluated based on monitoring data – rivers, with a length of 545,611 km. The assessment indicated that all 545,611 km were in a good ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Nera - Cerna hydrographic basins. Within the Nera - Cerna hydrographic basins, 3 water bodies highly modified were evaluated, totalling a number of 45.51 km. Of the 45.51 km monitored for ecological potential, the distribution was as follows: 39.63 km (87.08%) had in a good ecological potential and 5.88 km (12.92%) in a moderate ecologic potential.

Jiu hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Jiu hydrographic basin. Within the Jiu hydrographic basin, 40 natural water bodies were evaluated based on monitoring the biological and support elements – rivers, with a length of 1.251,7 km. Of the 1.251,7 km monitored for ecological condition, the distribution on lengths in relation to the ecological condition is as follows: 863,1 km (68,95%) in good ecological condition and 388,6 km (31,05%) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Jiu hydrographic basin. Within the Jiu hydrographic basin, 1 water body highly modified was evaluated, in the river category, 9 km in length. The assessment indicated that all 9 km fit the moderate ecological potential (PEM_O).

Olt hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Olt hydrographic basin. Within the Olt hydrographic basin, 73 water bodies were evaluated – rivers, by monitoring the biological and support elements, totalling 2.153 km. For the 2.153 km, the distribution on lengths in relation to the ecological condition is as follows: 1.559 km (72,41%) in good ecological condition and 594 km (27,59%) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Olt hydrographic basin. Within the Olt hydrographic basin, 12 water bodies highly modified were evaluated, based on monitoring the biological and support elements – rivers, with a length of 533,5 km, the

distribution on lengths in relation to the ecological condition is as follows: 181,50 km (34,02 %) in good ecologic potential and 352 km (65,98 %) in moderate ecological potential.

The ecological potential of the artificial surface water bodies - monitored in the Olt hydrographic basin. Within the Olt hydrographic basin, 2 artificial water bodies were delimited – in length of 42 km, which both fit the moderate ecological potential following the 2013 assessment.

Arges hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Arges hydrographic basin. Within the Arges hydrographic basin, 49 natural water bodies were evaluated – rivers, by ecological monitoring - rivers, totalling 1.693,28 km. For the 1.693,28 km, the distribution on lengths in relation to the ecological condition is as follows: 1.251,05 km (73,88 %)in good ecological condition and 442,23 km (26,12%) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Arges hydrographic basin. Within the Arges hydrographic basin, 9 highly modified water bodies were evaluated, based on monitoring of the ecologic potential – rivers, with a length of 323,4 km, of which: 52,50 km (16,23 %) were in a good ecological potential and 270,9 km (83,77 %) in moderate ecological potential.

The ecological potential of the artificial surface water bodies - monitored in the Arges hydrographic basin. Within the Arges hydrographic basin, in 2013, 2 artificial water bodies were monitored – in total, a length of 24.66 km, both bodies with a the good ecological potential.

Vedea hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Vedea hydrographic basin. Within the Vedea hydrographic basin, 16 natural water bodies were evaluated – rivers, by ecological monitoring - totalling 819.33 km for which the distribution is as follows: 130,58 km (15,57%) in good ecological condition and 707,88 km (84,43 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Vedea hydrographic basin. Within the Vedea hydrographic basin, 2 highly modified water bodies were evaluated, based on monitoring data, in total of 78,7 km, which were in the moderate ecological potential.

Ialomita hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Ialomita hydrographic basin. Within the Ialomita hydrographic basin, 26 water bodies were evaluated – rivers, by ecological monitoring – over a length of 1.038,00 km, for which the distribution is as follows: 605,00 km (58,29%) in good ecological condition and 433,00 km (41,71 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies (CAPM) - rivers monitored in the Ialomita hydrographic basin. Within the Ialomita hydrographic basin, 2 water bodies highly modified were evaluated, based on monitoring of the ecologic potential – rivers, with a length of 67.00 km. Based on monitoring data, all 67 km met the moderate ecological potential.

The ecological potential of the artificial surface water bodies - monitored in the Ialomita hydrographic basin. Within the Ialomita hydrographic basin, 2 artificial water bodies, in total length of 12.1 lm, were monitored. Based on monitoring data, all the 12.1 km met the moderate ecological potential.

Siret hydrographic basin

Siret hydrographic basin contains: the proper Siret hydrographic basin, Barlad hydrographic sub-basin and Buzau hydrographic sub-basin

The proper Siret hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Siret hydrographic basin (proper). Within the Siret hydrographic basin, 51 water bodies were evaluated – rivers, over a length of 4.195,87 km. For the 4.195,87 km, the distribution on lengths in relation to the ecological condition, is as follows: 3.334,95 km (79,48 %) in good ecological condition and 860,92 km (20,52 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Siret hydrographic basin (proper). Within the Siret hydrographic basin, 5 highly modified water bodies (CAPM) were evaluated, based on monitoring of biological and support elements – rivers, with a total length of 120.56 km. The distribution of the 120.56 km of CAPM – assessed rivers, is as follows: 18.17 km (15.08%) with good ecological potential and 102.39 km (84.92%) in moderate ecological potential.

Barlad hydrographic sub-basin

Ecological condition of natural bodies of surface water - rivers monitored in the Barlad hydrographic sub-basin. Within the Barlad hydrographic sub-basin, 6 natural water bodies were evaluated, based on monitoring data – rivers, over a length of 374.8 km. For the 374.8 km, the distribution on lengths in relation to the ecological condition is as follows: 122,87 km (32,78 %) in good ecological condition and 251,95 km (67,22 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Barlad hydrographic sub-basin. Within the Barlad hydrographic sub-basin, 2 highly modified water bodies were evaluated and monitored from an ecological potential – rivers, over a length of 214.6 km. All the 214.6 km met the moderate ecological potential.

Buzau hydrographic sub-basin

Ecological condition of natural bodies of surface water - rivers monitored in the Buzau hydrographic sub-basin. Within the Buzau hydrographic sub-basin, 14 water bodies were evaluated, based on monitoring data from an ecological point of view – rivers, over a length of 585.5 km, distributed as follows: 244.5 km (40,78 %) in good ecological condition and 355,0 km (59,22 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Buzau hydrographic sub-basin. Within the Buzau hydrographic sub-basin, the 2 highly modified water bodies – rivers, were assessed only from the point of view of support physical and chemical elements over a length of 47 km. All the 47 km met the moderate potential.

Prut hydrographic basin

Ecological condition of natural bodies of surface water - rivers monitored in the Prut hydrographic basin. Within the Prut hydrographic basin, 8 natural water bodies were evaluated – rivers, totalling 536,05 km. For the 536,05 km, the distribution on lengths in relation to the ecological condition is as follows: 218,36 km (40,74 %) in good ecological condition and 317,67 km (52,26 %) in moderate ecological condition.

The ecological potential of the highly modified surface water bodies - rivers monitored in the Prut hydrographic basin. Within the Prut hydrographic basin, 6 highly modified water bodies were evaluated, from an ecological standpoint – rivers, in length of 628.12 km. Following the evaluation of the data obtained, the distribution of the ecological potential was as follows: 510.90 km (81.34%) were classified as good ecological potential and 117.22 km (18.66%) in moderate ecological potential.

The ecological potential of the artificial surface water bodies - monitored in the Prut hydrographic basin. Within the Prut hydrographic basin, 2 artificial water bodies were monitored and assessed, accounting for113.96 km. Following the evaluation, the 113.96 km were within the moderate ecological potential.

The Danube hydrographic basin

Within the Danube hydrographic basin, a total number of 28 water bodies-rivers, were assessed based on monitoring (apart from the water bodies located on the main course of the river Danube and on its 3 main branches).

The ecological condition of the surface water bodies – rivers monitored in the Danube Hydrographic Basin. The distribution of the 766,6 km monitored and assessed in regard to the ecological condition is as follows: 67,85 km (8,85%) in good ecological condition, 616,48 km (80,4%) in moderate ecological condition and 82,27 km (10,73%) in bad ecological condition.

The ecological potential of the surface water bodies – heavily modified and artificial in the Danube Hydrographic Basin. The around 241,6 km monitored and assessed in regard to the ecological potential met the moderate ecological potential.

The Seaside Hydrographic Basin

Within the Seaside Hydrographic Basin**,** a total number of 14 surface water bodies, rivers, were identified and assessed by monitoring (apart from the transitory and coastal ones).

The ecological condition of the surface water bodies – rivers monitored in the Seaside Hydrographic Basin. Within the Seaside Hydrographic Basin, 12 natural water bodies - rivers were monitored and assessed in regard to the ecological condition, based on monitoring data. The total of rivers is 295.6 km. The distribution of the 295.6 km, in relation to their ecological condition, is as follows: 159.6 km (53,99 %) in good ecological condition and 136 km (46,01 %) in moderate ecological condition.

The ecological potential of the surface water bodies – heavily modified and artificial in the Seaside Hydrographic Basin. In this basin, 2 artificial water bodies – rivers (CAA), were assessed, in total length of 64.41 km. Based on these results, the two artificial water bodies monitored were classified in good ecological potential (100.00%) in moderate ecological potential.

The River Danube

Along the major course of the Danube River, administered by WBA Jiu and WBA Dobrogea – Litoral, a total number of 7 water bodies were identified and evaluated (4 water bodies on the main course and 3 water bodies on the 3 branches, all with a monitored total length of 1,260 km). The 7 water bodies were designated as being: 2 natural water bodies and 5 highly modified water bodies.

On the main course of the Danube were identified and evaluated **2 natural water bodies, Chilia and Sf. Gheorghe**. The evaluation of the data obtained revealed that the total monitored length of 190 km was in good ecological condition.

On the main course of the Danube were identified, monitored and evaluated five heavily modified water bodies. The ecological potential was evaluated for a total of **1070.5 km** of which **455.5 km** (42.55%) were classified **in good ecological potential** and **615.00 km** (57.45%) **in moderate ecological potential.**

The data of interest from the point of view of the environmental protection on the Black Sea are presented in Chapter 5 NATURE PROTECTION AND BIODIVERSITY, section 5.4. "Marine and Coastal Environment"

3.2.2 THE QUALITY OF THE LAKE WATER IN ROMANIA

The data centralized in table no. 3.2.2-1 presents the evaluation of main natural water bodies – natural lakes in Romania in the year 2013, based on ecological conditions and hydrographic basins.

Table 3.2.2-1: *Assessment of water bodies - natural lakes -depending on ecological conditions and hydrographic basins in 2013*

Hydrographic Basins	Reach the environmental objective	Do not reach the environmental objective			Total WB - natural lakes
	Very good / Good	Moderate	Poor	Bad	
Tisa	1	0	0	0	**1**
Someş	1	1	0	0	**2**
Mureş	3	0	0	0	**3**
Jiu	0	1	0	0	**1**
Olt	1	1	0	0	**2**
Argeş	0	1	0	0	**1**
Buzău	0	4	0	0	**4**
Ialomiţa	0	7	0	0	**7**
Siret	1	3	0	0	**4**
Prut	0	2	0	0	**2**
Dunăre	4	12	0	1	**17**
Litoral*	1	8	0	1	**10**
TOTAL	**12**	**40**	**0**	**2**	**54**

**includes the Sinoe lacustrine transient lake (bad ecological condition)*

Source: "Romanian Waters" National Administration

The large number of natural lakes which do not reach the quality objective, is caused mainly by the **eutrophication** process, a process encouraged by the following:

- The majority of the monitored natural lakes are located in the plain area, have shallow depths (about 3-7m) which in the summer period, improves the rapid development of algae, in particular that of the cyanofites;
- agricultural activities are carried out around these lakes, fact that can lead to enriching water by nutrients;
- population and intensive breeding of fish;
- the influence of recreational areas in close proximity thereto;
- the ageing of the lake, which is a natural phenomenon.

The data centralized in table no. 3.2.2-2 presents the evaluation of the main heavily modified water bodies - lakes in Romania for the year 2013, made depending on ecological potential classes and hydrographic basins.

Table 3.2.2.-2 Assessment of the ecological potential of heavily modified water bodies – accumulation lakes, on hydrographic basins, in 2013

Hydrographic basin	Reach the environmental objective	Do not reach the environmental objective	Total Water Bodies (accumulation lakes)
	Maximum / Good	*Moderate*	
Tisa	1	0	**1**
Someş	4	5	**9**
Crişuri **	5	3	**8**
Mureş	6	4	**10**
Bega – Timiş - Caraş	5	1	**6**
Nera-Cerna	2	0	**2**
Jiu	4	2	**6**
Olt	6	3	**9**
Argeş	7	8	**15**
Vedea	0	1	**1**
Buzău	2	0	**2**
Ialomiţa	4	2	**6**

Hydrographic basin	Reach the environmental objective	Do not reach the environmental objective	Total Water Bodies (accumulation lakes)
	Maximum / Good	*Moderate*	
Siret	10	2	**12**
Prut	1	9	**10**
Bârlad	4	3	**7**
Dunăre	1	7	**8**
Litoral	-	-	**-**
TOTAL	**62**	**50**	**112**

*** Includes the artificial lake Ghioroc*

Source: "Romanian Waters" National Administration

3.2.3. NITRATES AND PHOSPHATES IN RIVERS AND LAKES

Nitrates and phosphates are evaluated qualitatively in the "*Nutrients*" group. Nutrients are chemical elements and their compounds that are found in the environment, of which the plants and animals need to grow, or even survive. The presence of nutrients in water, soil and subsoil is normal; pollution represents the load with nutritive substances of environmental factors over the concentrations determined by the functioning mechanisms of ecosystems. In accordance with Directive on urban wastewater treatment and the Water Framework Directive, nutrients include the following physico-chemical elements of nitrogen and phosphorus: $N\text{-}NH_4$, $N\text{-}NO_2$, $N\text{-}NO_3$, $P\text{-}PO_4$, P_{total} ,The ecological condition given by "*nutrients*" is obtained by applying the "*worst case*" principle.

In terms of pollution, the interesting nutrients are the various forms of nitrogen and phosphorus (nitrates, nitrites, ammonia, organic nitrogen from plant debris or other organic compounds and phosphates). Excess nutrients, whatever the source may be, come by washing or infiltration into groundwater, rivers, lakes and seas. By boiling, the nitrate concentration in water increases, and purification filters do not absorb nitrates.

Naturally, nitrates (NO_3) and phosphate (PO_4) from waters come from aquatic animal manure (mainly fish), from the soil forming lacustrine basin or aquifer specific organic matter decomposition. Excess phosphates and nitrates come from human activities, namely the human waste and various industrial and agricultural sources (fertilizers and animal manure).

Presence of large quantities of nutrients in waste waters causes rivers and lakes contamination that are subject to eutrophication manifested through an accelerated increase of algae and other superior vegetable forms, the so called "*algal blooming*" process, which leads to an unwanted disturbance of the balance of organisms present in the water and on the water quality. The depletion of the water oxygen content results in the death and decomposition of the whole zooplankton mass. Without oxygen, the water becomes the place of fermentation and putrefaction processes.

Another important consequence and with dangerous effects on human health is the presence of nitrates, nitrites, in the drinking water. These compounds of nitrogen can cause infants or pregnant women a blood disorder called "*bluetongue disease*" that can seriously affect their health and even put their lives in danger.

Agriculture and livestock causes a significant pollution in groundwater, often cumulative and persistent in water layers. In areas declared vulnerable or susceptible to be vulnerable to pollution by nitrates from agricultural sources is monitored the nitrate content as required by GD no. 964/2000 as amended by GD no. 1360/2005 (published in the Official Gazette no. 526 / 25.10.2000 and no. 1061 / 28.11.2005).

Reported at country level there is a number of 1963 settlements established (and approved by Common Order no. 1552/743/2008 of the Ministry of Environment and Sustainable Development, respectively the Ministry of Agriculture and Rural Development, published in Romania's Official Gazette no. 851/18th of December, 2008), as areas vulnerable to nitrate pollution, distributed in the 8 economic development regions. The above mentioned order provides for revision of the areas vulnerable to nitrates from agricultural sources, at the level of the agricultural cadastre and elaboration of the maps with these areas.

In order to *reduce the potential of nitrate pollution in vulnerable areas the following measures are required:*

- use of specific methods of sustainable agriculture and biological systems: fertilization plans that comply with the implementation norms and the conditions of use of fertilizers on sloping lands, water saturated, flooded or covered with snow lands; crop rotation. Permanent leguminous crops (but also annual) are

preferred to improve the nitrogen balance in the soil, the use of residual organic material from the animal breeding (preferably of the solid composted ones) in combination with mineral fertilizers to provide nutrients for the crop and for the conservation of soil fertility. Doses of fertilizer to be applied are based on calculations of balance of nutrients in the soil to avoid overdose, especially for nitrogen, both to reduce production costs and environmental pollution;

- waste storage must comply with certain rules, in order to minimize pollution, storing them outside of sensitive areas and away from water sources;

Currently, for the prevention of nitrates pollution, at the level of the town halls in the rural areas of the country, "Action programs for protecting waters against pollution caused by nitrates from agricultural sources", in which the agricultural farm management must be oriented according to the principles of the Code of Good Agricultural Practice, are being drawn up. The relevant legislation, drafted by the Ministry of Environment and Agriculture, regulates: the surveillance and reduction monitoring of the intake of pollutants coming from agricultural sources, framework program for action for the elaboration of action programs in vulnerable areas to pollution by nitrates from agricultural sources, codes of good agricultural practices on the protection of waters from nitrates from agricultural sources and the best practices in farms. It is found in the following acts: MWEP Order no. 1072/2003 (published in Official Gazette No. 71 / 28.01.2004), Joint Order No. MEWM and MAFRD no. 296/216/2005 (published in the Official Gazette nr.529 / 22.06.2005) Joint Order MAFRD and MEWM no. 1270/1182/2005 (published in the Official Gazette no.224 / 03.13.2005) and the Order of MEWM no. 1234 / 14.11.2006 (published in Official Gazette No. 15 / 10.01.2007).

Nitrates and phosphate were analysed in rivers, but also in lakes and are indicators which contribute to the evaluation of the ecological condition/ecological potential of the surface waste bodies.

Monitoring of the areas vulnerable to nutrients, for the water courses in each county in Romania, is presented in detail in the chapter "Water quality" in each "County report on the state of environment for 2012", in accordance with the data provided to environment protection county agencies by the basin administration of "Romanian Waters" National Administration.

3.2.4. DISSOLVED OXYGEN, ORGANIC MATTER AND AMMONIUM IN THE WATERS OF RIVERS

The dissolved oxygen from water comes from dissolving in the atmosphere air through photosynthesis process. The amount of oxygen that is dissolved in a volume of water depends on temperature, pressure, salinity and the number of aquatic plants in the system. As the temperature, salinity or atmospheric pressure increases, the dissolved oxygen level decreases. Aquatic plants influence the amount of oxygen in the water because during the day these plants produce oxygen through photosynthesis, while at night the same plants consume oxygen. Such problem is encountered often in deltas and shallow lakes during the warm season.

Dissolved oxygen is essential for aquatic fauna and flora, as well as aerobic processes, respectively orifice bacteria that oxidises organic substances and which ultimately determine the water self-purification. Dissolved oxygen concentration varies depending on the category of use, decreasing below a certain limit with the effect of stopping aerobic processes, with very serious consequences. Also, low levels of oxygen in water leads to loss of its freshness, giving it a bland taste and making it non-drinkable, reducing self-purification of natural waters, favouring the persistence of pollution, with the unwanted consequences.

The increase of organic substances from water is synonymous with water pollution with germs that usually accompany these substances. Their presence promotes long persistence of microorganisms, including pathogens.

Indicators that give us information about organic matter in water are chemical consumption of oxygen (CCO) and the biochemical consumption oxygen (CBO5). Biochemical oxygen demand (BOD5) is the amount of oxygen consumed by microorganisms within 5 days for biochemical decomposition of organic substances contained in water. Oxidizable substances in water or chemical oxygen demand (COD) are substances that can oxidise both in cold (inorganic substances) and hot (organic substances) conditions. Oxygen amount equivalent with oxidant consumption is called oxidizability. Normal dissolved oxygen concentration varies between 4-6 mg/dm^3, depending on the category of use, decreasing below a certain limit having as effect the stopping of the aerobic processes, with very serious consequences.

The main indicator of oxygenation status of water bodies is the biochemical oxygen demand (BOD) which is the oxygen requirement of aquatic organisms that consume oxidized organic matter. The indicator shows the current situation and trends in BOD and concentrations of ammonium (NH4) in rivers. The annual BOD average value after 5 days of incubation (BOD5) is expressed in mg O2/l, and the average annual value of total ammonium concentrations in micrograms NH4/l.

CCOCr indicator is the chemical oxygen demand by oxidation with $K_2Cr_2O_7$ in acid medium. This indicator determines generally 60-70% of organic substances, including non-biodegradable substances. The sources of organic matter are the discharges from waste water treatment plants insufficiently treated, industrial effluents and discharges from agriculture. Organic pollution leads to a higher average of metabolic processes that require oxygen. This may result in the development of aquatic areas without oxygen (anaerobic conditions). Nitrogen transformation in reduced form, under anaerobic conditions, leads to increased levels of ammonia which is toxic to aquatic life when it is above certain concentrations, depending on water temperature, salinity and pH.

Organic substances of natural or artificial origin represent for the water the main pollutant. Organic substances of natural origin (plant and animal) consume oxygen from the water both for development and after death. During their decomposition, organic matters consume oxygen from the water more or less depending on the amount of organic matter discharged, causing destruction of fish stock and in general of all aquatic organisms. The most important organic substances of natural origin are oil, tannin, lignin, carbohydrates, marine biotoxins etc. Organic substances - artificial pollutants come from processing various substances in the refinery (gasoline, diesel, oils, organic solvents etc.), organic chemical and petrochemical industry (hydrocarbons, halogenated hydrocarbons, detergents).

The dissolved oxygen, CBO5, CCOCr and the ammonium are indicators which contribute both to the assessment of the ecological condition/potential of the water bodies, as well as to the tracking of the anthropic impact upon the water resources (especially the urban waste water impact). They are presented in detail, for each water course in Romania, in the chapter "Water quality" in each "County report on the state of environment for 2012", in accordance with data provided to county environment protection agencies by the Basinal Administrations of the "Romanian Waters" National Administration.

3.3. GROUND WATERS

THE QUALITY OF PHREATIC WATER AT A NATIONAL LEVEL

The ground water is an important resource due to its physico-chemical and biological quality. Since it is a less visible resource, its assessment is difficult. The study activity on the quality of the ground water is carried out at the level of the major hydrographic basins, in morphological units, and within them, on ground water bodies, through hydrogeological stations, containing one or more observation wells.

In the sense of the Water Framework Directive 2000/60/CE "the ground water body" is a *distinct volume of groundwater from one or more aquifers.* The "aquifer" is named *as a geological rock layer or multiple layers with a sufficient porosity and permeability, thereby to allow either a significant flow of groundwater, either a catchment of significant quantities of ground waters.*

The assessment of the chemical status of ground water bodies was performed in conformity with Water Law 107/1996 amended and supplemented, GD no.53/2009, regarding the protection of ground water against pollution and deterioration and the Order of the Ministry of Environment no.137/2009 which establishes the threshold values for groundwater bodies. For ground water, the following quality statuses were established: good chemical condition, poor local chemical condition and bad condition.

In the year of 2013, for the 139 existent ground water bodies monitored from the total of 142 existing bodies, a number of 1271 monitoring points (wells, springs, drains, fountains) were monitored for the annual preliminary evaluation of chemical condition. The 2 unmonitored ground water bodies in 2013 are situated either in hardly accessible mountain areas or they have a low number of wells bare of water influx.

The 1271 monitoring points are grouped as follows:

- 1153 wells belonging to the national network of hydro-geology
  - 1097 wells
  - 55 springs
  - 1 drain
- 92 wells / drinking water operational well belonging to third parties and pollution monitoring wells located around large industrial platforms
- 26 fountains monitoring nutrient pollution.

By applying the annual preliminary evaluation criteria, the situation of the **140 ground water bodies** in **the year 2012** is as follows:

- 122 bodies are in good chemical status (87.77%)
- 17 ground water bodies are in poor chemical condition (12.23%)

In Table 3.3.1., summarizes ***the classification of groundwater bodies*** for 2013, divided into basins/hydrographic basins, detailing the situation of groundwater bodies identified as being in poor chemical status - number of bodies, designation of the body identified as being in poor chemical status and specifying the chemical indicators whose values exceeded the threshold values that led to the classification of the water body as being in poor chemical condition.

Table 3.3.1: Chemical condition of the ground water bodies in 2013 at the level of Basins / Hydrographic Areas

BASIN /HYDROGRAFIC AREA	*Number of ground water bodies(monitored)*	*Chemical status*		*Slabă Water body in poor chemical status*	*Indicators that trigger the classification as poor chemical status*
		GOOD	*POOR*		
0	**1**	**2**	**3**	**5**	**6**
S.H.SOMEŞ- TISA	14	14	0	-	-
B.H.CRIŞURI	9	9	0	-	-
B.H.MUREŞ	22	20	2	ROMU03	nitrates, ammonium, phosphates
				ROMU20	nitrates
S.H. BANAT	20	18	2	ROBA01	nitrates, phosphates, lead
				ROBA02	nitrates
B.H.JIU	8	6	2	ROJI05	nitrates
				ROJI06	nitrates
B.H.OLT	14	13	1	ROOT08	nitrates
S.H.ARGEŞ-VEDEA	11	10	1	ROAG08	nitrates
S.H. BUZĂU-IALOMIŢA	18	16	2	ROIL06	nitrates, sulphates, chlorides
				ROIL07	sulphates, chlorides
B.H.SIRET	6	6	0	-	-
B.H.PRUT	7	4	3	ROPR04	nitrates, sulphates
				ROPR06	nitrates
				ROPR07	nitrates
S.H.DOBROGEA LITORAL	10	6	4	RODL01	nitrates, ammonium, chlorides
				RODL 04	nitrates, lead
				RODL 09	nitrates
				RODL10	nitrates, lead
TOTAL	**139**	**122**	**17**	-	-

(Source: "Romanian Waters" National Administration)

From the analysis of data obtained from monitoring the physical and chemical parameters in wells located in aquifers is observed that the most exceedances of the threshold values / standards of quality were recorded in the indicators: *nitrates, isolated ammonium chlorides, sulphates, phosphates and lead (Pb).*

With regard to groundwater contamination with ***nitrates,*** concentrations exceeding the permissible for this indicator were recorded for **185 wells** which represent ***14.55%*** of the ***monitored wells***.

Causes for contamination of the groundwater with ***nitrates*** are multiple and are cumulative. The two major sources of nitrate contamination are:

- *permanent washing* of soil impregnated with ***nitrogen compounds*** derived from the application of chemical fertilizers on some categories of arable land by rainfall and irrigation water,
- *discharge of wastewater loaded with nitrates in surface waters*.

In areas where the soil is affected by the application of chemical fertilizers, the concentrations of ***nitrates*** frequently fall around 100 mg NO_3/l (compared to the average standard of max. 50mg/l). Also, exceedances of the quality standard at **nitrates** in the pollution monitoring wells are recorded on current platforms of large chemical plants and the former compounds, but these exceedances are generally local, typically found inside or in adjacent zones but which can constitute a hazard of contamination of aquifers in the area, given the hydrodynamic and hydraulic conductivity of the water.

In 2013 the highest concentrations of nitrates were recorded in:

- *hydrographic area Dobrogea-Litoral, in pollution control wells located on water bodies RODL01, 02, 04.05, 06, 08, 09, 10;*
- *Olt river basin, in ROOT01, 02, 07, 08, 10, 12, 13 water bodies;*
- *Banat hydrographic area, in pollution control wells located on water bodies ROBA01, 02, 03, 05, 18;*
- *Arges-Vedea hydrographic area, in ROAG03, 05, 08, 09, 12 water bodies;*
- *Prut river basin, for groundwater bodies: ROPR02, 03, 04, 06, 07;*
- *Jiu river basin, in wells belonging to ROJI05, 06, 07 water bodies;*
- *Mures river basin, in wells belonging to ROMU03, 07, 20 water bodies;*
- *Ialomita river basin, for ROIL05, 11, 13 water bodies.*
- *Siret river basin, in wells belonging to ROSI03 and 05 water bodies;*
- *Somes-Tisza hydrographic area, in wells belonging to ROSO10 water body;*
- *Crisuri hydrographic area, in wells belonging to ROCO01 water body.*

Of the major polluters that may affect groundwater quality one can mention: *chemicals (fertilizers, pesticides) used in agriculture causing diffuse pollution which is difficult to detect and prevent, household waste and waste from livestock, heavy metals, petroleum products, wastes from industrial processes. Also, the quality of groundwater is affected by pollution due to the lack of correlation between the increase of the production capacity in agriculture and urban development with the modernization of the sewage systems and wastewater treatment plants, improper operation of existing treatment plants, the lack of an organized system for collection, storage and management of waste and sludge resulting from the urban wastewater treatment.*

Phreatic pollution is often an almost irreversible phenomenon with important consequences for the use of underground reserve for water supply for drinking purposes, the depollution of the phreatic water sources being a very difficult process.

3.4. DRINKING AND BATHING WATER

3.4.1. DRINKING WATER

Drinking water is the water intended for human consumption and can be found in:

- any type of water in its natural state or after treatment, used for drinking, for preparing food or for other house purposes, regardless of its origin and whether provided by distribution network, from tank or distributed in bottles or other containers;
- any type of water used as a source in the food industry for manufacturing, processing, preservation or marketing of products or substances intended for human consumption.

Providing people with quality drinking water and in sufficient quantity must be one of the priority directions of state policy and actions in public health. *Data on the effects of polluted water on the health of the human body are presented in Chapter 8 "ENVIRONMENT, HEALTH AND QUALITY OF LIFE" section 8.2.1 "Drinking water".*

Quality of the water supplied in centralised system in areas with more than 5,000 inhabitants or with a distribution volume of over 1,000 m³/day in 2012 *(Source: The National Institute of Public Health)*

The surveillance of drinking water quality in large areas of supply - ZAP (over 5ooo inhabitants or with a volume of distribution of drinking water for over 1000 cm / day) is performed under the provisions of Law on drinking water quality no. 458/2002, republished and GDR nr.974 / 2004 with subsequent amendments.

The national annual report elaborated by INSP - CNMRMC is an integrated part of the triennial progress report (2011-2012-2013) requested by the European Commission, the Ministry of Health being the authority responsible in the field of drinking water quality to the consumer.

Drinking water quality monitoring is carried out both by the County Public Health Departments and Bucharest Public Health Department, through Audit Monitoring and manufacturers / distributors of drinking water that perform the Control Monitoring.

The beneficiaries of the Report are: ZAP large population, Ministry of Health, Ministry of Environment and Climate Change, manufacturers / distributors of drinking water in centralized system, European Commission.

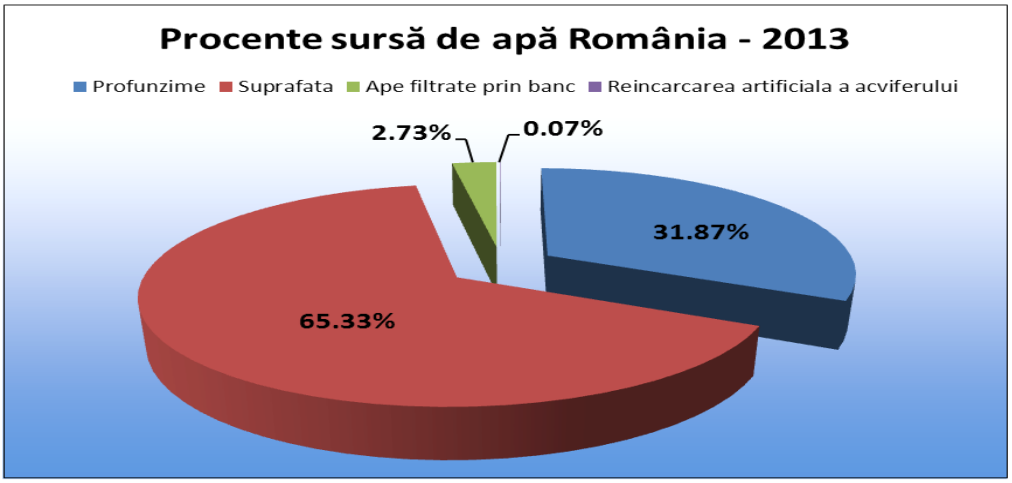
CONTROL MONITORING: The purpose of this monitoring is to provide regular information about organoleptic and microbiological quality of drinking water produced and distributed about the effectiveness of treatment technologies, focusing on disinfection technology in order to determine if the drinking water is adequate or not in terms of the values of the relevant parameters established by Law no. 458/2002 republished. Control Monitoring is carried out by manufacturers / distributors of drinking water in a centralized system. For the control monitoring the following ***parameters*** are required: Aluminium (only where used as coagulant), ammonia, coliform bacteria, color, hydrogen ion concentration (pH), conductivity, free residual chlorine (where chlorine or chlorine substances are used for disinfection), Clostridium perfringens (when the water source is surface water or mixed), Escherichia coli, Iron (only where it is used as coagulant, are determined the ferobacteria in treatment plants where it is done the water deferrisation), Taste, Smell, Nitrites, Oxidisability (is determined if the technical equipment does not allow determination of TOC.), sulphides and hydrogen sulphide (where is practiced water desulphurization), Turbidity, number of colonies developed (at 22^0C and 37^0C). The measuring of TOC (total organic carbon) is only done on supply systems that provide more than 10,000 cubic meters per day.

AUDIT MONITORING: The purpose of audit monitoring is to provide the information necessary to determine whether **for all parameters set by** Law on drinking water quality no. 458/2002, republished **the values are consistent or not**. For audit monitoring **is required to be monitored all parameters required by art. 5** unless the County Public Health Authority respectively Bucharest Public Health Authority have established, based on documents, that, for a determined period of time by them, a certain parameter of a particular drinking water supply system could not be present in such concentrations that lead to the modification of the set value. This paragraph does not apply to the parameters for radioactivity. Audit Monitoring is performed by the County P and Bucharest ublic Health Department.

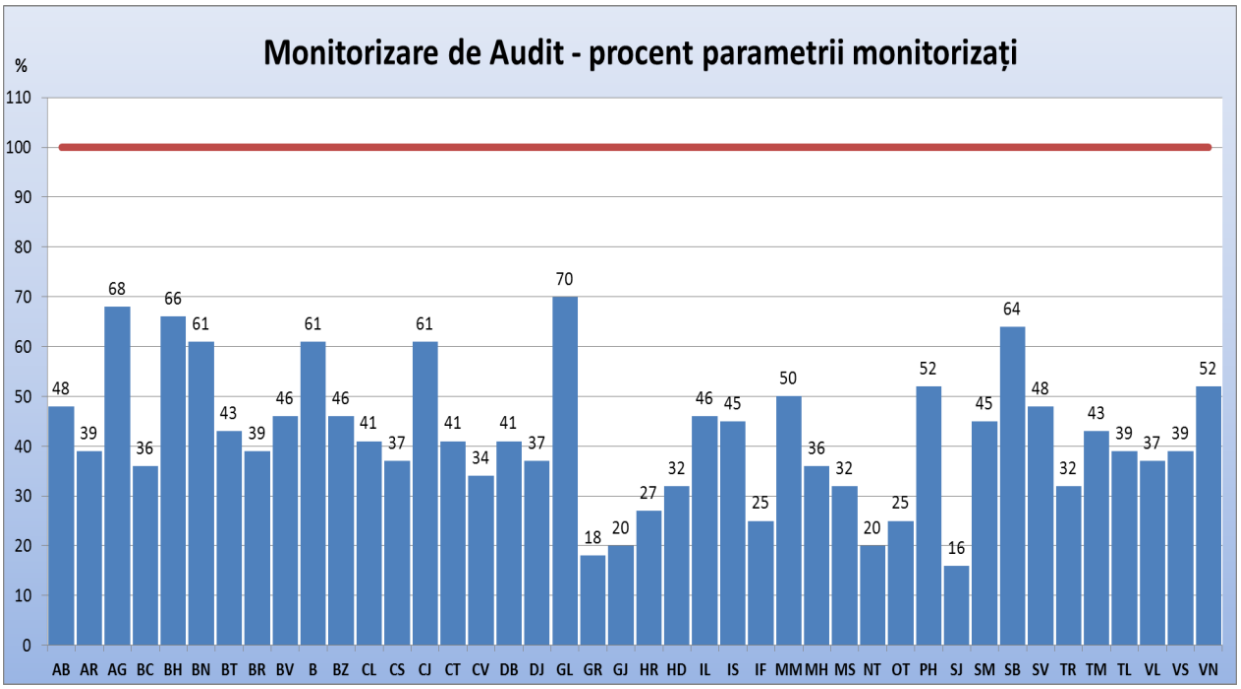
Both audit monitoring and control monitoring is performed according to the Law No.458 / 2002 republished and the Government Decision no. 974/2004 as amended and supplemented. Public Health Departments are required to approve the monitoring plans/schedulse submitted by the water operator at the beginning of the calendar year. Cost analysis for audit monitoring shall be borne by the manufacturer / distributor of drinking water. The frequency of sampling of water shall be determined for both audit and control monitoring as required by law (Law no. 458/2002 republished and Government Decision no. 974/2004 as amended and supplemented.).

In 2013, based on reports made by local Public Health Departments, revealed the following information:

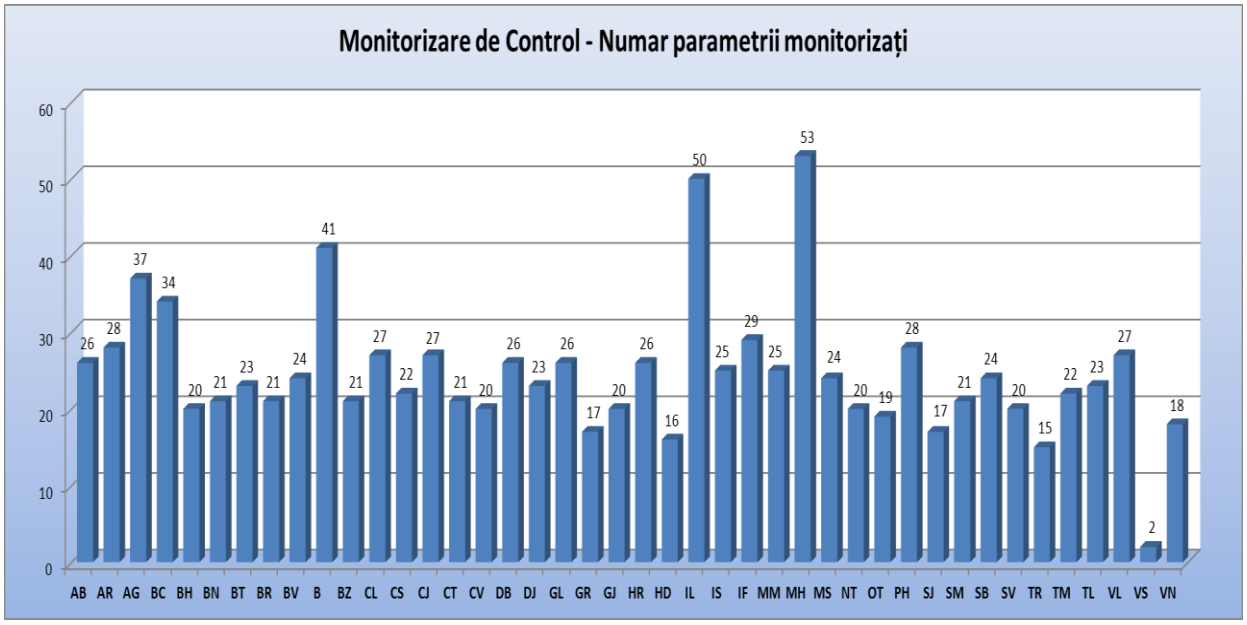
- ***Total population***: 20,400,399 inhabitants.
- ***ZAP large numbers***: 333.
- ***Supplied population in large ZAP***: 10,480,099 inhabitants, representing 51.37% of the total country population.
- ***Total number of microbiological, chemical parameters and indicators that should have been monitored*** according to national legislation and reporting requirements of the European Commission is 73.



(Source: National Institute of Public Health / Ministry of Health)



(Source: National Institute of Public Health / Ministry of Health)



(Source: National Institute of Public Health / Ministry of Health)

3.4.2. BATHING WATER

Bathing water means any type of surface water, running water (river), or stagnant water (lake) sea water inclusively, for which the authorities allow bathing, by organizing the area or by using non-organized areas, but traditionally used by a large number of people. The water in such bathing areas is monitored by the competent local authorities, according to the applicable regulations.

The rules set at EU level in this area regard the monitoring, assessment and management of bathing water quality and providing information on the quality of this water. The objective is twofold: to reduce and prevent pollution of bathing water and to inform Europeans about the extent of its pollution. At European level, the bathing water quality is regulated by Directive 76/160/EEC concerning the quality of bathing waters and Directive 2006/7/EC of the European Parliament and of the Council of 15th February 2006 concerning the management of bathing water quality and cancelling Directive 76 / 160/CEE. Both laws aim to ensure an appropriate quality of bathing water for the conservation and environmental protection and public health

protection in the Member States. It should be noted that Directive 76/160/EEC will be cancelled by Directive 2006/7/EC of 31st December 2014, but will remain applicable in the Member States where the transposition of the new Directive has not been completed, as reviewing legislation on bathing water concerns : consistency with the sixth environmental action programme, the Sustainable Development Strategy and the Water Framework Directive and to simplify the procedures in the light of scientific progress, improving stakeholder involvement and public information.

Directive 2006/7/CEE was transposed into national legislation by Government Decision no. 546/2008 concerning the management of bathing water quality, as amended and supplemented, and subsequent legislation (ex. RGD no. 88/2004 for approving the norms of surveillance, sanitary inspection and control of natural areas used for bathing, with subsequent amendments). In Romania the competent authority for assessing the quality of bathing water is the Ministry of Health, and the Annual Report on Bathing Water Quality is sent to the Commission by 31st December of the year for which the reporting was made.

In the 2013 bathing season (June 1 to September 15) were inventoried 50 natural bathing areas in Romania, for which the territorial Public Health Departments established a monitoring schedule. The list of these areas and the monitoring schedule were posted on the website of the Ministry of Health. In 49 of these areas, the bathing water is marine type and in an area is a freshwater lake.

All natural areas for arranged for bathing reported by Romania to the EC in 2013, for which were performed bathing water analyses, were consistent with regards to the sampling frequency and the measured values with the mandatory values provided in the Romanian legislation in force.

Of the 50 natural areas for bathing reported by Romania to the EC in 2013, for which was performed a bathing water analysis, only 17 (34.70%) were compliant with regards to the sampling frequency and the measured values with the mandatory values provided in the Romanian legislation in force.

At the end of 2013, Public Health Departments (PHDs) in 15 counties reported the existence of 36 bathing areas where bathing was prohibited, given the water quality and the frequency of monitoring that did not comply with the rules in force. Non-conformities observed were discussed by the Territorial Public Health professionals with the decision makers from local administrations and representatives from NARW - ABA in order to take appropriate measures to improve the quality of bathing water, so that these areas can be used for bathing and then reported to the European Commission.

It should be taken into account the goal of continuously improving surface water quality as specialists / responsibles for bathing waters within the EC desire, in a near future, to eliminate the water quality category "satisfactory".

Details on bathing water quality, in summer 2013, can be found in **Chapter 8 - Environment, health and quality of life**, Subchapter 8.2 - Effects of polluted water on health, 8.2.2 - Bathing water, or in the **National Report on Bathing Water Quality, *displayed on the AEM site*.**
(http://www.eea.europa.eu/ro, http://www.eea.europa.eu/themes/water/status-and-monitoring/state-of-bathing-water/state), or the website of the Ministry of Health, National Institute of Public Health,, http://www.ms.ro .

3.5. WASTE WATER

Surface water quality is influenced by wastewater discharges when they are not pre-treated or inadequately treated before discharge into natural emissaries.

In relation to their origin, the waste waters are classified as follows: domestic waste water; *urban waste water* and *industrial waste waters*.

Domestic waste waters are discharged after being used for household needs, by houses and public utility units

Urban waste water are defined as domestic waste water or mixture of domestic waste water with industrial (generally coming from agricultural-food industry) and/or storm waste water - collected by sewerage systems and taken and treated in wastewater treatment plants. Collection, treatment and disposal of urban waste water is regulated by the provisions of Directive 91/271 / EEC as amended.

Industrial waste waters are those discharged after being used in technological processes for obtaining industrial or agro-industrial finished products. . *According to their origin, industrial waste waters are classified as it follows:*

- *cooling waters*, representing the major share (volume) of industrial waste waters; the major pollutant is heat; present in hydropower industry;
- *washing water*, ranked 2 by volume; used in a variety of industries and resulting from the supply water used in order to remove some unwanted materials;
- *process waters* – those used as solvent or reaction environment in the processing of raw materials; they have a relatively low volume, but they are very concentrated;

Untreated wastewater from agglomerations (towns and villages - the most concentrated residential areas) contribute to pollution of surface and groundwater. Pollution is mainly due to the following:

- Low number of people connected to waste water collection and treatment systems;
- Improper operation of the existing treatment stations;
- Improper sludge management from the waste water treatment plants (byproducts of waste water treatment process);
- Development of urban areas without water supply and waste water treatment installations and systems, which results in discharge of non-treated waste water in natural emmisaries, leading to an insufficient protection of the water sources.

The largest impact on surface waters, especially in terms of pollution with organic matter and nutrients (nitrogen and phosphorus) is caused by the 22 large agglomerations of Romania, with a population of more than 150,000 population equivalent (pe).

The monitoring of "Waste waters" subsystem deals, in an integrated manner, with the water catchment, how to use it, treatment and discharge of water. In general, the waste waters monitoring activity considers the following:

- discharge of waters collected from users;
- waste waters self-monitoring (compliance with standards and regulations, frequency of analysing the waste waters, optimization of treatment plants, etc.);
- permanent monitoring of the quantities of pollutants discharged, rehabilitation of treatment plants, compliance with the limits allowed depending on the reception capacities of the emissaries;
- preventing, controlling and alarming in case of accidental pollutions.

3.5.1 THE STRUCTURE OF DISCHARGED WASTE WATER IN 2013

In accordance with the results of the overall situation, compared to a total volume of 1.977,613 million m^3/year discharged in 2013, 16,85 million m^3/year (respectively 0.85%) constitute the ***wastewater not requiring treatment***, volume consisting of conventionally clean water volume (except cooling waters, in accordance with the new EUROSTAT requirements) and the volume of geothermal waters. Summary of the volume of wastewater discharged in 2013 on economic activities is presented in *Table 3.5.1.-1* in "*Appendix to Chapter 3" WATER " - Source: " Romanian Waters "National Administration.*

3.5.2 POLLUTANT SUBSTANCES AND POLLUTION INDICATORS IN WASTE WATER

The intensity of the impact of pollution sources on receiving waters depends on two main characteristics of wastewater: ***effluent flow and pollutant load***. Thus, in Table 3.5.2.-1, 3.5.2.-2, 3.5.2.-3, 3.5.2.-4, 3.5.2.-5, 3.5.2.-6, 3.5.2.-7, 3.5.2.-8 in " *Appendix to Chapter 3" WATER " - Source: " Romanian Waters "National Administration*"; has been analysed the overall quantities of pollutants discharged in 2013, expressed as a set of physic-chemical indicators, ***on activities of the national economy***.

3.5.3 TENDENCIES AND PRIORITIES IN REDUCING POLLUTION OF WASTE WATER

Given the nature of the pollutant substances in waste water, but also the other pollutant sources, the management of the waste water is made in accordance with the European provisions in the water domain, especially with those of the Water Framework Directive (Directive 2000/60/CE), which establishes the political frame of the water management in the European Union, based on the principles of long term development and which integrate all the water problems. The Water Framework Directive integrates the requirements of the quality of water and many other requirements of the European directives in the water area. The most important directives, which can assure the reducing of the waste water pollution, are the following:

- ✓ Directive 91/271/EEC, regarding the urban waste water treatment, amended by Directive 98/15/EC and by Regulation (EC) No 1882/2003,
- ✓ Directive 2006/11/EC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community and the "daughters" Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC and 86/280/EEC, as modified by 88/347/EEC and 90/415/EEC,
- ✓ Directive 91/676/EEC concerning protection of water against pollution caused by nitrates from agricultural sources, as amended by Regulation (EC) No 1882/2003.

Framework Directive 60/2000/EC in the field of water constitutes a new approach in the field of water management, based on the principle of basins and imposing strict time limits for the implementation of the measure program. *The main aim of the Water Framework Directive (WFD) is to achieve a "good condition" for all of the water bodies, not only for surface bodies, but also for ground water bodies, excepting highly modified and artificial bodies, for defining the "good ecological potential".* According to this Directive, the Member States of the European Union must ensure achievement of good status for all surface waters until 2015, except the water bodies for which exceptions from the environmental objective attainment is requested.

One of the essential requirements of the Water Framework Directive is to establish quality objectives for all water bodies and therefore developing action programs to achieve these objectives, such as:

- prevention of deterioration of surface water and groundwater;
- protection, improvement and restoration of all surface water bodies, including those covered by the designation of artificial and heavily modified water bodies, as well as groundwater bodies, in order to achieve "*good condition*" by 2015;
- protection and improvement of heavily modified and artificial water bodies to achieve "good ecological potential" and "*good chemical status*" by 2015;
- progressive reduction of pollution from priority substances and cease discharges of priority hazardous substances in surface waters, by implementing the necessary measures;
- significant and sustained reduction in the growth trends of pollutants in groundwater;
- achievement of standards and objectives established by community legislation for protected areas.

The basin management plans represent the main implementation instrument of the Water Framework Directive 2000/60/EC and of the provisions of other European Directives from this domain.

The objectives of the Council Directive *91/271/EEC of 21 May 1991 on urban waste water cleaning, as amended and supplemented by the Commission Directive 98/15/EC on 27th February 1998* relate to the protection of the environment against the adverse effects of discharges of waste water and urban waste water in certain industrial sectors (mainly processing and manufacturing the products from the food processing industry). In Romania, the European legislation from the domain of waste water treatment and the discharge to the aquatic environment, has been transposed in the period 2002-2005, by GD no. 188/2002, for approving the norms concerning the discharge condition, completed and modified by the Government Decision no. 352/2005.

Considering both Romania's positioning in the hydrographic basin of the Danube and the Black Sea, and the need for protection of the environment in these areas, Romania declared its entire territory as a sensitive area. This decision is materialized through the fact that the agglomeration with more than 10.000 equivalent inhabitants has to assure an infrastructure for urban waste water treatment, than can allow an advanced treatment, mostly concerning the elimination of the nutrients (nitrogen and phosphor) from the waste water – according to art. 3(1) of G.D. no. 352/2005. In regard with the purification degree, the secondary treatment (biological stage) is a general rule for agglomerations smaller than 10.000 inhabitants.

The terms for the implementation of the Directive will vary and depend on the size of agglomeration (expressed in terms of produced pollution, respectively the number of population equivalent) and by its impact on receiving waters. *The final transition date for implementing the Directive was established for December 31, 2018, with intermediate deadlines for collecting and cleaning urban waste water in 2013, 2015 and 2018 respectively:*

- for collecting urban waste water (Article 3 of the Directive): December 31, 2013 for human agglomerations of more than 10,000 p.e. and December 31, 2018 for human agglomerations with less than 10,000 p.e. ;
- urban waste water cleaning and disposal - Article 4 (1 a, b) and Article 5 (2): December 31st , 2015 for human agglomerations of more than 10,000 p.e.. and December 31st, 2018 for human agglomerations with less than 10,000 p.e. ;

After the transposition into national law of the requirements of Directive 91/271/EEC regarding urban waste water cleaning from the period of membership, Romania has made important steps in the implementation of the directive, starting from the year 2007. The number and type of the agglomerations, as well as the measures concerning the waste water collecting and cleaning, were initially provided in the Treaty of Accession to the European Union and in the Position Paper of Romania, situation reflecting the actual status from the year 2014. Starting with the year 2007, this situation was re-evaluated in regard with the provision of the Environmental Sector Operational Programme (SOP-Environment), approved and entered into force by the date July 11th, 2007. The implementation of the measures of the POS environment - priority Axis 1" *Extension and modernization of the water/waste water systems*" is promoted by carrying out feasibility studies at the level of counties, in the County - Master Plans and some applications from the Cohesion Fund. By promoting the investments in improving the quality of and access to the wastewater infrastructure, financed by SOP Environment, it is envisaged to provide sewerage and treatment services in most urban areas and to establish efficient regional structures for the management of wastewater.

The European financial programming period 2014-2020 will continue financing the necessary measures taken to comply with the requirements on human agglomerations provided by Directive 91/271 / EEC. In the previous programming period, 2007-2013, the total budget was 3.27 billion euros, of which 2.78 billion euros represented non-reimbursable European funds (Cohesion Fund). In the period 2014-2020 pursue cohesion funds are expected to continue to ensure the investments in infrastructure for water / wastewater. The necessary investment for the infrastructure of water is also provided from other sources: European funds (European Agricultural Fund for Rural Development - EAFRD, ISPA, World Bank, EBRD, EIB, SAPARD, etc.), the state budget (Environment Fund, government programs to promote projects of the works of development and modernization of the infrastructure in rural areas, other national regulations, etc.), local budget, own resources of operators / public - private partnerships and loans.

From the data of the "Romanian Waters" National Administration related to infrastructure work on water / wastewater,at national level, the levels of collection and treatment of biodegradable organic load (expressed in%) of human agglomerations of more than 2,000 p.e. increased in recent years. In 2013, the values of the levels of collection and treatment of biodegradable organic load were 59.95% for wastewater collection and for wastewater treatment 49.89%, increasing by around 13% for wastewater collection compared to 2007, respectively around 12.57% for wastewater treatment. Targets to be achieved for the transition period - 2013 – are around 69% for wastewater collection and around 61% for wastewater treatment, ensuring compliance of human agglomerations of more than 10,000 in terms of waste water collection.

The highest levels of wastewater collection (over 70%) are identified in the counties of Brasov, Caras-Severin, Constanta, Cluj, Hunedoara, Harghita, Sibiu and Bucharest, and on the opposite side (below 30%) was Giurgiu and Gorj. Regarding the degree of connection to wastewater treatment plants, the situation is the following: in Constanta, Cluj, Sibiu and Timişoara were registered values above 70% and in Calarasi, Vaslui, Giurgiu Gorj counties were registered values lower than 30%.

In the graph 3.5.3.-1 "Appendix to Chapter 3" WATER "- Source: „Romanian Waters" National Administration it is presented „The situation in 2013 at county level, regarding the collection and treatment of biodegradable load in waste water from human agglomerations of more than 2,000 p.e. "

Urban Wastewater Treatment Directive is also addressed to waste water coming from the food industry (meat industry, beverages, dairy products etc. which have a biodegradable organic load higher than 4000 p.e.). In this respect there are set provisions for the agricultural-food industry companies which discharge wastewater directly into surface waters. It is compulsory for them to treat the wastewater before discharging it into the natural waters.

In the first Implementation Plan of the Directive on industrial wastewater treatment, were identified 31 companies which discharged industrial wastewater directly into the surface water (waters with a higher load of 4.000 p.e). Currently 19 of these companies are still working and are authorized. Water management permits for 12 agro-industrial units (of the 31 industrial companies) were withdrawn because the units ceased their activity,

are in stand-by or closed. Recently have been identified 12 other agro-industrial companies that discharge directly into surface waters, having a load higher than 4,000 p.e. All of them are authorised and comply with the provisions of the Directive on waste water. In terms of impact on the surface water quality, at national level, waters coming from agro-industrial industry represent only 1.35% of the total load of wastewater discharged into the natural receivers.

In the timeframe after joining the European Union (2007-2013), approx. 3,810 billion euros were invested nationwide for expansion works and wastewater infrastructure rehabilitation. The total investment planned for wastewater infrastructure is worth approx. 12.187 billion euros, value evaluated in the River Basin Management Plans for both basic measures and supplementary benefits, until 2027.

In accordance with the requirements of art. 5 of the WFD, in 2013 was elaborated **the National Report regarding the analysis of the characteristics of basins / hydrographic areas in Romania, the revision of the impact of human activity on the status of surface and groundwater water bodies and the economic analysis of water use (2013 Report)** in order to review / update the report elaborated in 2004, outlining the relevant developments. These reviews and updates were based on the Basin Management Plans developed in 2009 and on the Management Plan of the Danube river basin elaborated in 2010, as well as other information and data that cover the period 2011-2013. The 2013 Report provides an analysis of the characteristics of basins / hydrographic areas, the analysis of the impact of human activity on the status of surface and groundwater, and economic analysis of water use, being the basic document in the implementation of the second river basin management plan. Also, compared to the 2004 Report, ***the 2013 Report contains the first inventory of emissions, discharges and losses of priority substances in accordance with the requirements of Directive 2008/105 / EC on environmental quality standards in the field of water, amended by the Directive 2013/39 / EC as regarding the priority substances in the field of water policy.***

In accordance with the requirements of ***Directive 2008/105 / EC on environmental quality standards in the field of water*** (Article 5) as amended by Directive 2013/39 / EC as regards the priority substances in the field of water policy, Member States and therefore Romania, have the obligation to carry aut the inventory of emissions, discharges and losses of priority substances. Such an inventory is particularly useful in implementing various requirements of the Water Framework Directive and consequently those of the Marine Strategy Framework Directive 2008/56 / EC on the basis of which can be identified and determined the exact measures to emissions, discharges and losses of priority substances (eg. by identifying the main sources of pollution, estimate their contribution to the overall pollution and identifying ways of access of pollutants in the aquatic environment), and track the effectiveness of their implementation. On the other hand, based on the inventory can be assessed the magnitude of the contribution of the natural geological sources and processes of transport over long distances. Another important role of the inventory is that it allows the identification of information gaps and therefore the needs to develop new strategies and action programs leading to the completion of the necessary data and information.

A first inventory of emissions, discharges and losses of priority substances was performed in our country in 2013, for each of the 11 hydrographic basins with data from the period 2010-2011 for metals and respectively 2009-2011 for organic micropollutants. The inventory was developed for the 33 groups of priority substances and the 8 other pollutants generically referred to as "priority substances". Methodological elements needed for the national inventory were based on the European guidelines within the Joint Strategy for the implementation of the Water Framework Directive 2000/60 / EC, namely Guide no. 28 "Technical Guide for preparing the inventory of emissions, discharges and losses of priority substances and priority hazardous substances".

Also, the application of the provisions set aut in Directive 2009/90 / EC establishing technical specifications for chemical analysis and monitoring of water status in accordance with Article 8 (3) of Directive 2000/60 / EC and the development of methods for analysis and monitoring of substances proposed by the Directive 2008/105 / EC on Environmental Quality Standards for priority substances / priority hazardous, continues to ensure the assessment of the implementation of measures for the progressive reduction of discharges, emissions and losses of priority substances and the elimination of discharges, emissions and losses of priority hazardous substances.

In accordance with the requirements of art. 14 (1b) of the Water Framework Directive on 22 December 2013 has been published the ***Document on the important issues of water management*** elaborated at basin and national level in order to ensure the process of informing and consulting the public for a period of 6 months (June 2014). **(Note:** ***See http://www.rowater.ro/SCAR/Planul%20de%20management.aspx).***

The document highlights important issues of water management in Romania - key issues underlying the establishment of measures necessary to achieve the environmental objectives. The important issues of water management are addressed in relation to pressures on surface water bodies and groundwater for which there is a risk of not achieving the environmental objectives and economic sectors related to these pressures and are consistent with the problems of water management in the Danube International District.

Have been identified the following important water management issues that directly or indirectly affect the status of surface water and groundwater, with major impact on the water resource management: organic substances pollution, nutrient pollution, hazardous substances pollution and hydromorphological alterations.

Organic matter pollution is mainly caused by direct or indirect emissions of untreated or insufficiently treated wastewater from human agglomerations, industrial or agricultural sources. This causes significant changes in the balance of oxygen in surface waters and consequently impacts the species composition / aquatic populations, respectively, on the environmental status of waters.

The implementation of the first Management Plan requires technical and economic efforts to achieve measures related to the collection / wastewater treatment and industrial sector by upgrading or construction of sewerage systems and treatment plants, as well as the introduction of Best Available Techniques (BAT) in the industrial technological processes. So far, measures were implemented resulting in the reduction of organic pollution, but there is a need to establish additional measures in the future, if the basic measures are not sufficient to achieve a good status of water bodies.

An important issue of water management is ***nutrient pollution***, especially nitrogen and phosphorus. Excess nutrients lead to eutrophication, which causes change in composition and decrease in the biodiversity of species and reduces the possibility of use of water resources for drinking, recreation, etc. As in the case of organic matter, nutrient emissions come from both point sources (urban wastewater, industrial and agricultural untreated or insufficiently treated water) and from diffuse sources (particularly agricultural: breeding, use of fertilizers, etc.).

In order to reduce nutrient pollution of waters, in addition to technical measures to improve the quality of effluent discharged from sewage of settlements, industrial facilities and animal breeding farms, and the application of the Code of Good Agricultural Practice, the introduction and selling of phosphates free detergents is the fastest and most effective measure to reduce emissions of phosphorus into surface waters. For a large number of agglomerations of less than 10,000 population equivalents, in the national legislation phosphorus removal is not a mandatory requirement. Therefore reducing phosphate in detergents can have a significant impact on reducing phosphorus loads from agglomerations of less than 10,000 population equivalents in a shorter period than for the construction / modernization of collection systems and treatment plants.

Pollution with hazardous chemicals can significantly deteriorate the condition of water bodies and may have indirect effects on the health of the population. In accordance with the European directives in the water sector and ICPDR approach, there are 3 types of hazardous chemicals, namely:

- priority substances - pollutants or groups of pollutants presenting a significant risk to the aquatic environment, including water used for the abstraction of drinking water;
- priority hazardous substances - pollutants or groups of pollutants presenting the same risk as the previous ones and in addition are toxic, persistent and bioaccumulative;
- specific pollutants at river basin level - pollutants or groups of pollutants specific to a particular river basin.

In the category of hazardous substances form part artificial chemicals, metals, polycyclic aromatic hydrocarbons, phenols, endocrine disruptors and pesticides, etc. In order to achieve and maintain a good water status is necessary to comply with the quality standards at European level, the progressive reduction of pollution from priority substances and specific pollutants and stop or eliminate emissions, discharges and losses of priority hazardous substances. After analysing the pressures generated by human activities within the sub-basins, were identified the following sources of pollution from priority substances, priority hazardous substances and specific pollutants: extraction and processing of non-ferrous metals, pulp and paper production, electroplating, ferrous metallurgy, chemical industry, petrochemical industry, weapons manufacturing industry, energy industry, mining, transport industry, construction, metallurgy and machine building, electric power and heat, food, human agglomerations and agriculture.

Hydromorphological alterations of longitudinal and lateral continuity interruption type of watercourses, changing of the hydrological regime and morphological conditions, and also the implementation of future infrastructure projects, are some of the causes that may have an impact on the status of surface water bodies.

Hydromorphological alterations due to various types of constructions performed on bodies of water can lead to interruption of longitudinal continuity and the emergence of morphological changes, can be barriers to migration of fish species (by limiting / blocking their access to relevant habitats for feeding and reproduction), if they are not equipped with facilities for the migration of ichthyofauna.

Among the various ecosystem services and wetlands / floodplains, through their connection to water bodies, these play an important role in the functioning of aquatic ecosystems and can have a positive effect on water status by providing important habitat for ichtyofauna and other species by reducing the concentrations of nutrients and by providing water retention areas, can also contribute to mitigating the effects of floods, etc.

A significant pressure can be represented by embankments, most of the dammed water bodies being designated as heavily modified water bodies, which must reach good ecological potential (GEP), through specific measures.

Hydrological alterations can cause changes in the hydrological regime of watercourses, being represented mainly by water withdrawals, and pulsating waves from the production of hydropower and water flow speed reduction on certain sections (caused by transverse sealing).

Groundwater is the source of water for various uses, is mainly used for drinking water and for other purposes. Also groundwater water bodies are interconnected with aquatic ecosystems, therefore, the requirement to ensure a good quality is fully justified. In general, diffuse sources of pollution that impact groundwater bodies are human agglomerations of population not connected to wastewater collection and treatment systems, agricultural activities, especially through improper storage of manure, historical sources of pollution, respectively, units that have ceased activity, misuse of land (non-compliant landfills), etc.

The identification of significant water management issues is based on the evaluation of the pressures on water bodies in accordance with the requirements of the Water Framework Directive. The important issues of water management, both nationally and at basin / hydrographic areas level, are similar to those established in the International river basin of the Danube in the document ***Significant Water Management Issues in 2013***, developed by the International Commission for the Protection of the Danube River (ICPDR), with the contribution of the Danube countries (**Note: *See https://www.icpdr.org/main/SWMI-PP***).

Furthermore, the integration with other sectorial policies is an important issue in order to identify and highlight potential synergies and conflicts. The process is underway to enhance cooperation with various sectors such as hydropower and agriculture, coordination between quantitative management of water resources and flood management in accordance with the requirements of Directive 2007/60 / EC on the assessment and management of flood risk and the marine environment, through the Marine Strategy Directive 2008/56 / EC. This contributes to the development and completion of country and regional strategies and at the development of new Management Plans of the basin / hydrographic basins.

As part of the second Management Plan will be established measures for each category of important issues on water management, based on the progress made in implementing the measures set out in the first Management Plan, the results on the characterization of basins / hydrographic areas, the impact of human activities and economic analysis of water use, both for the surface water and the groundwater, in the year 2013. The second Management Plan will include, in the continuation of the first Management Plan, basic and supplementary measures to be implemented until 2021 and will be established, where appropriate, measures for the next planning cycle for 2027, in order to achieve the environmental objectives of water bodies.

With regard to the implementation of ***Directive 91/676/EEC concerning the water protection against pollution caused by nitrates from agricultural sources***, amended by the (EC) Regulation 1882/2003, the authorities monitor the plan of measures for the punctiform and diffuse pressures from agriculture, exerted at the level of surface and underground waters. The major objectives of the Directive, included in the action plans, are the reduction of the pollution caused or induced nitrates from agricultural sources, and prevention of water pollution with nitrates.

Romania did not get a transition period for this Directive, the action programs are put in practice throughout a four-year period after being prepared (art. 5 paragraph 4 of the Directive). The deadline (the final completion date) for each individual measure is established by the phasing schedule attached to the water management authorisations and/or from the action plan attached to the (integrated) environment authorisation, also considering the potential transition periods obtained by the units (animal farms) under the incidence of Directive 2010/75/EU regarding industrial emissions (integrated prevention and control of pollution) – IED.

3.6 ACCIDENTAL POLLUTION

Accidental pollution of water represents any alteration of the physical, chemical, biological or bacteriological water produced by accident, damage or other similar cause, as a result of errors, omissions, negligence or natural disasters and from which water becomes possible improper use before pollution. Accidental pollution is often of high intensity and short duration. In case of major accidental pollutions, large damages can take place both to people and environmental, by hazardous substances emission in significant streams. After the generation of an accidental pollution, authorities promptly intervene to remove the effects by limiting the spread, the collection, dismantling and destruction of pollutants, measures to restore the normal situation and restore the ecological balance. However, the most important problem is to develop quality measures for the protection of water resources by preventing and combating accidental pollution.

In 2013, the National Administration "Romanian Waters", recorded **65** accidental pollution, of which 30 with oil products, 19 with untreated wastewater and 13 of other nature (mine waters, organic and inorganic chemicals, gas mixture, clay, mica, sand, suspended solids from silt).

Production of accidental pollution is explained by the negligence of some operators while carrying out technologic processes and illegal actions taken by individuals.

Of the total pollution in 2013, 15% comes from unidentified sources and approx. 3% was recorded as a result of the effects of natural phenomena (floods, high temperatures). In only 5% of the cases was registered fishing mortality.

Accidental pollution with oil products (47%) had as cause the breakage of oil transport pipelines, for theft purposes, or their wear and tear. Distribution of the river basins shows that the basins Arges-Vedea and Olt had the most accidental pollution cases (11, respectively 10), in Buzău - Ialomiţa hydrographic area, Mureş river basin, Siret river basin (8 in each h.a./r.b.) and in thr Crisuri hydrographic area there were no accidental pollution cases.

During 2013 these pollutions mostly affected the inner rivers, while on the Danube were registered 7 accidental pollution cases.

In 2013 there were no major accidents involving dangerous substances according to the provisions of Annex 6 from HGR no. 804/2007 on the control of major accident hazards involving dangerous substances, as amended and supplemented.

In "APPENDIX 2, accidental pollution in 2013 - water" are presented the most significant pollutions for the environmental factor "water" sanctioned by the National Environmental Guard.

3.7 SUSTAINABLE MANAGEMENT OF WATER RESOURCES

3.7.1 SIGNIFICANT PRESSURES ON WATER RESOURCES IN ROMANIA

Water quality is a paramount issue that should concern us all. Our health is directly dependent by the water source. The main source of pressure on the surface water quality status, and not only, is exercised by man by discharging in emissaries of untreated or insufficiently treated waste water. To protect water resources, this practice prohibited by law must be stopped, meaning that the treated water quality must comply with existing prescriptions.

In accordance with Water Framework Directive, within the basin management plans, ***significant pressures*** *were considered those which have as a result unachieved environmental objectives for the water body. According to the mode in which the water body's receiving system operates, it can be known if a pressure can cause an impact. This approach linked to the pressure list and the particular characteristics of the receiving basin, leads to the identification of the significant pressures.*

An alternative is that conceptual understanding to be summarised in a simple set of rules that indicate directly if a pressure is significant. An approach of this type is to compare the magnitude pressure with a criterion or a limit value relevant to the body of water. In this respect, European Directives presents limits over which the pressures can be called significant and the substances and groups of substances to be taken into account. The establishment of significant pressures it is the base of the identification of the connection between all of the pressure categories - objectives - measures. The analysis of the pressures and of the impact, based on the strength of the DPSIR concept (*Driver-Pressure-State-Impact-Response*) was taken into account.

The set of criteria has led to significant pressure identification, having in regard treated or untreated waste water in the resources of surface water:

- ***human agglomerations:***

✓ (identified in accordance with the requirements of the Directive on urban waste water cleaning - Directive 91/271/EEC), are considered significant sources of pollution, if they have: more than 2000 inhabitants equivalents (p.e.), having systems for the collection of waste water with or without sewage plants and which discharge in the resources of water; less than 2000 p.e. agglomerations are considered significant punctiform sources if they have centralized sewerage system ; also, human agglomerations with unitary sewerage system, but do not have the ability to collect and treat the mixture of waste waters and pluvial waters in periods with intense rains., are considered significant punctiform sources.

- ***industry***:

✓ installations which are included in the scope of Directive on the prevention and integrated pollution control - 96/61/EC (IPPC Directive) - including units which are listed in the European Pollutant Emission Register (EPER) or the European Pollutant Release and Transfer Register (E-PRTR), which are relevant for the factor to the environment - water;

✓ the facilities which discharge dangerous substances (list I and II) and/or priority substances above the limits of the legislation in force (in conformity with the requirements of the Directive

2006/11/CE which replaces Directive 76/464/EEC, regarding the pollution caused by the dangerous substances evacuated in the aquatic environment of the Community;

- ✓ other facilities which discharge in the water resources and which are not in conformity with the legislation in force on the water environment factor.

- ***agriculture:***

- ✓ the animal farms under the incidence of the Directive on the prevention and integrated pollution control - 96/61/EC (IPPC Directive) - including units which are listed in the European Pollutant Emission Register (EPER) which are relevant for the water environment factor
- ✓ farms which expel dangerous substances (list I and II) and/or priority substances above the limits of the legislation in force (in conformity with the requirements of the Directive 2006/11/CE which replaces Directive 76/464/EEC, regarding the pollution caused by the dangerous substances evacuated in the aquatic environment of the Community;
- ✓ other agricultural facilities with punctiform evacuation and which are not in conformity with the legislation in force on the water environment factor.

Based on these criteria, in the National Report on analysis of the characteristics of basins / hydrographic areas in Romania, on the reviewing of the impact of human activity on the status of the water bodies of groundwater and surface water and economic analysis of water use (2013Report) have been identified a number of 3941 uses of water using surface water resources as a receiver of discharged water. After analysing the sources of pollution, taking into account the criteria mentioned above, resulted a total of 953 significant point sources (468urban, 325 industrial, 90 agricultural and 70 of other types).

*With regard to the **significant diffuse sources of pollution**, regarding the utilization of land, one can mention:*

- ***human agglomerations /localities that do not have systems for the collection of waste water*** or appropriate systems for the collection and disposal of sludge from the treatment plants, as well as the localities which don't have compliant deposits of household wastes
- ***animal breeding farms which do not have proper systems of storage/use of manure***, the localities identified as areas vulnerable to nitrates pollution from agricultural sources, units that use pesticides and do not comply with the legislation in force, other agricultural units/activities which may lead to significant diffuse emissions;
- deposits of raw materials, finished products, auxiliary products, non-compliant storage of waste, ***units that produce diffuse accidental pollution***, abandoned industrial sites.

The following ***ways of generating diffuse pollution*** are taken into consideration: atmospheric deposition, runoff, leakage from drainage network, soil erosion, underground leakage, leakage from impervious urban areas. The underground leakage is the main way for diffuse nitrogen emissions (65,64%), followed by leakage from impervious urban areas (20,72%) and surface leakage (5,31 %).

For phosphorus, leakage from impervious urban areas has the greatest contribution to the diffuse emission (60,94%), followed by underground leakage (19,32%) and soil erosion (17,96%). Half of the amount of nitrogen emitted from diffuse sources is due to agricultural activities, resulting in a specific emission of 4.98 kg N / ha agricultural area and about 61% of the total diffuse phosphorus emission is due to localities / human agglomerations, agriculture contributing with about 19%, which represents an average specific emissions of 0.23 kg / ha agricultural area.

The average diffuse specific emission on the total area for nitrogen is approx. 6.78 kg N / ha, and for phosphorous is 0.76 kg P / ha.

Compared to the first Management Plan, specific emission factors on agricultural land have slightly increased given the increasing use of chemical fertilizers.

Another important category of significant pressures is that linked to the ***significant hydro-morphological pressures.*** Within the same ***2013 Report*** have been identified several categories of works considered significant, namely: accumulations, derivations, adjustments, embankments and bank protection works, built on water bodies in various purposes scopuri (ensuring water requirements, regulation of natural flows, defense against the natural destructive effects of water, electricity production, combating excess moisture, etc.) with functional effects on human communities.

Accumulation lakes whose area is more than 0.5 km^2 are 236 and mainly produce as hydromorphological pressure, the continuous interruption of leakage and flow regulation.

In Romania, there are a number of 1393 regulated river sectors with a total length of 8255 km. Analysing their hydromorphological parameters according to the criteria for defining significant hydromorphological pressures, it is found that a total of 354 regularization works, totalling 3367 km can be considered significant hydromorphological pressures.

The hydrotechnical objectives from the category of derivatives, numbering 99, are intended to supplement the tributary flow in accumulations and to provide the industrial water requirement for municipalities producing significant changes in the water flows on which they operate.

Applying the criteria for determining the significant pressures ***in Romania there were identified 48 water samples and 60 restorations that can be considered significant.*** Water samples and restorations (discharges) produce significant hydromorphological alterations which materialize by altering the characteristics of the watercourse on which they are positioned so that water intakes and discharges whose flows were sampled or restored, are significant in terms of quantity. In addition to the impact of existing hydromorphological alterations on the status of water bodies, there are a number of projects in various stages of planning and implementation, which can contribute to the physical alteration of water bodies.

Future ***infrastructure projects*** have as main objective the provision of water, flood protection, electricity production, insurance of navigation conditions etc. As part of the development activities of the ***Spatial Plan / Plan on Flood Risk Management*** was conducted the process to identify and prioritize the investments required to achieve the objectives of the national strategies in the field.

These actions have resulted in the elaboration of lists of proposed works (projects) divided into three horizons: short term – until 2015, medium term - from 2015 to 2018 and long term - after 2018. Subsequently, these lists of future infrastructure projects were discussed and approved in the Basin Committee by representatives of stakeholders in water resource management.

In addition to the significant pressures presented were also identified ***other activities / pressures that may affect the status of water bodies*** or fish farming activities, ballast and sand extraction from minor beds of rivers and logging.

The quality of water resources is influenced to some extent by ***accidental pollution***, which represents the sudden deterioration of physical, chemical, biological and bacteriological of water, above the allowable limit. Depending on the type of accidental pollution, they may have different magnitudes and effects (local, basin, cross-border) on water resources.

3.7.2 STRATEGIES AND ACTIONS CONCERNING THE SUSTAINABLE MANAGEMENT OF WATER RESOURCES

The process of integration of water management resources from the Danube river basin district with other policies is promoted by the Danube Declaration of 2010 and the European Union documents to safeguard Europe's water resources (Blueprint - 2012). These documents are also taken into account by Romania, as a state party to the Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube River Protection Convention) and as a member of the European Union.

The management of water resources requires an integrated approach to the provisions of the Water Framework Directive 2000/60 / EC with those of other European directives on water policy and other relevant policies and strategies of certain sectors, namely Directive 2007/60 / EC on the assessment and flood risk management, the Marine Strategy Framework Directive 2008/56 / EC, hydropower sector, nature conservation, climate change, etc.

In Romania, the development of the national strategy and policy in the field of water management, assurance of the coordination and of the control of implementing the internal and international rules in this domain shall be carried out by the Ministry of Environment and Climatic Changes through the Department of Waters, Forests and Fisheries. The quantitative and qualitative management of the water resources, the management of the water works, as well as the implementation of the national strategy and policy, in compliance with the national regulations; it is carried out by the "Romanian Waters" National Administration, through the water basin administrations under their subordination. The legislative framework for sustainable management of water resources is provided by water Law No 107/1996, with the subsequent amendments and completions.

The strategy and national policy in the field of water management shall aim to achieve a policy of sustainable management of the waters by ensuring the quantitative and qualitative protection of the waters, the respondent destruction of the waters, as well as to improve the potential of water in relation with the

requirements of the sustainable development of the society and in agreement with European directives in the area of waters.

For the implementation of this policy, the following objectives are taken into account:

- Improvement of the condition of the surface water bodies and of the ground waters by implementing the management plans of the hydrographic basins, in conformity with the provisions of the Water Framework Directive of the European Union.
- The implementation of the Management Strategy of Flood Risk, of the necessary plans and programmes and the achievement of the measures which derive from these, implementing it in accordance with the provisions of the European legislation;
- The elaboration of the Guidance Schemes for Arranging the Hydrographic Basins for the water use, towards the reduction of the negative effects of the natural phenomena on human life, goods and activities in correlation with the economic and social development of the country;
- The implementation of the plan about the protection and rehabilitation of the Romanian shore of the Black Sea, against the erosion and the promoting of an integrated management of the coastal area, in conformity with the European recommendations in the field, including the implementation of the Master Plan provisions – Protection and rehabilitation of the coastal area;
- Strengthening the cross-border and international partnership with similar institutions from other countries, for the purpose of monitoring the stage of implementing the international agreements and promoting common projects.

The current objective is focused on the durable water management based on implementing the European Union legislation and particularly the principles of the Water Framework Directive and the Floods Directive, already transposed by the Water Act 107/1996, as further modified and completed. In this context, the instruments required for the water policy and strategy include the general flowchart for hydrographic basins organization and management, the integrated water management by hydrographic basins and adjusting the institutional capacity to the requirements of the integrated management. Numerous actions for the achievement of each proposed specific objective were planned. Some of these have been carried out up until the present time, and others are being carried out or will be carried out in the following stage.

The necessary actions for improving the condition of surface and ground waters were established within the Management Plans of the Hydrographic Basins, as a part of the Management Plan of the international district of the Danube, drafted in conformity with the provisions of the Water Framework Directive. The Management Plans of the basins, as well as the National Management Plan were approved by the Government Decision no. 80/26.01.2011 for the approval of the national management Plan associated with the portion of the international hydrographic basin of the river Danube that is within the territory of Romania, Romania's Official Gazette no. 265/14.04.2011. By implementing and monitoring the approved measure programs for significant sources of pollution, the environmental objectives for the bodies of water, good condition and the good potential ecological will be achieved. The investment costs required to implement measure programs have been evaluated to approx. 21 Billion Euro by the year 2027.

Floods pose a threat to human health and safety. Directive 2007/60 / EC on the assessment and management of flood risk and the ICPDR Action Programme on flood defence set the framework for flood management in the Danube basin. Flood protection measures may affect the status of surface waters (eg. dams and polders), but some measures can support achievement of the objectives of the Floods Directive and the Water Framework Directive (eg. by reconnecting adjacent wetlands and floodplains). To ensure the best possible solutions is required a coordinated elaboration of the second Management Plan and the first Management Plan of the Danube flood risk in 2015. Also, at the national level, has been achieved and reported at the European Commission, the preliminary assessment of flood risk, and by 22nd March 2014 will be completed and published hazard and flood risk maps.

Marine Strategy Framework Directive 2008/56 / EC aims to better protect the marine environment in Europe, with the objective to achieve a good status of marine waters by 2020. Actions undertaken in the Danube River Basin District will reduce pollution from continental sources and protect ecosystems in coastal and transient waters in the Black Sea region. The Water Framework Directive and the Marine Strategy Framework Directive are closely interconnected, which requires coordination of related activities.

Regarding the inland navigation, following the adoption of the Joint Declaration on inland navigation and environmental sustainability in the Danube river basin in 2007, significant progress has been made towards establishing an integrated approach for planning, across the basin, in order to achieve sustainable navigation projects along the Danube.

In December 2012, the International Protection Strategy Committee for the Protection of the Danube River (ICPDR) on the adaptation to climate change has been completed and adopted. The strategy provides a description of the climate change scenarios for the Danube River Basin District and the expected impacts on water. It provides an overview of possible adaptation measures and describes the steps to integrate climate change adaptation in the activities of ICPDR and in the following planning cycles. In Romania, the National Strategy on Climate Change was adopted by Government Decision no. 529/2013 for the approval of the Romanian National Strategy on Climate Change 2013-2020, and its implementation aims at reducing emissions of greenhouse gases and to adapt to the negative effects of inevitable climate change on natural and anthropogenic systems.

It is expected that water scarcity and droughts to become relevant for water resources management in the hydrographic basin, in this sense paying attention to climate change. In the Danube countries, water scarcity and drought are not considered significant water management issues for most countries, but a number of countries have taken these issues into account at national level. According to the UNESCO **World Water Assessment Programme 2012 "Water management under uncertainty and risk"** in 2050, Romania will not be covered by the risk of depletion of water resources, with an estimate of the amount of water available annually of at least 1.7 million litres of water / capita. However, the main sectors flagged as potentially affected by drought and water scarcity are agriculture, biodiversity, electricity production, navigation and public health.

(Note: see - http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/wwdr4-2012/)

In the Danube river basin district and in Romania, are planned or are already being implemented specific measures, such as: increasing irrigation efficiency, reduce losses in water distribution networks, mapping and forecasting drought events, education of the public about water saving measures, economic instruments for payments, wastewater reuse, etc.

With regard to nature conservation, in recent years, the national network of protected areas has been completed with the denomination of Natura 2000, and the law has specific provisions to protect and improve the favourable conservation status of species and wildlife habitats which are of community interest. Based on an integrated approach to all relevant aspects of water resources, the Water Framework Directive mentions therein, the relationship with habitats and species where maintenance or improvement of water is an important factor in their protection. In this regard, it requires creating and updating a register of protected areas that includes this category of habitats and species.

The joint effort of water users, stakeholders and the general public, of water management authorities, through the application of the measures provided for in the strategies and plans for the integrated management of water resources will lead to the achievement of the environmental objectives of water bodies, being in the same time an opportunity for this generation, for people and organizations to work together to improve the aquatic environment in all its aspects.

4. LAND USE

4.1. SOIL

INTRODUCTION

The soil is defined as the surface layer of the earth crust. It is formed from mineral particles, organic matters, water, air and living organisms. It is a very dynamic system which meets many functions and is vital for the carrying out of human activities, as well as for the ecosystems to survive.

Acting as an interface between earth, air and water, the soil is a non-renewable resource, which fulfils several vital functions, of which we mention:

- producing nourishment/biomass;
- depositing, filtering and transforming various substances;
- a source of biodiversity, habitats, species and genes;
- serves as a physical platform/environment for people and human activities;
- a source of raw materials;
- represents a geological and archaeological patrimony.

4.1.1. DISTRIBUTION BY CLASS OF USE

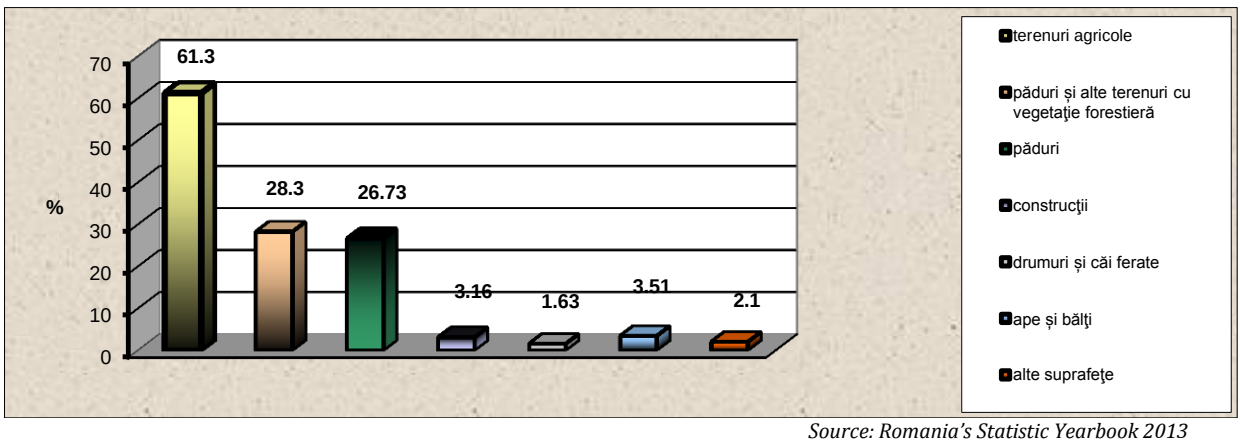
In table 4.1.1.-1 it is shown that in 2013 the largest share, as in previous years, was represented by agricultural fields (61,3%), followed by forests and other forest lands (28,3%). Other lands occupy 10,4% of the country's surface (waters, ponds, yards, buildings, communication networks, unproductive fields).

Table 4.1.1.-1 *The distribution of lands according to their categories of use, in 2013*[1]

Category of use	Surface,	
	Thousand ha	%
Agricultural fields	14615,1	61,3
Forests and other forest land, of which:	6746,9	28,3
Forests	6373,0	26,73
Constructions	752,4	3,16
Roads and railways	388.3	1,63
Waters and ponds	836.8	3,51
Other lands [2]	499.6	2,10
Total	**23.839.1**	**100**

[1]) *Source: Romania's Statistic Yearbook, 2013;*
[2]) *Unproductive lands*

Figure 4.1.1.1 *Distribution of lands according to their categories of use in 2013*



Source: Romania's Statistic Yearbook 2013

4.1.2. DISTRIBUTION OF AGRICULTURAL LANDS BY TYPE OF USE

In table 4.1.2,-1 is shown the distribution of agricultural lands by type of use in 2013.

Arable lands occupy 65,3% of the total agricultural area, while the rest is distributed among pastures (20,9%), grassland (10,9%), vineyards (1,5%) and orchards (1,4%).

At the end of 2013, total private agricultural property was of 93,83% out of the total agricultural area and consisted of: state private property, territorial administrative units, legal entities and individuals.

In the last 65 years, following a growth in the demographic index, the arable land per capita has decreased from 0.707 ha in 1930 to 0,467 ha in 2013, the resources being practically depleted.

Table 4.1.2.-1 *Distribution of agricultural land depending on type of use in 2013*[1)]

Type of use	Surface, thousand ha	%
Arable	9392,3	65.3
Pastures	3270,6	20.9
Hayfields	1544,9	10.9
Vineyards	210,5	1.5
Orchards	196.8	1.4
Total agricultural	**14.615,1**	**100**
Of which private property	***13712,9***	***93.83***

[1]) Source: Romania's Statistic Yearbook, 2013

4.1.3. CLASSES OF SOIL QUALITY - soil quality

The quality of agricultural lands refers both to the fertility of the soil, as well as to the way in which other environmental factors interact with the plants. From this point of view, the agricultural lands can be grouped in 5 quality classes, differentiated in terms of the worthiness average mark, (first class - 81-100 points , class V – 1-20 points). The quality classes of the lands determine if they are suitable for agricultural purposes.

The number of points of worthiness is obtained by means of a complex operation of thoroughly knowledge of a land, stating its favourability for the existence requirements of some given crop plants, under normal climatic conditions and within rational use.

Table 4.1.3.-1 presents the framings of agricultural lands into quality classes, according to the national worthiness average mark, for the year 2013 (partially), without applying the pedologic improvement works.

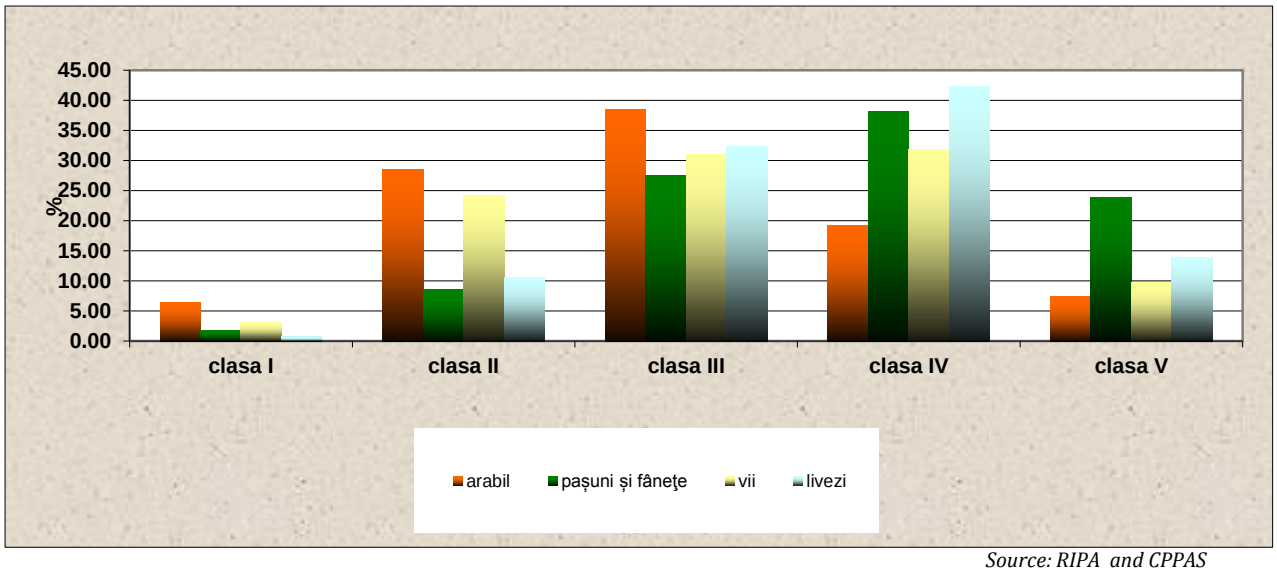
We notice that in the case of arable lands, which cover 63.77% of the charted surface, most of the lands pertain to the second (28,40%) and third (38,83%) classes of quality. Basically, the arable quality class I contains 6.3% of the total arable land, the remaining classes having different restrictions. For pastures and hayfields the majority classes are III-V, for vineyards, the classes II-IV, and classes III-IV for orchards.

Table 4.1.3-1. *Classification of agricultural lands into quality classes, according to the national wothiness mark in 2013*[1)]

Usage	Total mapped area	Of which by quality classes :				
	Ha / % of total agrarian	Class I	Class II	Class III	Class IV	Class V
		Ha / % of total usage	Ha / % of total usage	Ha / % of total usage	Ha / % of total usage	Ha / % of total usage
Arable	9264527,31/ 63,77	580760.36/ 6.27	2631193.31/ 28.40	3597347.95/ 38.83	1779092.47/ 19.2	676133.22/ 7.3
Pastures + Hayfields	4754440,42/ 32,72	86147.60/ 1.81	412213.27/ 8.67	1312668.93/ 27.61	1812781.57/ 38.13	1130629.05/ 23.78
Vineyards	261461,43/ 1,80	8268.58/ 3.16	63699.38/ 24.36	80884.12/ 30.94	82111.95/ 31.4	26497.40/ 10.13
Orchards	248055,65/ 1,71	1848.10/ 0.75	26594.07/ 10.72	79558.52/ 32.07	104951.91/ 42.31	35103.05/ 14.15
Total agrarian	**14528484.81/ 100**					

1) Source: RIPA. and CPPAS

Figure 4.1.3.1 *The classification of agricultural lands into quality classes, according to the national worthiness mark (ha/% of total use) in 2013*[1]



Source: RIPA and CPPAS

4.1.4. MAIN RESTRICTIONS OF SOIL QUALITY

From the inventory conducted by the Research Institute for Pedology and Agro-chemistry in collaboration with 37 Offices of Pedology and Agrochemistry Research, in the years 1994-1998, from 41 counties, and with other research units, on approximately 12 million hectares of agricultural land, of which approximately 7.5 million hectares of arable land (about 80% of arable surface), soil quality is affected in a smaller or larger extent by one or more restrictions. Their damaging influences are reflected by the deterioration of the features and functions of the soils, specifically in their bioproductive capacity but, what is even more serious, in affecting the quality of the agricultural products and food safety, with serious consequences for the quality of human life.

These restrictions are determined either by natural factors (climate, form of relief, edaphic features, etc..) or by anthropogenic agricultural and industrial activities, in many cases, the mentioned factors may be acting together in a negative way, having the effect of lowering the soil quality, and even of cancelling their functions. The main restrictions on agricultural soil quality are presented in Table 4.1.4.-1.

Drought can occur on approximately 7.1 million ha, of which the largest part of 3.2 million ha previously arranged with irrigation works, in 2006-2007 were recorded as being affected by drought.

Periodic excess moisture in the soil affects about 3.8 million ha, of which a large part of the perimeters with drainage works, that do not work at the expected efficiency. Several perimeters from areas with old and inefficient damming works, without maintenance, are periodically flooded, recording serious damages by destroying farms, crops, livestock, communication lines and loss of human life.

Water erosion is present in varying degrees on 6.3 million ha, of which about 2.3 million are arranged with anti-erosion works, being powerfully degraded in the present in it's most part, this along with ***landslides*** (about 0.7 million ha), causing soil loss of up to 41.5 t/ha per year.

Wind erosion occurs on about 0.4 million ha, with the risk of extending, knowing that in recent years, some forests and protective curtains were cleared in areas with sandy soil, being susceptible to this degradation process. These soils have a reduced edaphic volume, low water retention capacity and suffer from the consequences of drought, having a low fertility.

The excessive frame content in the superior part of the soil affects about 0.3 million ha.

Soil salting affects almost 0.6 million ha, with some worsening trends in the irrigated, drained and irrationally exploited fields, or in other areas with secondary salting potential, which total an additional 0.6 million ha.

Tabelul 4.1.4.-1. *The surface of agricultural lands affected by various limiting factors of the productive capacity*

Name of the factor	Affected surface[1)] thousand ha	
	Total	Arable
Drought	7100	
Periodical excess of humidity in the soil	3781	
The erosion of the soil by water	6300	2100
Landslides	702	
The erosion of the soil by wind	378	273
Excessive frame on the surface of the soil	300	52
Salting of the soil	614	
• of which with high alkalinity	223	135
The secondary consolidation of the soil due to improper works ("plough sole")	6500	6500
The primary consolidation of the soil	2060	2060
Formation of the crust	2300	2300
Small/extremely small reserve of humus in the soil	7485	4525
Severe and moderate acidity	3424	1867
A poor and very poor supply of mobile phosphorus	6330	3401
A poor and very poor supply of mobile potassium	787	312
A poor supply of nitrogen	5110	3061
A lack of microelements (zinc)	1500	1500
The physical-chemical and chemical pollution of the soil, of which:	900	
• pollution with substances carried by the wind	363	
• the destruction of the soil by various excavations	24	
Covering of land with wastes and solid residues	18	

[1)] Source: R.I.P.A. The same surface can be affected by one or more restrictive factors.

Damage to soil structure and secondary consolidation ("plough sole") occurs on about 6.5 million ha, primary consolidation is present on about 2 million ha of arable land, and tend to form a surface crust on about 2, 3 million ha.

The agrochemical status, analysed on 66% of the agricultural fund, presents the following unfavourable attributes:

- strong and moderate acidity of the soil on about 3.4 million ha of agricultural land and moderate-strong alkalinity on about 0.2 million ha of agricultural land;
- weak to very weak insurance of soil with mobile phosphorus, on about 6.3 million ha of agricultural land;
- weak insurance of soil with mobile potassium, on about 0.8 million ha of agricultural land;
- weak insurance of soil with mobile nitrogen, on approximately 5.1 million ha of agricultural land;
- extremely low to low insurance of soil with humus on approximately 7.5 million ha of agricultural land;
- deficiencies in micro-elements on significant areas, especially zinc deficiencies, strongly felt in the maize culture on approximately 1.5 million ha.

Physical-chemical and chemical pollution of the soil affects about 0.9 million ha; aggressive effects which are particularly strong to the soil determine the heavy metals pollution (especially Cu, Pb, Zn, Cd) and sulphur dioxide, mostly identified in critical areas like Baia Mare, Zlatna, Copsa Mica. Overall, pollution with substances carried by the wind affects 0.363 million ha. Although, in recent years, a number of industrial units were closed and others have reduced their activity, soil pollution remains high in the strongly affected areas. Oil pollution and salty water from oil exploitation, refining and transport is present on about 50 000 ha**.**

Soil damage by excavation works affects about 24 000 ha, being the most serious form of damage to soil, common in the mining industry, for example, in the mining basin of Oltenia. The quality of the lands affected by this type of pollution has decreased by 1 to 3 classes, so some of these areas have become practically unproductive.

Covering soils with waste and solid residues caused the removal from the agricultural circuit of about 18000 ha of agricultural fields.

The data mentioned are highlighted by the results of the re-inventory of land affected by various processes presented in summary in Table 4.1.5.3.-1

4.1.5. PRESSURES OF SOME FACTORS ON THE STATE OF ROMANIAN SOIL QUALITY

4.1.5.1. Fertilizers

Table 4.1.5.1.1 and figure 4.1.5.1.1, represents the situation of applying chemical fertilisers, by agricultural soils, during the 1999 - -2013 stage, out of which an increase is noted for the fertilised area, from 3,640,900 ha to 5.965.817ha, smaller compared to that registered in the previous years.

Compared to 1999, the total amounts of NPK increased from 35,4kg to 49.9kg on arable land, but the amount of phosphorus and potassium fertilizer decreased compared to previous years and increased the amount of nitrogen fertilizers.

However, these quantities are much lower than it is necessary for the crops, consequently, they intake from the soil reserve, as it is also observed from the data obtained within the level I monitoring network.

The amount of manure (Table 4.1.5.1.-2) decreased by 20% during 2013, compared to 1999, while the surface onto which it was applied by 10%.

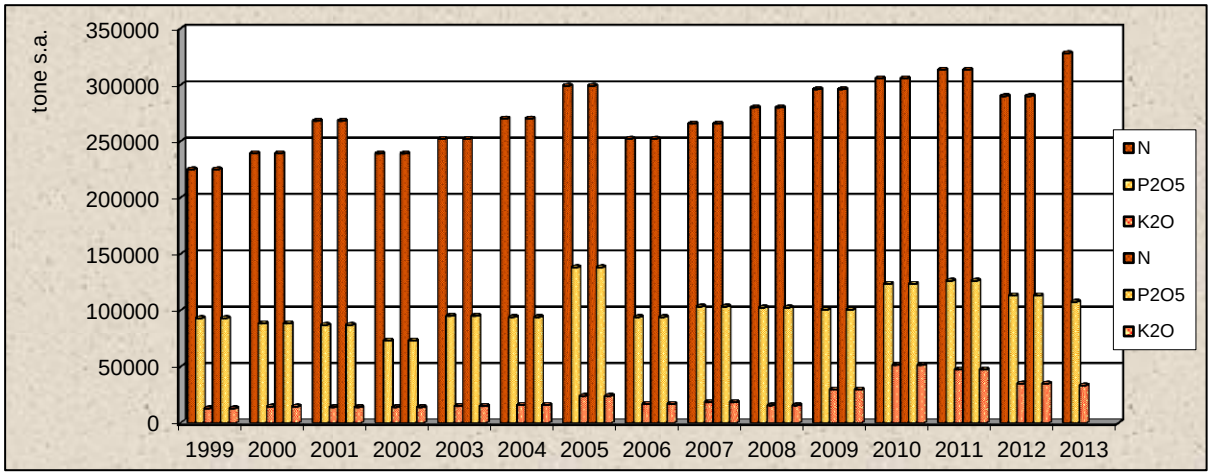
In 2013, only 6.5% of arable land is fertilized with manure, which, in conjunction with mineral fertilization data, indicates the need to balance the nutritional balance of these lands, to achieve secure and stable crops.

Tabel 4.1.5.1.-1 *Use of chemical fertilisers in agriculture between 1999 - 2013*

Year	Chemical fertilizers used (tons of active substance)				$N+P_2O_5+K_2O$ (kg.ha)		Fertilised surface, (ha)
	N	P_2O_5	K_2O	Total	Arabil	Agricol	
1999	225000	93000	13000	331000	35,4	22,5	3640900
2000	239300	88300	14600	342200	36,5	23,0	3724578
2001	268000	87000	14000	369000	39,3	24,8	-
2002	239000	73000	14000	326000	34,7	22,0	-
2003	252000	95000	15000	362000	38,5	25,6	-
2004	270000	94000	16000	380000	40,3	25,8	-
2005	299135	138137	24060	461392	49,0	31,3	5737529
2006	252201	93946	16837	363000	38,5	24,7	5388348
2007	265487	103324	18405	387000	41,1	26,3	6422910
2008	279886	102430	15661	397977	42,3	27,1	6762707
2009	296055	100546	29606	426207	45,3	29	5889264
2010	305756	123330	51500	480586	51,0	32,7	7092256
2011	313333	126249	47362	486944	51,8	33,3	6893863
2012	289983	113045	34974	438002	46,8	30,0	6340780
2013	328088	107543	33324	468955	49,9	32,1	5965817

Source: Ministry of Agriculture, Rural Development, The Department, for Agro-Environment Policies, Land Improvements and Land Capital

Figure 4.1.5.1.1 *Use of chemical fertilisers in agriculture between 1999 - 2013*



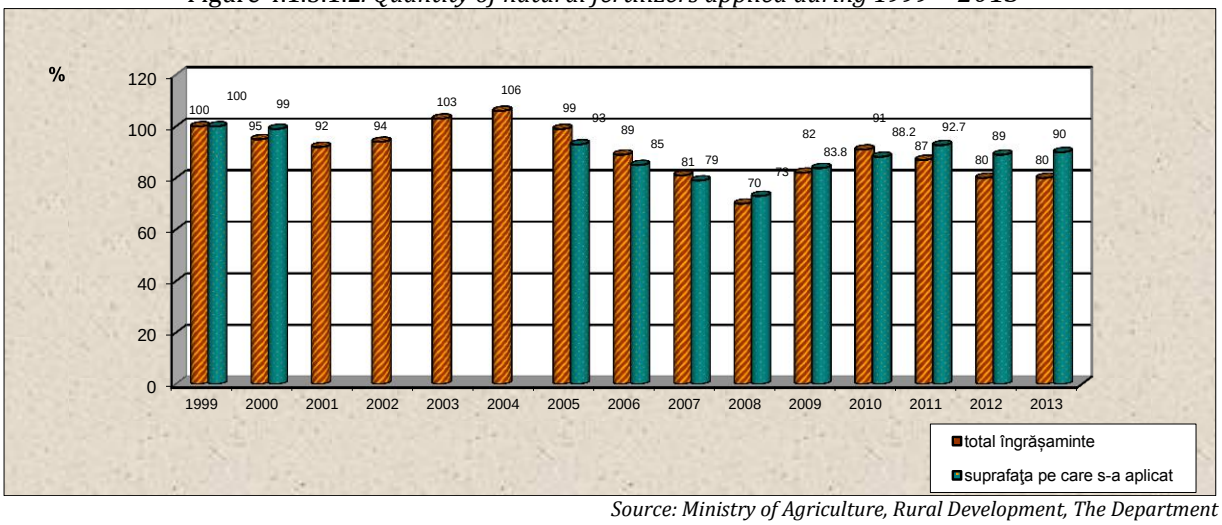
Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

Table 4.1.5.1.-2 *Quantity of natural fertilizers applied during 1999 - 2013*[1]

Year	Total of fertilizers		The area where fertilizers have been applied		Share of the application surface in comparison to the usable surface	**Average quantity of ha**			
						on the applied surface		on the arable surface	
	tons	%	ha	%	%	kg/ha	%	kg/ha	%
1999	16.685.312	100	680.016	100	6,90	24.537	100	1,129	100
2000	15.812.625	95	674.200	99	6,80	23.454	96	1,068	95
2001	15.327.000	92						1,032	91
2002	15.746.000	94						1,061	94
2003	17.262.000	103						1,173	104
2004	17.749.000	106						1,200	106
2005	16.570.000	99	632.947	93	6,78	26.179	107	1,124	100
2006	14.900.000	89	575.790	85	6,10	25.877	105	1.011	90
2007	13.498.000	81	536929	79	5,69	25.139	102	0,916	81
2008	11.725.220	70	494.412	73	5,25	23.715	97	0,797	71
2009	13.748.307	82	569.531	83,8	6,05	24,140	98	0,935	83
2010	15.231.715	91	600.052	88,2	6.37	25,38	103	1,04	92
2011	14.510.194	87	630293	92.7	6.70	23.02	94	0.99	88
2012	13.292.617	80	605694	89	6.48	21.95	89.5	0,91	81
2013	13.282.877	80	613563	90	6.53	21.65	88.2	0.91	81

Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

Figure 4.1.5.1.2. *Quantity of natural fertilizers applied during 1999 – 2013*



Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

4.1.5.2. Amendments

Is shown in Table *4.1.5.2-1* the situation of application of the amendments in 2013. Amendments were applied on an area of 21,945 ha, accounting for a total of 96.941t, and the average amount was 4.42 t ha. Compared to the previous year , decreased both the total amount applied and amended surface.

Table 4.1.5.2-1 *Data on amended agrigultural soil in 2013*

Treatment type	Surface (ha)	Quantity (t)	Medium quantity (t/ha)
Total	**21.945**	**96.941**	**4,42**

Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

4.1.5.3. Products for protection of plants

Compared to the member countries of the European Union, Romania is not even close to the position of being "saturated" with phytosanitary products, the average consumption in our country per arable hectare has dropped from 1.18 kg active substance/ha in 1999 to 0,865 kg active substance/ha in 2013 (table 4.1.5.3.-1).

4.1.5.4. Soils affected by zootechnical residues

According to inventories, almost 5,000 ha were affected by zoo technical residue pollution. As a result of the decrease of the livestock, the quantity of zoo technical pollutants have also dropped, and the switch from growing animals in cooperatives to growing them in households has reduced somewhat the concentration of residues in certain points and the dissipation of residues on larger areas, but with a reduced charge.

From the preliminary data of the last inventorying of the polluted areas, only an area of 4,973 ha has resulted as being affected by zoo technical residues (tab. 4.1.5.4.-1). At regional level 89.5% of the reported surface is located in the Northeast region.

In terms of differentiating agro-zoo technical waste management, the observation of the rules of good agricultural practices is imposed, in line with the legislation in force.

4.1.5.5. Situation of the arrangements of land improvements

Land improvements are managed, for the most part, by the National Administration of Land Improvements. In the year 2013, compared to 2012, the area landscaped with irrigation works and soil erosion works remained constant (table 4.1.5.5.-1 and figure 4.1.5.5.1).

The area improved by various works in the agricultural fund, administered by the National Administration of Land Improvements and local factors, in 2013:

- was of 8.403.632 ha, 254.626 ha less than in 1999;

The percentage of the main types of facilities is as follows:

- *the area equipped for irrigation* is theoretically accounted for 36.78% of all facilities, decreasing by 88,528 ha compared to 1999.
- *the area equipped with surface drainage works* comprises 36.72% of all facilities and decreased in 2013, by 115,658 ha compared to 1999 and by 266 ha compared to 2011.
- *the area arranged with antierosion works* is of 26.50% of all facilities, and decreased in 2013 by 50.440 ha compared to 1999.

Practically, according to the Statistical Yearbooks, in the 2000 – 2012 stage, small areas were irrigated, between 45,719 ha and 569 100 ha, and in 2012, 164.500 ha (tabelul 4.1.5.5-2).

Tabel 4.1.5.3.-1 *The situation of use of plant protection products during 2000-2013* **1)**

Specification	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
Arable land, thousands ha	***9381,1***	***9420,2***	***9427,3***	***9423,3***	***9415,9***	***9409,3***	***9405***	***9352,3***	***9352,3***	***9392,3***
Pesticide consumption										
Total (t. a.l.), of which:	***8.341,64***	***6.790,4433***	***6.994,3475***	***5.883,579***	***6.120,0208***	***4.167,6112***	***7.545.894***	***6.582.935***	***6.366.074***	***6566,378***
- insecticides	1.343,05	968,9147	858,8815	841,4090	718,0175	313,5112	2.061.336	993.324	827801	822953
- fungicides	3.959,16	3.304,7896	3.263,149	2.626,998	3.041,0103	1811,8567	2.066.323	1.989.229	1905005	1987348
- herbicides	3.039,43	2.513,254	2.857,754	2.394,142	2.344,524	2041,1925	3.418.235	3.600.382	3633268	3756077
Growth regulators		0,357		0,350	-	-	-	-	-	-
Miscellaneous Products		3,128	14,5630	20,6800	16,469	1,051	-	-	-	-
Returning per 1 arable ha										
Total (kg a.l.)	***0,89***	***0,72***	***0,74***	***0,62***	***0,65***	***0,44***	***0,80***	***0,70***	***0,68***	***0,865***
of which:										
- insecticides	0,14	0,10	0,09	0,09	0,08	0,03	0,22	0,11	0,09	0,108
- fungicides	0,42	0,35	0,35	0,28	0,32	0,19	0,22	0,21	0,20	0,262
- herbicides	0,33	0,27	0,30	0,25	0,25	0,22	0,36	0,38	0,39	0,495

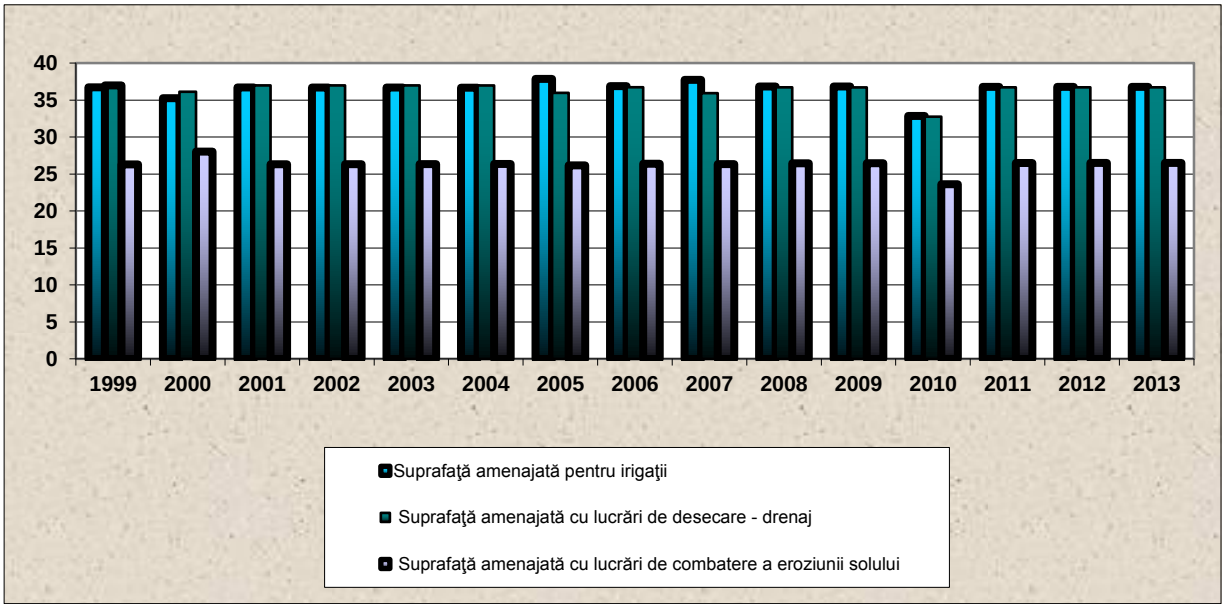
1) Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

Table 4.1.5.5.-1. *Evolution of land improvement, arrangements for agricultural lands during 1999-2013* [1)]

Year	Surface		Surface arranged			
	Arranged for irrigations[2]		with works of voidance-drainage		with soil anti-erosion works	
	ha	%	ha	%	ha	%
1999	3179796	36,72	3201553	36,98	2276909	26,3
2000	3177512	35,25	3201628	36,12	2485374	28,03
2001	3177207	36,7	3201628	36,98	2278490	26,32
2002	3176283	36,69	3201748	36,98	2279904	26,33
2003	3176252	36,69	3201885	36,98	2280336	26,34
2004	6176632	36,67	3202431	36,97	2281335	26,36
2005	3001091	37,86	2851181	35,97	2074913	26,17
2006	3097309	36,88	3085295	36,73	2216577	26,39
2007	3057047	37,73	2911441	35,93	2134250	26,34
2008	3095633	36,83	3085295	36,72	2222287	26,45
2009	3095721	36,83	3085895	36,71	2224469	26,46
2010	3094839	36,82	3085895	36,71	2225383	26,47
2011	3091268	36,78	3086161	36,72	2226470	26,50
2012	3091268	36.78	3085895	36.72	2226469	26.50
2013	3091268	36,78	3085895	36,72	2226469	26,50
±	-88.528		-115.658		-50.440	

1) Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

Figure 4.1.5.5.1 *Evolution of land improvement arrangements for agricultural lands (%) during 1999 – 2013*



Source: Ministry of Agriculture, Rural Development, The Department for Agro-Environment Policies, Land Improvements and Land Capital

Table 4.1.5.5-2. *The actual area irrigated (with at least one splash), during 2000 - 2012*[1)]

Area	2000	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012
ha	85.000	327.900	569.100	45.719	96.200	335.707	205.218	296.800	83300	102.800	164.500
%	100	286	670	54	113	395	241	349	98	121	193

1) Source: Romania's Statistic Yearbook, 2012

4.1.6. CRITICAL AREAS FOR SOIL DEGRADATION

4.1.6.1. Soil pollution from industrial activities(mining, steel, energy, etc.)

The quality of soils is affected, in different degrees of pollution, by industrial activities, as it is shown in data obtained from the partial inventorying performed. (tab. 4.1.6.1.-1).

Generally, pollution means, within the field of soil protection, any situation which affects the quality of soils from a qualitative and/or quantitative point of view.

The types of soil pollution are those foreseen in the Methodology for developing soil studies, Volume III (1987) and in the Romanian system of soil taxonomy (2003) (types of pollution - indicator 28).

The pollution degree has been assessed on 5 classes, either depending on the percentage of harvest reduction from the quantitative and/or qualitative point of view, compared to the production obtained on the unpolluted soil (Table annexes), or by exceeding the thresholds set forth by *Order no. 756 from November 3rd, 1997* for *approving the Regulations regarding the evaluation of environment pollution*.

Table 4.1.6.1.-1 presents the register of the surfaces affected by the three categories of pollution:

- **industrial and agricultural pollution;**
- **pollution by slope processes and other physical processes;**
- **soil pollution by other natural and/or anthropic processes.**

4.1.6.2. Industrial and agricultural pollution

In this category are included types of pollution with codes 1-9 and 17-20.

The general situation of soils in Romania affected by different processes is shown in Table 4.1.6.1.-1.

(*Source: National Research Institute for Soil Science, Agrochemistry and Environment - ICPA.*).

Table 4.1.6.1.-1 The general situation of soils in Romania affected by different processes [1)]

General name of the processes		Code	Surface (ha) and degree of damage					
			slight	moderate	strong	severe	excessive	Total
I	**Diverse processes of soil pollution caused by industrial and agricultural activities**	**1.** Pollution due to daily excavation works (daily mining exploitation, ballast-holes, careers, etc.)	2	16	255	519	23640	**24432**
		2. Pollution with landfills, heaps, sludge beds, mine dumps rubbish dumps etc.	247	63	236	320	5773	**6639**
		3. Inorganic wastes and residues (minerals, organic matters, including metals, salts, acids, alkalis), from industry (including the extraction industry)	10	217	207	50	360	**844**
		4. Substances carried by air	215737	99494	29436	18030	1615	**364348**
		5. Radioactive materials		500			66	**566**
		6. Organic wastes and residues from the food, light and other industries	13	19	12	17	287	**348**
		7. Agricultural and forestry wastes and residues	37	65	90	642	306	**1140**
		8. Animal faeces	2883	993	363	265	469	**4973**
		9. Human faeces		689	11		33	**733**
		17. Pesticides	1058	650	224	77	67	**2076**
		18. Contaminated pathogenic agents		505			117	**617**
		19. Salted waters (from oil extraction)	952	497	408	205	592	**2654**
		20. Oil products		473	248	5	25	**751**
		TOTAL I	**220939**	**104176**	**31490**	**20130**	**33350**	**410121**
II	**Soils affected by slope porcesses and other processes**	**10.** Superficial and deep erosion, landslides	944.763	1.013.854	749420	454150	210729	**3372916**
		15. Primary and/or secondary compacting	543371	544556	251268	125555	88526	**1553276**
		16. Pollution by sediments caused by erosion (mudding)	4088	2389	4808	1178	836	**13299**
		TOTAL II	**1492222**	**1560799**	**1005496**	**580883**	**300091**	**4939491**
III	**Soils affected by natural processes and/or anthropic processes**	**11.** Salt soils (saline and/or alkaline)	264163	80639	52488	36867	50678	**484835**
		12. Acid soils	1766295	1926886	716794	186023	18132	**4614130**
		13. Water excess	640738	1075063	420208	199479	185785	**2521273**
		14. Excess or deficiency of nutrients and organic matter	8358147	11604450	7549319	3306533	1373196	**32191645**
		TOTAL III	**11029343**	**14687038**	**8738809**	**3728902**	**1627791**	**39811883**
		GENERAL TOTAL	**12742504**	**16352013**	**9775795**	**4329915**	**1961232**	**45161495[2)]**

[1)] *Source: National Research-Development Institute for Pedology, Agro-chemistry and Environment Protection (R.I.P.A) and The County Offices for Pedology and Agro-Chemistry Studies (C.P.P.A.S);*
[2)] *The same area can be affected by several processes*

Code. 01. Pollution (degradation) by opencast mining soils, gravel pits, quarries

Among the forms of such pollution, the most serious is soil destruction on large areas caused by opencast mining to extract coal (lignite). As a consequence, the fertile soil layer is lost, disappear various agricultural and forestry uses. After preliminary data, at the country level are affected 24,432 ha, of which 23,640 are excessively affected. The largest areas are in Gorj (12,093 ha), Cluj (3,915 ha) and Mehedinti (2315 ha)

At regional level, the most affected are the South-West Oltenia (over 60% of the area affected) and North West (19%).

In Gorj county were recultured 3,333 destroyed ha and arranged to be an area of 12,093.5 affected ha, and in Valcea County and Mehedinti County are arranged 318 ha, respectively, 94 ha, and shall be recultured 1,074 ha and, respectively, 466 ha.

Important areas are affected by gravel (about 1,500 ha), which deepen the channels of waters, causing lowering of the groundwater and, consequently, reductions in water from surrounding areas, and soil disturbance by deposition of material extracted.

Code 02. Pollution with dumps, halde, decantation ponds, flotation tailings deposits, garbage deposits etc.

The increase in industrial and domestic waste raises special problems, both by occupying an important land area and for human and animal health. Operating decantation ponds may affect the surrounding lands where retention dams are broken through contamination with heavy metals, cyanide from flotation, with other elements in excess (as was the case in previous years in Baia Mare). The same effect have decantation ponds in conservation (eg Balan Quarry - Fagul Cetăţii pond in Harghita County - where grazing i done in conditions of soil pollution with heavy metals).

The preliminary inventory shows that this type of pollution affects 6,639 ha in 35 counties in which 5773 ha excessively. The largest areas are in the West (23.2%), Northeast (20.5%), North West (19.7%), Central (12.3%), South-West Oltenia (12 2%) (see tables 4.15.1, 4.15.2, 4.15.3, 4.15.7, 4.15.8).

Code 03. Pollution from waste and inorganic residues (minerals, inorganic materials, including metals, salts, acids, bases) from industry (including mining)

It is estimated that this type of pollution affects 844 ha, of which 360 ha are affected excessively, mostly in counties with mining activities, steel and non-ferrous metallurgy industry. At regional level the largest areas are in the (South-West Oltenia region (30%), South East (27.4%), North West (13.6%), Western Region (12.9%)

Cod 04. Airborne pollution substances (hydrocarbons, ammonia, sulphur dioxide, chloride, fluoride, nitrogen oxides, lead compounds, etc.)

Also important areas are affected by emissions from the fertilizer, pesticides, oil refining plants, as is the case in Bacau, where are poorly-moderately affected 104,755 hectares of agricultural land and the asbestos cement and binders plants. In the case of ferrous metallurgy (Baia Mare, Copsa Mica, Zlatna) were affected in varying degrees by the heavy metal content and the emission of sulphur dioxide, 198,624 ha, producing diseases of humans and animals in the surrounding areas within a radius of 20 -30 km.

Air pollution by substances that cause acid rain (SO2, NOx, etc.), such as fertilizer plants, power plants, etc., affect air quality, especially as is the case of non-ferrous metallurgy; they contribute to the acidification of soils in varying degrees, causing leaching of bases in the soil to depth and drastic reduction of the content of nutrients, especially phosphorus.

Another type of airborne substance pollution is produced by asbestos cement and binders plants, which in addition to air pollution, cover dust plants containing calcium, which in the presence of water form calcium hydroxide, causing foliage disorders.

Dissipation of ash from the coal power plants dumps pollute the air, are deposited on soils "enriching them" in alkali and alkaline earth that can reach groundwater if they are located on land with low level in these.

In total there are affected by airborne pollution 364,348 ha, of which 49,081 ha are strongly-excessively and moderately 99.494 ha. Over 87.3% of the affected areas are located in the Centre (43%), Northeast region (28.8%), South-West Oltenia (15.5%).

Code 05. Radioactive pollution is reported in 5 counties (Arad, Bacău, Braşov, Harghita and Suceava)

According to preliminary data, in total are affected by this type of pollution 566 ha, 66 ha excessively. This type of pollution is manifested in Arad, Bacau Brasov, Harghita, Suceava. The largest areas are located in Brasov (500 ha).

Code 06. Pollution from waste and organic waste from food and light industry and other industries affects 348 ha of which 287 ha excessively. The largest areas are in Caras-Severin (150 ha) and Galati (101 ha).

Code 07. Pollution from waste and agricultural and forestry residues

It is reported on 1140 ha of which very strong and excessive on 948 ha and the largest areas are in Bacau 626 ha.

Code 08. Pollution from animal waste

This is the disruption of the chemical composition of the soil by enrichment with nitrates, which may have toxic effects on groundwater. Are affected in varying degrees 4,973ha, of which 1,097ha moderately strong-excessive.

Code 09. Pollution from human waste

Sampled only in 4 counties affects 733 ha, of which 33 ha excessively polluted, but it is present in all areas, especially where there is no sewerage network.

Code 17. Pesticide pollution is reported in only a few counties totaling 2,076ha and of which 1,986 ha in Bacau County around Chimcomplex Complex; in general is slight and moderate pollution.

Code 18. Pollution with contaminated pathogens is reported only in four counties, 617 ha, of which 505 ha moderately and exeсessively on 117 ha.

Code 19. Salt water pollution (from oil extraction) or associated with crude oil pollution.

This type of pollution disturbes the ecological balance of the soil and groundwater on 2.654 ha, strongly-excessive on 1,205 ha. High levels of salt water in the case of "rash", drastically changing soil chemistry, meaning the penetration of sodium adsorption complex with toxic effects on plants, occurring flora Plover and contaminating groundwater. For land slope landslides occur. It can also be disturbed composition of groundwater that supplies wells of households on the territory of neighboring residents. The most important areas are located relative in the South-Muntenia (30.3%), South-West Oltenia (29.1%) and Northeast (27.9%).

Code 20. Oil pollution from mining, transport and processing - physical processes that occur due to oil extraction activities consist in the disturbance of the fertile layer of soil within operating parks (areas excavated, road transport network, powerlines, under pressure pipelines and surface or buried cables, etc.). All this has the effect of soil compaction, changes in the configuration of the land due to excavation and finally, reduction of productive agricultural land or forestry.

Chemical processes are determined by the type of pollution:
- Oil, or oil and brine (mixed);
- Upward, downward and superimposed pollution.

Nationally is prevailing the upward pollution, which is due, in general, to cracking pressure pipes, leaks of which may reach the pedofreatic canvas. Soil retention capacity of the petroleum products is dependent on the clay content, this being able to infiltrate, in general, up to 70-80 cm and more, making it difficult for the clean-up process. An important indicator illustrating these products in soil retention is the carbon / nitrogen (C / N) ratio.

In the 5 counties inventoried (Bacau, Covasna, Gorj, Prahova County) are affected 751 ha, of which 278 ha heavily-affected.

4.1.6.3. Soil pollution with emissions from coal thermal power plants

Within the research thematic approached, determinations of the physical and chemical features have been made in the last few years for the soils in the area of influence of some thermal power plants, the following elements being highlighted:

- early soil pollution with low-moderate amounts of heavy metals;
- a weak acidification of soils under the impact of low SO_2 emission, as a result of using lignite, less rich in sulphur;
- heat plants pollution effects extend over a wide area, but the most affected is that around the unit, and the heaps of sterile area, located on land depression, bearing the risk of allowing access into groundwater of heavy metals and acid pollutants, which have a higher concentration in the stored materials; for example, in the influence area of CET Mintia and Paroseni, 3.500 ha of agricultural lands are moderately affected and in the influence area of CET Rovinari and Turceni, about 30.000 hectares are weakly affected and 25.000 ha are moderately affected.

Although apparently less polluting than the non-ferrous metallurgy, the coal thermal power plants impose a series of actions to be taken, such as:

- continuous surveillance of the state of pollution of soils and vegetation in the affected area
- a re-technologization of the units in cause, by replacing used filters, desulphuring coals, especially in the case of those rich in sulphur, refilling the lands, etc.

4.1.6.4. Soil degradation due to slope processes

As shown in Table 4.1.6.1.-1 the situation of restrictive factors, at country level, the following areas are expected to suffer in varying degrees from slope processes,: 6,300,000ha by water erosion, 378,000ha by wind, and landslides of various types manifest differently on 702,000 ha

Also, in the above mentioned Table is the inventory made in recent years of the land affected by slope processes (surface erosion, depth, landslides and warping) in Romania.

According to provisional data, different slope processes affect 3,372,916ha, of which 664,879ha excessively-strongly. Over 33,5% (1,129,652ha) of the surface reported is in the North-East region, while large areas affected by erosion and landslides are also found in the South East (20,4% -689,410ha), Centre (440,745 ha), West (329238ha), North-West (316,809ha).

Compared to the total surface affected, previously mentioned, the total surface resulted is lower, taking into account the fact that mapping works have been run for only a part of the agricultural land fund, so that it is to be expected that the final surfaces are close to the initial ones, being however more reduced with the surfaces conceded to the forestry fund. On the other hand, it is possible that re-ceded forests, located on sloping lands, would stand for an extension of the degraded lands, by means of these processes.

Other natural and/or anthropogenic processes affecting soil quality are:

- primary and/or secondary consolidation, inventoried for 1.553.276ha, out of which very strong and excessive consolidation on 214.081ha; The largest areas are found in the West (32.4%), North-East (28.5%), South-Muntenia (14.7%) and Central (12.2%) regions.
- the pollution caused by sediments due to erosion (mudding) (code 16), signalled in 8 counties on 13.299ha, out of which strong on 4.808ha, very strong and excessive on 2.014ha. About 85% of the affected area is located in North-East region (11,293 ha).

4.1.6.5. Accidental pollution, major environmental accidents

Accidental pollutions: are environmental accidents that occur in its entirety and from very complex reasons

Natural pollution - is of secondary importance while the contribution of anthropogenic pollutants becomes more serious:

a) volcanic eruptions eliminate gases, vapours, solid particles that are transported on long distances by wind and air currents;
b) soil, wind erosion caused by rain, is all the more intense the more the soil is devoid of vegetation, in slope or in an area with rich hydrographic network;
c) plant and animal residues emit on decomposition a number of pollutant gaseous substances. Pollen or fungi can be natural aerosols which adversely affect human population health;

Artificial pollution takes the following form:

- physical (noise, radiation, heat);
- chemical, biological (pathogens, viruses, bacteria, fungi);

Depending on the environment in which it operates, pollution can be:

- air pollution;
- soil pollution;
- water pollution

The alarming increase of accidental pollution and especially those with serious consequences require urgent measures for making the control activities efficient, both through direct systematic actions, but also through better cooperation between territorial environment authorities and the economic potential environmental polluters.

Accidental pollutions can be:

- accidental pollutions determined by technological and human negligence causes;
- accidental pollutions of localities and lands with petroleum products, by breaking pipelines transporting these products;
- accidental pollutions determined by traffic accidents;
- accidental pollutions caused by natural factors;
- accidental pollutions with petroleum products.

In **ANNEX 2, Accidental pollution in 2013**, are presented, by counties and environmental factors, accidental pollutions that occurred in 2013.

The general trend is to reduce agricultural land in favour of other areas, **compared to 1990 the agricultural area of the country decreased with 178,100 ha**, which represents about 1.2% of the total agricultural land.

It is noticed an increase in areas affected by different degradation processes such as surface and depth erosion, excess humidity, activation and reactivation of semi-stabilised landslides, soil compaction, the weight of which varies in different counties, depending on their specific condition. It has also been found an increase in the acidity of soils, increase of shortage of nutrients, especially phosphorus and humus. All these have led to the expansion of areas with soils classified in quality classes IV and V.

4.1.6.6. Conclusions

The main restrictive factors of soil quality are drought, erosion and landslides, periodic waterlogging, salinization, compaction, increased acidification and ensuring particularly poor soil with humus and phosphorus.

The area of agricultural land with facilities total 8.4 mil. Ha, noting that much of that work are not maintained. Chemical fertilization of soils is declining, the average amount of N, P, K, dropping from 130 kg/ha of arable land in 1986 to 50kg/ha in 2013. Organic fertilization was applied in recent years only on about 6,5% of the cultivated area, using about 22 t/ha manure in 2013. Consumption of plant protection products dropped from 1.18 kg active ingredient/ha in 1999 to 0.87 kg/ha of arable land 2013

4.2 STATE OF THE FORESTS

4.2.1 NATIONAL FORESTRY REAL ESTATE

Romania's national forestry real estate occupies at the end of 2013, an area of 6539 thousands hectares, representing 27.4% of the country surface. Forestry real estate area on 31st of December 2013, compared with the same date of 2012, increased with 0.2% due mainly to the rearrangement of forest areas and introduction in the forest fund of the degraded lands, according to the *Law. 46/2008 concerning the Forest Code. Evolution the forestry real estate* during 2009 - 2013, is presented in Table 4.2.1-1.

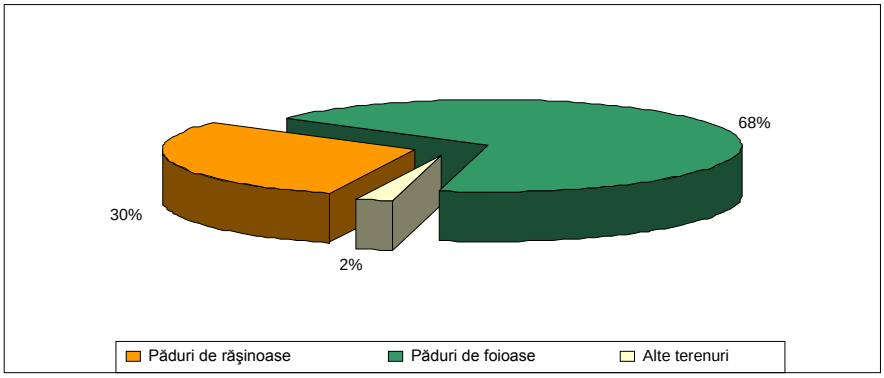
Tble 4.2.1-1 *Evolution of the forestry real estate, by usage, in the period 2009 – 2013*

Categories of use	National forestry real estate surface (thousands ha)				
	2009	2010	2011[1)]	2012	2013
Total forestry fund	6.495	6.515	6522	6529	6.539
Forest area, of which:	6.334	6.354	6362	6373	6.381
• resinous	1.935	1.941	1947	1945	1.937
• deciduous	4.399	4.413	4415	4428	4.444
Other lands the forestry fund	161	161	157	156	158

[1)] *Rectified data from the previously published, source NIS*

The forestry real estate in Romania is an area smaller that one third of the country, below the EU average, which is about 36%.

Figure 4.2.1.1. *Total forest real estate of wood component in 2013*



4.2.2 ECONOMICAL FUNCTION OF FORESTS

The relations of the forestry and forest sector as a whole, with other national sectors and economies, are of special importance. The forest, with its multiple ecological, economical and social functions it has, is a good national interest which is of interest and conditions various activity domains, from the environmental protection to those connected to capitalising the natural resources. The harmonious bonding of such preoccupations, which are apparently contradictory, is of maximum importance. Wood is the main exploitable product of forests. This is equally raw matter in the processing industry and construction materials, as well as fuel.

Among the forest non-wooden products, the most important ones are the hunting and fish products, forest fruit and edible mushrooms, wicker products, forest seeds and saplings, medicinal and aromatic plants, resin, honey etc. The privatisation of some connected activities in forestry and in the domain of exploiting and processing wood, as well as restoring the property right over a great part of the forest lands weights the evaluation of the real participation of the entire forest sector to GDP. Most of the newly created small and medium sized companies have registered mixed activities in the operating authorisations, and the statistic report of the turnover is not done by faithfully reflecting the share of forest activities.

The main forest products made in 2013, were:

- timber (gross volume) – 1 565 345,7 thousands lei;
- forest seeds – 663 thousands lei;
- forest fruits – 19 786,1 thousands lei;
- edible mushrooms from spontaneous flora – 905,3 thousands lei;
- hunting products (venison) – 1 757,9 thousands lei;
- honey – 36,6 thousands lei.

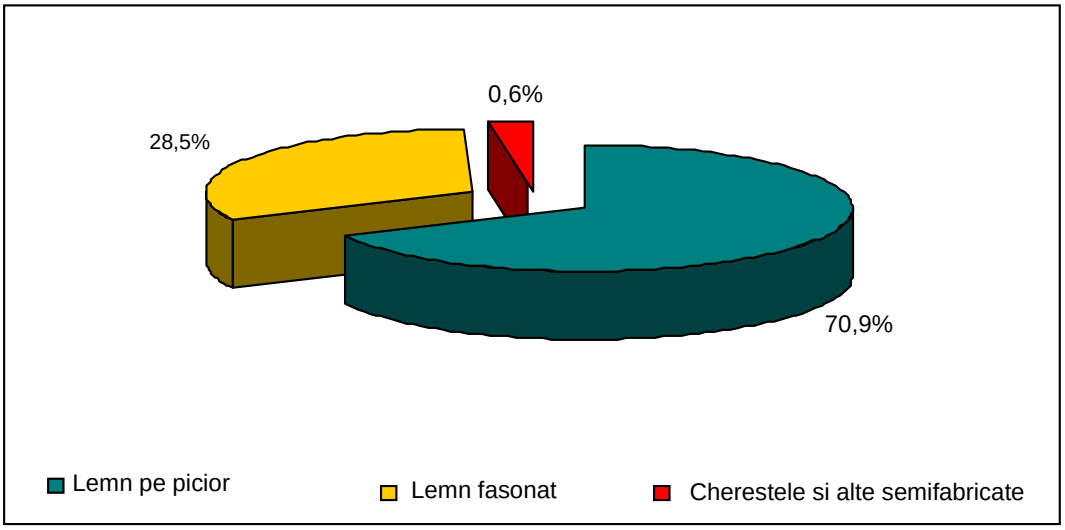
4.2.3 WOODEN MASS SET IN THE ECONOMICAL CIRCUIT

Forests provide economic used products (wood, game, fish, forage, berries, mushrooms, herbs), being also the most valuable biotope of the planet. As complex ecological system, of large dimensions and perennial nature, the forest improves the climatic conditions, improves surface run-off flows, prevents erosion and landslides, reduces pollution, and protects hunting.

From the forest, the most used is wood, the raw material for manufacturing, construction and households.

From the volume of timber sold, 70,9% is standing timber, 28,5% shaped wood and only 0,6% wood and other unfinished products(Fig. 4.2.3.1).

Figur3 4.2.3.1 *The structure of wood sold (gross volume) in 2013*



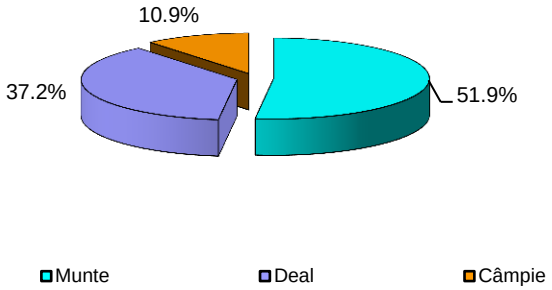
Distribution of timber sales (gross volume) in 2013, by development regions as follows:

- North East region - 28,4%
- Centre region - 22,2%
- West Region - 12,2%
- North West region - 12,1%
- South – Muntenia region - 9,9%
- South West Oltenia region - 7,4%
- South – East region - 7,4%
- Bucharest – Ilfov region - 0,4%

4.2.4 DISTRIBUTION OF FORESTS BASED ON THE RELIEF SHAPES

In figure 4.2.4.1 is shown the distribution of forests, by relief shapes, at a national level. The largest percentage of the total forested area is the mountain area, where the percentage reaches 51.9%. In the hill area forests occupy a percentage of 37.2% of the total forested area of Romania. The plain has the lowest percentage of forested area, representing only 10.9%.

Figure 4.2.4.1. The distribution of forests by relief shapes



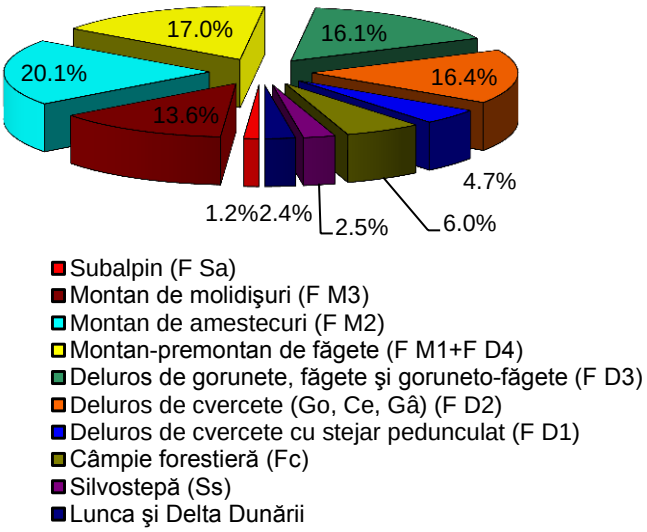
Distribution of forests on phytoclimatic floors, presented in figure 4.2.4.2, presents the varieties and specific elements for each of the three types of relief: plains, hills, mountains.

In plain it develops a characteristic steppe and steppe vegetation. In steppe and forest steppe, vegetation underwent anthropogenic changes and was replaced by large expanses of farmlands.

Sub-Carpathian hills and mountain area with lower altitudes are covered predominantly by oak and mixed with the altitude increases, the beach. It rises up in the mountain area around the altitude of 1200 m.

From the phytoclimatic point of view, in the mountain area mixed forest floor (beech, fir, spruce, larch, pine), floor and floor sub alpine mountain spruces and the highest altitudes are characteristic.

Figure 4.2.4.2 *Distribution of forests on phytoclimatic floors*



4.2.5 HEALTH STATE OF FORESTS

In 2013, forests of oak, poplar, willow and other deciduous trees were affected by defoliating insects on a total area of 469.815 ha.

Of this area, 46.141 ha were included in the control area and 423.674 ha in supervision area

Compared to the previous year there is an expansion of infenstations produced by *Lymantria* dispar that affected forests from the: Western Plain, Romanian Plain, Carpathian Hills of Muntenia and Dobrogea, Danube Delta.

The main defoliators of deciduous forests identified were: *Tortrix viridana, Geometridae*, *Lymantria* dispar, *Stereonichus fraxini* and Pygaera anastomosis.

Works to combat defoliator insects of deciduous forests in the state forests were carried out on a total area of 37,638 ha forest fund of which 36,778 ha were treated by aerial-chemical way and on 860 ha were applied soil treatments. Significant areas that on which there have been carried out works to combat defoliator insects of deciduous forests were found at the Forest Adminstration of Mehedinti - 17 849 ha and Dolj - 11,155 ha, while in other Forest Administrations who performed such work, the surfaces didn't exceed 2,000 ha.

At the Tulcea Forestry Administration, as forest areas infested with Lymantria dispar were found within the Danube Delta Biosphere Reservation and the legislation on environmental protection is restrictive in terms of application of chemical treatments in protected areas, were used treatments with InfLD virus from the ground up, to combat the defoliator on an area of 805 ha.

The defoliators of deciduous forests against which treatments were applied in 2013 were: *Lymantria* dispar on 36,006 ha, *Tortrix viridana*, individually or in combination with *Geometridae* on 896 ha and *Stereonichus Fraxin* on 736 ha.

From the assessments made on the ground in treated forests it is shown that in 2013 the efficacy of treatments was very high in all stands and all pests, pest insect mortality percentages ranging between 95 and 100%.

In parallel with these actions, the promotion of biological control methods by stimulating breeding insectivorous birds, ants protect useful and useful mammals (bats, hedgehogs, etc.), continued.

According to the measures set out in the stands of conifers infested with bark beetles were placed pheromone traps of different types, classic trap trees, chemically treated trap trees and baited with pheromones and chemically treated trap trees batteries and baited with pheromones.

In young plantations of spruce, fir and larch, *Hylobius abietis* saplings rammer was fought during the growing season, by installing toxic rugs on 2.885 ha.

In nurseries belonging to National Forest Administration - Romsilva, insects were controlled on 663 ha, plant parasites (mainly *Microsphaera* ab.) on 666 ha and rodents on 68 ha.

In young plantations and in natural regeneration, treatments against plant parasites were applied on 4.209 ha.

To prevent illegal grazing 10,9 km of hedges were installed and 45,1 km of ditches were executed.

In order to prevent fire propagation and extension in the forestry fund areas were mineralized lots in a total area of 1,329 ha.

In total, in the stands, nurseries and wickeries works preventive and curative works were executed on 220.326 ha.

In recent decades, in many forest areas, pollution has increased, affecting the health of trees in these areas. Industrial pollution, both the internal and the cross-border one, triggers acid rain. On extended area the harmful effects of dust resulting from the work units producing construction materials (cement and lime) act and are felt, juts like the effects of the thermal power plants operating on coal and oil shale.

Abnormal dryness due to industrial pollution is present in all forest species in areas of environmental impact, such as Zlatna, Copsa Mica, Bocsa - Crivina, Turceni-Rovinari Bicaz-Tasca, Anina etc. Toxic gases and dust released into the atmosphere caused a decrease in physiological processes of trees, reducing significantly the annual growth of wood, wood drying and qualitative degradation, followed by dissolution of soil erosion and land sliding downhill.

This phenomenon is present in stands of various ages, backgrounds and consistencies as well as on a wide range of site conditions.

Regarding the main reasons that cause premature drying and evolution of the phenomenon, research has highlighted the involvement, mainly, of the following factors: successive and long-term droughts, industrial pollution, excessive grazing, exploitation of wood by applying non-ecologic technologies, use of inadequate equipment etc.

4.2.6 SURFACES IN THE NATIONAL FORESTRY REAL ESTATE TRANSITED WITH CUTTING-DOWN

In 2013, 19064 thousand m^3 of wood (gross volume) were collected, resinous representing 41,3% of the total volume of timber harvested 32,2%, beech, oak 9,0%, various hardwood (locust, maple, ash, walnut, etc.). 10,1% and various species of soft wood (lime, willow, poplar, etc..) 7,4%.

Table 4.2.6.-1 *Evolution of the volume of timber harvested, by the main species in the period 2009 - 2013*

Wood species	Volume of timber harvested (thousand cubic feet (gross volume)				
	2009	2010	2011	2012	2013
Volume of timber harvested, of which	16.520	16.992	18.705	19.081	19.064
• resinous	6.635	6.832	7.521	7.615	7.866
• beech	5.489	5.654	6.175	6.332	6.135
• oak	1.403	1.566	1.747	1.687	1.719
• various hard species	1.845	1.785	1.946	2.014	1.927
• various soft species	1.148	1.155	1.316	1.433	1.417

Harvested timber was intended, in a proportion of 96,8% for the certified legal entities in forestry exploitation activities and 3,2% for individuals who are allowed to exploit the wood from the forests they own (table 4.2.6.-2).

Table 4.2.6.-2 *Evolution of the share volume of harvested timber, on main destinations, expressed in thousand cubic metres - gross volume in the period 2009 – 2013*

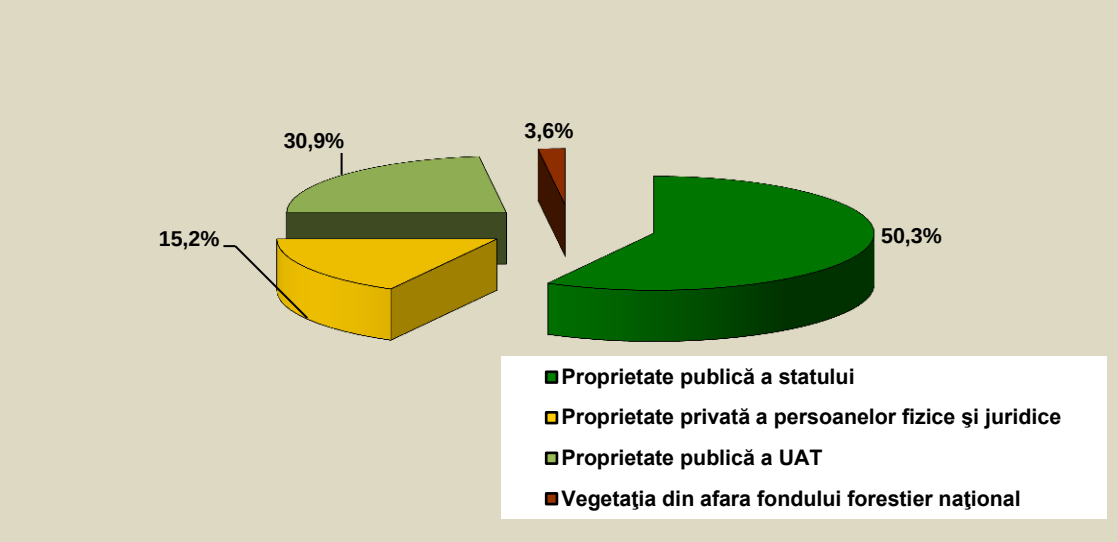
Wood species	Volume of timber harvested (thousand cubic feet (gross volume)				
	2009	2010	2011	2012	2013
Volume of harvested timber, of which	16.520	16.992	18.705	19.081	19.064
• for authorized legal entities	16.008	16.535	18.122	18.441	18.445
• for population supply	512	457	583	640	619

In 2013, 50,3% of the total volume of wooden mass was collected from the public property forests, the rest being harvested from publicly owned forests of administrative units (15,2%), private forests (30,9%) and forest vegetation located on lands outside the forestry real estate (3,6%).

The volume of wood harvested in 2013 compared to 2012 increased by 1.0% in privately owned forests and by 1.0% in publicly owned forests and forest vegetation outside the national forest. The publicly owned forests of administrative-territorial units has decreased the volume of wood harvested from the previous year by 8.0%.

Structure of the wood volume that has been harvested by ownership in 2013, is shown in figure 4.2.6.1.

Figure 4.2.6.1 *Structure of the wood volume that has been harvested by ownership in 2013*



In 2013, the main wood products accounted for 66.5% of the total volume of timber harvested, secondary wood products and wood products 21.5%, and 12.0% hygienic wood products.

In 2013, regeneration cuts in forests were made on 71,4% of the total area covered with cuts, coppice regeneration on 3,7%, substitutions-regeneration cuts on less productive and degraded trees on 1,0% and 23,8% conservation cuts.

Table 4.2.6.-3 *Evolution of the cutting surface, the types of cuts, in the period 2009 – 2013*

Types of cuts	Cutting surface (hectares)				
	2009	2010	2011	2012	2013
The total area covered with cuts	92.377	99.229	107.690	109.615	108.315
Regeneration forest cuts of which:	68.455	71.722	78.536	78.528	77.370
• successive cuts	4.472	4.302	5.315	3.958	3.613
• progressive cuts	53.660	56.827	63.905	64.560	63.296
• gardening cuts	6.507	5.767	4.863	5.441	5.585
• wiped cuts	3.816	4.826	4.453	4.569	4.876
Regeneration cuts in the grove	3.665	4.568	4.565	4.318	4.031
Substitution-cutting productivity and poor recovery of degraded forest brushes	1.175	1.033	1.088	958	1114
Conservation cuts	19.082	21.906	23.501	25.811	25.800

Areas on which all the wood was harvested were the ones with wiped cuts (6,3% of the total regeneration cuts), with such areas to be afforested or used in other forest purposes.

4.2.7 AREAS WITH FORESTRY VEGETATION DEFICIT AND AVAILABILITIES OF REFORESTATION

The counties where forests occupy reduced surfaces are:

Ilfov and Bucureşti	– 3%;	Călăraşi	– 4%;
Constanţa	– 5%;	Brăila	– 5%;
Teleorman	– 5%;	Ialomiţa	– 6%;
Galaţi	– 8%;	Olt	– 9%;
Botoşani	– 10%;	Giurgiu	– 11%;
Timiş	– 11%;	Dolj	– 12%;
Tulcea	– 12%.		

4.2.8 FOREST AREAS REGENERATED IN 2013

In 2013, regeneration of forests was carried out on 26.285 hectares, 558 hectares more than in 2012. Of the total area of forest subjected to regeneration, 59,6% (15.848 hectares) were natural regeneration, 7,8% more than in 2012 and 39,3% (10.437 hectares) were represented by afforestation (artificial regeneration), 5,3% less than the previous year.

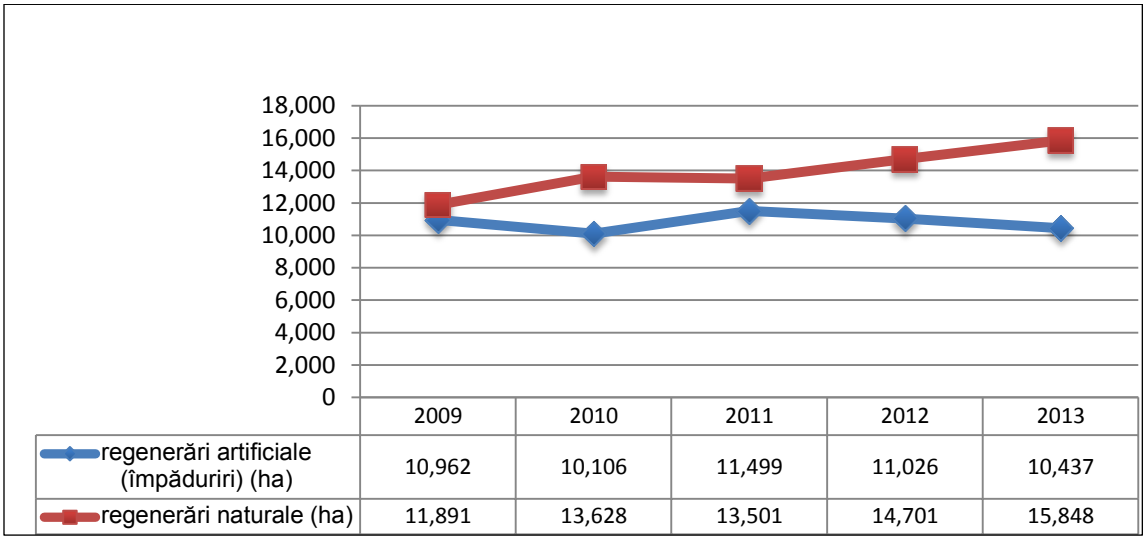
Evolution of forest areas subject to regeneration in the period 2009- 2013, is presented in Table 4.2.8.-1. şi Figure 4.2.8.2

Table 4.2.8.-1 *Evolution of forestry fund areas submitted to the regeneration process on categories of land, between 2009 – 2013*

Categories of lands	**Regenerated areas (hectares)**				
	2009	**2010**	**2011**	**2012**	**2013**
Total regenerations	22.853	23.734	25.000	25.727	26.285
Natural regenerations, of which:	11.891	13.628	13.501	14.701	15.848
• In forestry fund	11.890	13.618	13.501	14.618	15.848
• Other lands outside the forestry fund	1	10	0	83*	0
Artificial regenerations, (forestations), of which:	10.962	10.106	11.499	11.026	10.437
• In forestry fund	10.380	9.659	10.331	10.088	9.902
• On lands taken over in forestry fund	0	0	425	106	33
• Other lands outside the forestry fund	582	447	743	832	502

***** *lands taken over in forestry fund and lands outside the forestry fund*

Figure 4.2.8.2 *Evolution of the share of naturally and artificially regenerated areas in the period 2009 – 2013*



In 2013, most of afforestation, 98,1% (25.783 hectares) were made on forest fund lands and only 1,9% (502 hectares) on land outside the forest fund.

Compared to 2012, the area afforested in 2013 with deciduous species was higher by 1.075 hectares, while the area of coniferous forest species was higher by 517 hectares.

Table 4.2.8.-3 *Forestation surface evolution, by species, in the period 2009–2013*

Species	Afforested areas (ha)				
	2009	2010	2011	2012	2013
Total forestations, from which:	10.962	10.106	11.499	11.026	10.315
• with deciduous species	6.265	4.849	5.758	5.216	5.106
• with resinous species	4.697	5.257	5.741	5.810	5.209

The largest forest area, 98,8% was achieved by plantations, of which the seedlings of deciduous species on 49,5% and resinous seedlings on 50,5%.

Table 4.2.8.-4 *Forestation surface evolution, by species, in the period 2009 – 2013*

Type of afforastations	Afforested areas (ha)				
	2009	2010	2011	2012	2013
Total forestations	10.962	10.106	11.499	11.026	10.437
Seedlings plantations	10.840	10.022	11.499	10.969	10.315
Direct sowing of forest trees, of which:	122	84	50	57	122

In 2013 works were made for preparing the land on an area of 3761 hectares and soil on an area of 2614 hectares.

At the same time, works to help the natural regeneration on 17.598 ha were carried out, 1.277ha more than in 2012.

4.2.9. ANTHROPIC PRESSURES EXERCISED OVER FORESTS, PUBLIC AWARENESS

Although it is relatively reduced compared to previous year, the phenomenon of illegal cuts also persisted in 2013, the following factors being identified:

- the low level of the inhabitants' incomes in the areas affected with illegal cuts, which has determined the search for income sources from the forests;
- incompletion of the general cadastre and real estate advertising, which allows circuits of transactioning the forest lands/wood mass by abstracting from the legal stipulations on managing or providing services in forest system;
- non-provision of the forest services, respectively guarding the private forestry fund by the owners;
- the shortage of personnel controlling the forest system in relation to the high degree of diversity of property forest categories, with the very large number of properties and with a high degree of dispersion and fragmentation of the forest properties belonging to the natural persons;
- creating the artificial economical circuits;
- uncontrolled development of the wood primary processing capacities, by far over the size of the forest resources legally created;
- formation of some wood illegal commercialising networks in the forests scanty areas, by entrepreneurs forcing the resource in the counties with wide forest surface;
- the crisis of the conventional power sources, correlated with the lack of strategies for capitalising the chopped wood and remains of exploitation with energetic aims, stated in abstracting and wasting the valuable wood resource; among other things, this has lead to disconnecting the consumers from the natural gas network and switching to wood-based heating, normally apt for industrial use;
- non-implication of the state's authorities in binding the owners to forest, at their own costs or by enforceable titles, the surfaces which the wood has been abusively exploited from;
- removing and wasting wood resource by the trade companies performing wood exploitation works without complying with the equipment and specialised personnel conditions;
- lack of local bodies' implication, other than the forest ones;
- lack of celerity of handling the forestry criminal cases and wood trade;
- non-concordance between some regulations on the forestry system and stipulations of the Constitution of Romania regarding the property right and way in which this is manifested.

4.2.10. IMPACT OF FORESTRY OVER NATURE AND ENVIRONMENT

If a coherent policy regarding the sustainable management for the national forest fund is ensured, the effects on the environment elements (stopping of torrents, improvement of degraded lands, improving the climate conditions, with favourable effects on agricultural crops, etc) will also contribute to maintaining the CO2 level in atmosphere, by significant increasing the carbon stored in trees and in forest soils.

The increase of the forest surfaces and other lands covered with forest vegetation, besides shielding the torrents, the improvement of the degraded lands, improvement of the clime conditions with favourable effects on agricultural harvests etc., shall also contribute to maintaining the CO_2 balance in the atmosphere, by considerably increasing the carbon stored in trees and forest soils, from about 1,225 million tons, currently, to around 1.600 millions of tons in the future, when an adequate structure of the newly created forest ecosystems would be done.

4.3 TRENDS

The general trend is to reduce the agricultural land in favour of other areas, relative to 1990, the country's agricultural land decreased by 133,500 ha, representing about 1% of total agricultural land.

One can note the increase of areas affected by different degradation processes such as surface and depth erosion, excess humidity, activation and reactivation semi-stabilized landslides, soil compaction, the weight of which varies in different counties, according to their specific conditions.

From the inventory conducted by the Research Institute for Pedology and Agro-chemistry in collaboration with 37 offices for Pedological and Agricultural Studies, in the years 1994-1998, from 41 counties, and other research units on approximately 12 million hectares of agricultural land, of which approximately 7.5 million

hectares of arable land (about 80% of arable land), soil quality is affected to a lesser or more extent by one or more restrictions determined either by natural factors (climate, form of relief, edaphic characteristics, etc..), or by agricultural and industrial human activities; in many cases these factors may act together in a negative way and having the effect of decreasing soil quality and even cancelling its functions.

Their damaging influences are reflected by the deterioration of the features and functions of the soils, respectively in their bio productive capacity but, what is even more serious, in affecting the quality of the agricultural products and food safety, with serious consequences in the quality of human life. For the most part, the status of the managed improvements made by the National Administration of Land Improvements, is far from satisfactory, some of which are not functional due to lack of exploitation equipment, of poorly maintained component parts and lack of maintenance and operating funds. As consequence, it is necessary to rehabilitate and modernize the land improvement works.

It was estimated at country level that the following areas are suffering in different degrees, from slope processes:

- 6.300.000 ha – water erosion (rain),
- 378.000 ha – wind erosion (wind),
- 702.000 ha – landslides (land) of different types.

Over 33.5% (1,129,652ha) of the surface reported is located in the North-East region, large areas affected by erosion and landslides are also found in the South East (20.4% 689,410ha), Centre (440,745ha), West (329,238ha), North-West (316,809ha).

Compared to the total surface affected, previously mentioned, the total surface resulted is lower, taking into account the fact that mapping works have been run for only a part of the agricultural land fund.

On the other hand, it is possible that the re-ceded forests located on sloping lands would stand for an extension of the degraded lands by these processes.

By their very existence, forests provide shelter to a wide variety of species of wildlife hunting, but allow harvesting and other non-wood products as berries, mushrooms of spontaneous, grass species used medicinally or ornamental resin.

Sustainable forest management ensures realization of their multiple economic, social and environmental. Human influence on the forest is generally negative and results from the violation of forest and environmental legislation on cutting of trees, arrangement of campsites, collection and transportation of waste to pre-determined places, setting fire hearths.

Measures that need to be undertaken in the field of forestry fund must focus on: preservation of biodiversity of forest ecosystems through sustainable management measures, by applying intensive treatment that promotes natural regeneration of species of the fundamental natural forest type, by conservation of virgin and quasi virgin forest, increasing the forest area through forestation of land outside the forest fund and inclusion of forested areas in forestry fund, reconsideration of forest treatments in light of the climate change, providing funds for the payment of compensation representing the value of the products that the owners of the products don't harvest due to the protection measures established by forest planning.

An un-afforested land is subject to further degradation. Instead, forested slopes, not only totally change the look of the place, but have an important role in filtering water. Forest contributes to the formation and preservation of environment, but in itself, in today's world, it needs constant care from man, so that it can exercise its environmental functions in good conditions.

5. PROTECTION OF NATURE AND BIODIVERSITY

If one way be better than another, that you may be sure is nature's way.
(Aristotle)

Biodiversity is made up of two words "biological" and "diversity". It encompasses the variety of all living organisms within and between species. Finally, biodiversity is nature in all its forms.

In 2002, world governments pledged to reduce the rate of biodiversity loss by 2010. The European Union took taken another step and advocated for total stopping of biodiversity loss in Europe by 2010. However, an evaluation of the European Environment Agency (EEA) shows that, despite the progress made is in some areas, the EU target will not be reached. Indeed, biodiversity loss still occurs with unprecedented speed.

Year 2010 was declared by the United Nations the *International Year of Biodiversity*, the subject at hand will be subject to an examination and an intense debate over the year. That the target has not been reached already produced serious discussions within the EU on the actions that are needed to conserve biodiversity.

We're back in a moment of reflection and opportunities. Pressures we face - whether economic or energy-related health and environmental - can be solved. We owe it to future generations. We will succeed best if we recognize that we know very little about our natural environment, its complexity and the effects they have on it. We need to rediscover humility and look back in amazement at what is around us. *(source: http://www.eea.europa.eu*).

5.1 ROMANIA'S BIODIVERSITY

5.1.1 STATUS

Romania's biodiversity is one of the most remarkable in Europe. It is important at global, regional, national and local level. Romania has ratified *The Convention for Biological Diversity* (referred to further as "The Convention" or CBD), signed at Rio de Janeiro, on 5th June 1992, through *Law no.58/1994.* In accordance with *The Convention*, through biodiversity we understand the variety of expression of the living world, the variability of the living beings from all sources, including, among others, of the terrestrial, marine and other waters' ecosystems and the ecosystems of the ecological complexes all the above are part of; this includes the diversity among species, between species and ecosystems.

The three objectives of CBD are:

- ✓ conservation of the biological biodiversity
- ✓ sustainable use of the components of the biological diversity
- ✓ fair and equitable division of the benefits resulting from the use of genetic resources.

Romania has continuously participated to the international environment politics, signing and ratifying the most important conventions, resolutions, declarations and environmental agreements. Thus, Romania has attended: The United Nations Conference for Environment Protection, Stockholm 1972, in 1992 The United Nations Conference from Rio de Janeiro, ratifying in 1994, *The Convention of Biological Diversity*, in 2002, The United nations Conference from Johannesburg.

At the same time, Romania ratified *The Convention on Wetlands* (Ramsar, 1991), *Bern Convention on Conservation of European Wildlife and Natural Habitats* (1993), *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES, 1994), *Bonn Convention on Conservation of Migratory Species* (1998), *Carpathian Convention* (2003). Also, our country joined the Pan-European Strategy and Action Plan on the Conservation of Bio-Diversity and of "landscape", the Agreement regarding the Conservation of Small Cetaceans from the Mediterranean and Black Sea.

Romania has become a member of several organisations and structural components from the network of environment protection and conservation: BIRDLIFE, ECONET, EMERALD, GREEN CROSS etc.

Not considering the great agricultural areas and some terrestrial and aquatic ecosystems under the negative impact of some pollution sources, where modifications of the structure and dynamic of the biological

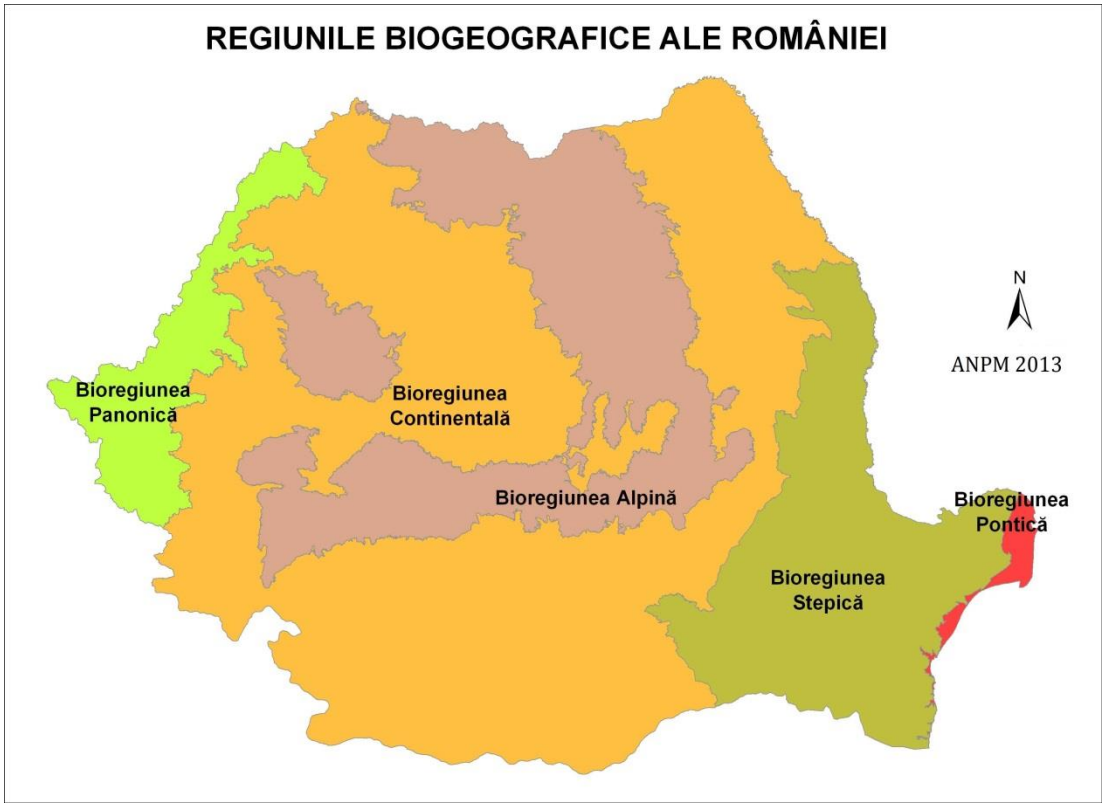
diversity are encountered, the rest of the natural environment is within normal parameters of quality, offering the necessary conditions for the conservation of the specific bio-diversity.

As a consequence of its geographical position, Romania enjoys the existence of a unique biodiversity, both at the level of the ecosystems and species but also at genetic level.

On our country's territory no less than 5 bio-geographical regions are joined, of which two, the steppe and the Pontic ones represent new natural elements added to the inheritance of the EU, marking the introduction of numerous types of habitats and species. The five bio-geographical regions are (figure 5.1.1. -1):

- continental (53%);
- alpine (23%);
- steppe (17%);
- pannonian (6%);
- pontic (1%).

Figure 5.1.1. -1

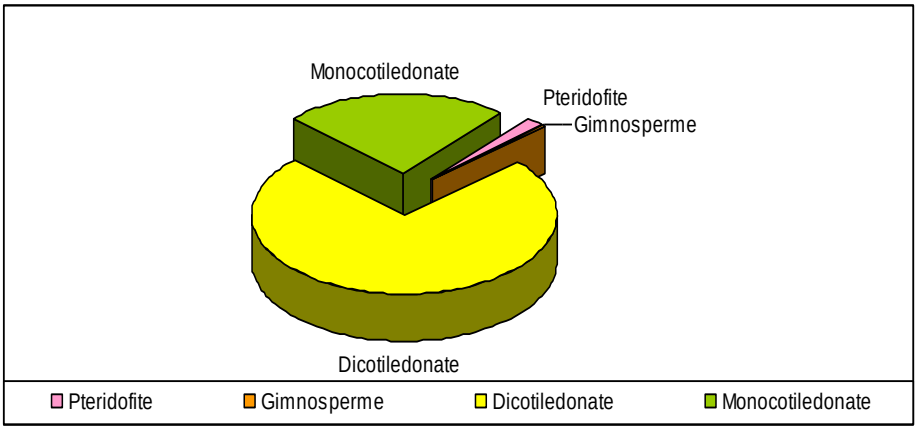


The variety of climate influences, of the types of relief and of the lithology, creates a great diversity of hydro-geomorphological conditions, which in turn determine unique and extended types of natural habitats, some of which are, possibly, without equivalent in the European Union. Also, the Carpathian chain is a vital habitat for the big carnivores. According to the report "*Study on estimating populations of large carnivores and the wildcat in Romania (Ursus arctos, Canis lupus, Lynx lynx and Felis silvestris) in order to maintain a favorable conservation status for setting the number of strictly protected animals which can be hunted in the 2013-2014 hunting season*", în 2013 was estimated a number of 9538 5786 – 6546 brown bears, 5926 2501 – 2932 wolves, 2635 1200 - 1435 Eurasian wildcat and 8563 10500 - 13000 wildcats, representing a large number of the population of these species of large carnivores on the European continent. Another natural area of European importance is the Danube Delta. Its marshes are a unique natural heritage with a rich biodiversity and many species of birds (more than 3,000 pairs of pelicans - representing over 80% of European livestock - will be protected by the EU Birds Directive).

The wild flora and fauna in our country shows Mediterranean, oceanic and continental influences, forming a natural patrimony of aesthetic, cultural and scientific value. Romania is well known for the flora diversity hosting 3.630 species of plants, of which, up to present, 23 species are declared monuments of nature.

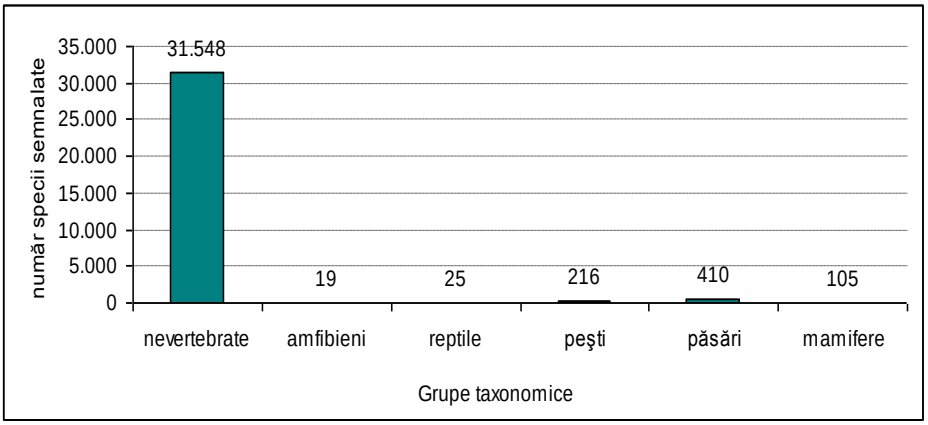
The *Red List* of superior plants in Romania (1994) comprises a number of 1.438 taxonomies and infrataxa (1.235 species and 203 subspecies) distributed on big taxonomic groups as follows: 26 Pteridophytes, 7 Gymnosperms, 1.062 Dicotyledon, 343 Monocotyledon (figure 5.1.1 -2).

Figure 5.1.1. -2 *Big taxonomic groups of superior plants*



Due to its greatly diverse habitats, Romania has a very rich fauna hosting 105 mammal species, 19 amphibian species, 25 reptile species, 216 fish species, 410 birds' species (figure 5.1.1. -3).

Figure 5.1.1. -3 *Species of wild animals present in Romania*



At regional level, the biodiversity is characterised through a great diversity of types of natural habitats as well as species of flora and fauna.

In the ***North-Eastern Region*** biodiversity is characterised by the existence of 3 bio-geographical regions: continental, steppe and alpine. The main types of habitats identified are: forest habitats, meadow and bush habitats, rock and cave habitats, moorland and swamp habitats, sweet water habitats. In hill and plane regions, broadleaf forests can be encountered. Mountain areas are covered in forests, especially coniferous forests. At the topmost part of the forest, there is the subalpine level made out from shrubs (juniper, blueberry, etc.). on the topmost ridges, there are alpine grass lands, covered with small herbs.

Main habitat types identified in **Bacau** county are habitats of forest, grassland and scrub habitats, rocky habitats and caves, bogs and marshes, freshwater habitats. Were designated by Law 5/2000, G.D. 2151/2004, OM 2387/2011 and G.D. 971/2011, a total of 35 protected areas. Among them 23 are protected areas of national interest: 9 natural reservations, 5 Special Bird Protection Areas - APSA and 12 are Sites of Community Importance: 9 SCI (Sites of Community Importance) and 3 SPA (Bird Protection Areas).

Among the natural protected areas of national interest (natural reservations and APSA) and Community interest ones (SCI and SPA) there are many overlaps, so the total area of the county included in protected areas cannot be simply summed up. The total area of sites of Community importance in Bacau county is 45,179ha,

which is based on the total area of 660,300 ha, a proportion of 6.84% and natural areas of national interest occupy a total area of 9725.7 hectares, that is, 1.47%.

Major habitat types present within the county are: forest habitats, agricultural habitats, meadows and pastures, wetlands and aquatic habitats.

Forest habitats in the county cover an area of 265248ha of which about 44% is distributed in the mountains, 43% in hilly areas and 13% in the plains. These are of particular importance for biodiversity and are a vital support for many species of national and community interest, also are important passageways for the migration of strictly protected species of large carnivores (bear, wolf, lynx and wild cat).

Wetland habitats are home to a rich invertebrate and fish fauna and are important areas for nesting and feeding and resting of the waterfowl of Community and national interest.

Areas that provide a mosaic of habitats, in particular the combination of wetland habitat and forest habitats, have an impressive richness of species and are those that must benefit of effective conservation measures, especially in the natural protected areas perimeters.

In **Botosani** county forest habitats, grasslands and scrub habitats, rocky habitats and caves, bogs and marshes, freshwater habitats, were identified.

1. Botosani County *forest habitats* have an area of 55,540 ha, which represents 11.07% of the county, a percentage that is below the national average (which is 27%).

2. *Grassland habitats (grasslands, meadows, natural grasslands)* total 89,781 ha and represent 18% of Botosani County.

3. *Rocky habitat* it is found in Ripiceni and Manoleasa villages and Ştefăneşti town. The limestone karst of these habitats is a favorable living environment for the thermophilic plant *"Schivereckia Podolia"* a national endemism with an "endangered" status.

4. *The bog habitat* is identified in the villages of Lozna and Dersca.

5. *Freshwater habitats* - the most important lakes in Botosani County are Costesti on the Prut River, the Accumulations Bucecea and Rogojeşti on Siret River, Cal Alb, Negreni, Havârna Hăneşti on Başeu River, Mileanca on Podriga River.

We can distinguish two areas of fauna: one of steppe and other of forest. Steppe fauna, respectively in the plains, is represented by some rodents *(Citellus citellus, Sicista subtilis, Microtus arvalis, Lepus europaeus),* mustelids *(Putorius putorius, Mustela nivalis)*, carnivores - *Vulpes vulpes*.

Avifauna is represented by numerous species protected by international agreements and conventions or by the Birds Directive, being the motivation of the proposals for Special Bird Protection Areas (in the Prut meadow there have been identified 93 species of birds). Were identified also mammals, amphibians, fish and invertebrates. Avifauna is represented by numerous species protected by international agreements and conventions or by the Birds Directive, being the base of declaring the Special Bird Protection Areas. On the larger ponds or puddles on the Prut there are often found the species *Fulica atra*, *Anas sp*, *Anser sp*, *Larus sp*, *Ardea cinerea, Nycticorax nycticorax*, *Egretta garzetta*, *Cygnus sp*, *Phalacrocorax sp*, *Podiceps sp*, *Aquila sp*, *Accipiter sp*, *Haliaeetus albicilla*. The most representative area of the county in terms of ornithological variety is the Prut meadow where have been identified 93 species of birds.

Forest fauna includes some of the elements mentioned above, but is characterized especially by the following species: *Capreolus capreolus*, common to all Siret hills and forests and in the hills Cozancea, *Sus scrofa*, *Vulpes vulpes*- that goes also to the plain where it hunts rodents, *Felis silvestris, Muscardinus avellanarius.* Avifauna is the represented by *Turdus merula, Turdus philomelos, Garrulus glandarius* and some species of chaffinch *(Parus major), Streptopelia turtur, Dendrocopus sp.* To these are added some prey birds as: *Milvus Accipiter sp and sp.*

Iasi county is characterized by a rich biodiversity, with cca.1760 species of wild flora and over 450 species of wildlife species that most of them are properly preserved in terrestrial and aquatic ecosystems. On the territory of Iasi County there were inventoried: 16 habitats of European Community importance, 6 species of flora of European Community interest with definite presence (listed in Annex 3b, GEO 57/2007), plus 4 species cited in the scientific literature for Iaşi County, but require further study for confirmation, 107 species of wild flora of national interest, 164 species of wildlife of European Community interest, 58 species of wildlife of national interest, 27 natural reservations, amounting to a total of 5330.89 ha, 19 sites SCI type - declared for the preservation of Community interest habitats and of Community interest species, other than poultry and 6 SPA type - declared for the preservation of birds of Community importance, therefore a total of 25 Natura 2000 sites. In the standard forms of Natura 2000 sites are included 16 habitat types of European Community importance. As regards fauna, are found species of mammals, birds, reptiles, amphibians, fish, invertebrates, insects.

The total area of protected natural areas of local, national and European interest, existing on the territory of Iasi County covers an area of approximately 80 000 ha, representing about 14.6% of the county.

In **Suceava** county, the peat reserves (*Tinovul Mare Poiana Stampei, Tinovul Gaina-Lucina, Tinovul Saru Dornei*) stand out, which preserve rare plant species and glacial relicts (dwarf birch, cranberry, Sphagnum moss, the dew of heaven) to this the reservations of secular forests (Slătioara and Giumalau secular woods) are added, which

are proof of the last virgin and quasi virgin bodies of forests. All these reservations are joined by the gorges reservations (*Moara Dracului, Cheile Zugrenilor, Cheile Lucavei*), geology (*Pietrele Doamnei-Rarau, Doisprezece Apostoli*), which are of landscape and recreational value. Very important are the botanical reservations where renowned researchers studied and which led to the discovery of new species important for science and flora of Romania (*Fanetele seculare Ponoare, Fanetele seculare Frumoasa, Rachitisul Mare, Fanetele montane Todirescu*). In the hilly and plateau areas one can find deciduous forests . Mountain areas are covered with forests, especially resinous (over 77% of the total area occupied by forests). Suceava County also has an important hunting and fishing fund, as well as the most outstanding meadows in the country.

At the upper limit of the forest is developed the sub-alpine level composed of shrubs (mountain pine, juniper, blueberries etc.). The highest peaks are alpine meadows consisting of small herbs. The diversity of flora and fauna specific to the county is linked to the existence of some habitats, mainly forest and water habitats, part of them unspoiled, which represent a wealth of great price, to be protected and exploited rationally. The county has an important hunting and fishing background and the best pastures in the country.

The biodiversity of **Vaslui** County is characterized by the existence of two bioregions: Step and continental, thus achieving a harmonious join of the natural pastures with forests specific to Central European element, showing florist influence of the steppe and forest steppe. On the hills unsuitable for agriculture and where the forest was cut, often are found specific elements of the Ponto-sarmastic steppe habitat. In this habitat, under Directive 92/43 / EEC, have a protection regime the following species: ground squirrel *(Spermophilus citellus)* tartan *(Crambe tatarica),* grass snake *(Echium russicum),* Iris *(Iris aphylla ssp. Hungarica).* * 40CO habitat - Ponto-Sarmatian deciduous bushes is the transit element from the grassland area to the forest area. In forest areas one can meet forest habitats, such as: Ponto- sarmastica forest vegetation with pubescent oak, Dacian oak and hornbeam forests, Eurosyberian forest steppe vegetation and Asperulo –Fagetum type forests of beech. Freshwater habitats are found in the floodplain of the river Prut that forms the eastern border of the county, a distance of approx. 150 km.

In Prut river's meadow, one can find ponds, marshes and lakes with a very rich underwater world, composed of species of fish, mammals and birds subject to protection under Directive 92/43/EEC .

Wild flora of Vaslui county is characterized by five European protected species and 14 endemic species, whose conservation requires a strict protection regime. We mention : zavascuta (*Astragalus manos pessulanus*), yellow tulip (*Tulipa bierberstiana*) soft chain dwarf (*Evonymus nana*), elecampane (*Inula oculus christi*) Sadina (*Chysopogon gryllus*), Sipic *(Cephalaria uralensis*), tendril (*Ephedra distachya*) Garn (*Quercus frainetto*), iris (*Iris brandzae*), nobleman's beard (*Ajuga laxmanni*) woody shrub (*Caragana frutex*), motley tulip (*Fritillaria meleagris*) pheasant's eye (*Adonis hybrid*) and woodruff (*Asperula moldavica*) .

Also in Vaslui County we meet 71 animal species protected at European level, of which: 5 species of mammals, 52 species of birds, 10 species of fish and one species of invertebrates. Most animal species protected under Council Directives 92/43/EEC and 2009/147/EC are found in the Prut river meadow. Of these, we mention: the ground squirrel *(Spermophilus citellus),* otter *(Lutra lutra),* in smaller rivers we meet small fish: Petroc *(Gobio kessleri),* boarca *(Rhodeus amanes sericeus),* mason *(Zingel zingel),* fusar *(Zingel streber),* sabit *(Pelecus cultranus),* avat *(Aspius aspius),* vârlar *(Misgurnus fossilis)*, grig *(Cobitis taenia)* and eel *(Misgurnus fossilis)* and a total of 26 bird species in accordance with in Annex I of the Council Directive 2009/147/EC.

In the ***South-Eastern Region*** biodiversity is characterised by the existence of 4 bio-geographical regions: alpine, continental, steppe and pontic.

Braila County holds a great variety of terrestrial and aquatic ecosystems (meadow forests, meadows, ponds, lakes and canals with alluvial shores), typical to the steppe bio-geographical region. The main types of habitats in the county are characteristic of the steppe biogeographical region and are both aquatic and land (forests and meadows). The forest vegetation habitats account for about 5% of the county's area (80% in the flood plains of the Danube and Buzau and Siret rivers - predominantly of poplar and willow - and 20% are composed mainly pf terrace forests of acacia and oak). Natural grassland habitats are better represented in the perimeter Natural Park Balta Mică of Brăilei. Aquatic habitats are quite diverse, ranging from the Danube arms and floodplains to various sweet or salted lakes located in the county, being also the ones that, despite human impact, best preserved the natural biological diversity, a characteristic of the region. Lakes in Brăila are divided into three categories: clasto-karst (lakes clustered in the loess subsidence depressions or krov), also called Crov lakes, river estuaries (oxbow lakes) and floodplain lakes.

Oxbow lakes and arm lakes are found especially in the Danube valley (Blasova) Călmăţui terrace and near Braila (Braila Salt Lake). An important class of surface water is represented by the therapeutic salt lakes, with sapropelic mud. These are: Salt Lake Braila, Câineni Băi and Movila Miresii Lakes. Over a half of the birds observed in the country are found here, this being located on the most important birds migration corridor from the lower basin of the Lower Danube, in the middle of the migration routes between the nesting areas from the north of Europe and their winter refuges in Africa. In Balta Mica a Brailei, which is a protected area, despite of the changes that have occurred in the structure of ecological systems, the natural ecosystems are preserved somewhere around 50%. In percentage, the bird fauna from the Natural Park Balta Mica a Brailei represents

more than half of that in Romania, namely 53%. Of these, 169 species are protected at European level (via the Bern Convention), 58 species are migratory birds protected by the Bonn Convention and 6 species are protected by the CITES Convention. Also, 68 species appear in Addendum 1 to the Birds Directive. The fact that this floodable area of Braila is part of the international network of nesting and passage locations situated on the eastern Danubian migration corridors, was the main reason why this area was declared protected area and, subsequently, admitted as a RAMSAR SITE humid area of international importance. Zoocenoses are specific to habitat types described above, the complex is characteristic of forests (mixed) and permanent ponds. The invertebrates are represented by the large number of species to all types of ecosystems, with a uniform distribution. Vertebrates are less numerous, both in number of species and number of individuals.

Buzau County has 3 bio-regions: continental (43.8% of the county), steppe (36.3% of the county) and alpine (19.9% of the county). 29 types of natural habitat of Community interest were identified, most of which are included in the sites of Community importance. The species of community interest identified so far, which have been designated sites and 8 species of mammals (*Canis lupus, Lutra lutra, Lynx lynx Spermophilus citellus, Ursus arctos, Sicista subtilis, Muscardinus avellanarius, Cricetus cricetus*), 8 species of reptiles (*Emys orbicularis, Elaphe quatuorlineata*, *Lacerta agilis, Lacerta viridis, Lacerta praticola, Podarcis muralis, Natrix tessellata, Vipera berus*), 12 species of amphibians (*Triturus cristatus, Triturus dobrogicus, Triturus montandoni, Bombina bombina, Bombina variegata, Hyla arborea, Pelobates fuscus, Bufo viridis, Rana dalmatina, Salamandra salamandra, Rana temporaria, Rana lessonae*), 8 species of fish (*Eudontomyzon mariae, Barbus meridionalis, Gobio uranoscopus, Gobio kessleri, Cobitis elongata, Cobitis taenia, Misgurnis fossilis, Cottus gobio*); 11 invertebrate species (*Carabus variolosus, Cerambyx cerdo, Lucanus cervus, Rosalia alpina, Callimorpha quadripunctata, Euphydryas aurinia, Boloria aquilonaris*, *Lycaena dispar, Lepidea morsei, Pholidoptera transsylvanica, Apatua metis)*; 13 plant species (*Echium russicum, Adenophora lilifolia, Campanula serrata, Crambe tataria, Eleocharis carniolica, Iris aphylla ssp hungarica, Agrimonia pilosa, Cypripedium calceolus, Dicranum viride, Drepanocladus vernicosus, Nitraria schoberi*- specie endemică, *Lycopodium inundatum, Polygonum alpinum*).

Among the animal species of community and national interest whose sampling in the wild and exploitation are subject to management measures (Annex 5A and 5B/GEO57) are present: *Canis aureatus*, *Martens martens, Mustela putorius, Rupicapra rupicapra*, *Sciurus vulgaris, Vulpes vulpes, Martens foina, Mustela nivalis, Meles meles, Capreolus capreolus, Cervus elaphus, Dama dama, Sus scrofa, Thymallus thymallus, Barbus barbus, Galanthus nivalis.*

Among the wild birds listed in Annex II of the Birds Directive we mention: *Acrocephalus arundinaceus, Acrocephalus palustris, Alauda arvensis, Anas acuta, Anas clypeata, Anas crecca, nas Penelope, Anas platyrhynchos, Calidris alpina, Calidris temminckii, Calidris ferruginea, Calidris minuta, Carduelis cannabina, Charadrius hiaticula, Coccothraustes coccothraustes, Columba oenas, Cygnus olor, Delichon urbica, Emberiza rustica, Erithacus rubecula, Falco subbuteo, Falco tinnunculus, Galerida cristata, Gallinago gallinago, Gallinula chloropus, Hirundo rustica, Larus cachinnans, Lanius excubitor, Merops apiaster, Miliaria calandra, Motacilla alba, Motacilla flava, Muscicapa striata, Netta rufina, etc.*

Have been declared protected species of fauna: lynx (Lynx lynx) - Siriului peaks, Milea Viforâta Forest, Harţagu Forest, White Stork *(Ciconia ciconia)* - plain area, great egret *(egret)* .- Balta Amara, Little egret *(Egret garzetta)* - Balta Amara, Scorpio *(Euscorpius carpatichus)* – Meledic Plateau, Capercaillie *(Tetrao urogallus)* - Siriului peaks, Milea Viforâta Forest, Harţagu Forest, termites *(Reticulitermes)* – the Hill with bats, Meledic Plateau, fallow deer *(Dama dama)* - Lopătari- Bisoca, green woodpecker *(Picus viridis)* – Sibiciu corridor - Lopătari, chamois *(Rupicapra Rupicapra carpathica)* - Siriului peaks, Mălâia.

Protected species of flora: Garofiţa *(Dianthus spiculifolus)* – Siriului peaks, Smirdan *(Rhododendron kotschy)* - Siriului peaks,, variegated tulip *(Fritillaria meleagris)* - Crâng Park in the city of Buzau, grove Tulip *(Tulipa bierbestiniana)* - Crâng Park in the city of Buzau, fluffy ash *(Fraxinus pallisae)* - Spătaru Forest and Frasinu Forest, Sundew *(Drosera rotundifolia)* - Lake Manta from Siriului Mountains, Mount Penteleu, Goodyera repens - Milea Viforâta Forest, Peony *(Paeonia arborea)* - Monteoru Park, Gărdurariţa *(nitration Schober)* - Pâclele Mari and Pâclele Mici, lady's slipper *(Cypripedium calceosus)* – Niscov Valley, Siriu, Tisa *(Taxus baccata)* – Nehoiului Valley, green algae *(Chara crinita)* - Balta Albă.

Constanta county is characterized by a large number of natural and semi-natural habitats with a vast diversity: aquatic habitat (freshwater aquatic habitats, brackish, marine and coastal), terrestrial habitats (habitats of forest, grassland and scrub steppe, steppe habitats, swamps and bogs) and underground habitats (cave habitats). Habitats identified so far are classified into seven classes (coastal and halophytic communities, continental waterways, thickets and meadows, forests, marshes and wetlands, detritus, rocks and continental sands, agricultural land and artificial landscapes), which include 58 types of habitats natural and ruderal communities (agricultural land and artificial landscapes), according to the classification presented in the paper "Habitats from Romania", 2005 N. Doniţă et . al., and annex 2 of the *GEO no. 57/2007 on the regime of protected natural habitats, conservation of natural habitats, of wild flora and fauna* and annex I of the Habitats Directive (92/43/EEC) . Among the 54 natural habitat types present or possibly present, 6 are European priority natural

habitats and 25 require special conservation measures nationally and are characterized by a high and very high conservation value.

Regarding ecology of plant species, dominant species are xerofile and xeromezofile, followed by mesophilic, hygrophilic and hydrophilic. Dobrudja is characterized by the floristic migration phenomenon particularly emphasized due to its climate, soil types at the location at the confluence of migration routes of varied phytogeographical elements (central European, Balkan, Pontic-Balkan, Pontic-Pannonian, Pontic, Euxine, tauro-Caucasus, Mediterranean, sub-Mediterranean etc.). Representatives are Eurasian species to which numerous Balkan, Pontic-Mediterranean, sub-Mediterranean and continental species are added. In the county there are over 900 species of Spermatophytae, from which to date there have been identified 8 plant species whose conservation requires the designation of special areas of conservation under the national legislation in force: *Moehringia jankae, Centaurea jankae, Centaurea pontica, Echium russicum, Liparis loeselii, Salicornia veneta*, *Campanula romanica*, *Potentilla emilii-popii*, mostly characteristic species to steppe and forest steppe habitats. Over 200 species of vascular flora of national interest, with varying degrees of hazard and vulnerability, have been identified in the county of Constanta.

It has also been identified and described a number of Dobrogean endemic species, such as: *Adonis vernalis var. murfatlariensis*, *Paeonia tenuifolia*, *Brassica elongata var. splendidepinnulata, Linum borzeanum, Carduus murfatlarii, Centaurea orientalis f. murfatlarii, Stipa lessingiana f. murfatlarii*..

Particularly interesting is the vegetation of marine dunes from Agigea, where on a small land area is found a great variety of plants, some of which are endemic. Floristic rarity from here are tertiary relict *Ephedra distachya* (cramp), *Alyssum borzeanum* and *Convolvulus persicus* (sand bindweed). The Romanian coastal flora of the Black Sea Constanta County has over 700 related taxa.

Wildlife of Constanta County is characterized by great richness, as a consequence of the variety of habitats and is represented by a number of more than 345 types of vertebrate (45 species of mammals, 243 species of birds, 19 species of reptiles, 10 species of amphibians and 28 species of fish) and a considerable number of invertebrates. Very well represented numerically are bats in the family of Rhinolophidae and Vespertilionidae, most of them vulnerable or endangered species.

Galati County has a wide variety of terrestrial and aquatic ecosystems (specific meadow forests, meadows, ponds and lakes, etc.) characteristic to steppe biogeographic region. The aquatic habitats, quite various, are those which, despite human impact, preserved best the natural biological diversity characteristic of the county. Continental biogeographical region is present in a small area in the north of the county. The richness of habitat types is reflected in the number of species of flora and fauna, many of which have special status - protected, endemic, rare, very rare, vulnerable or endangered. Conservation objectives underlying the designation of community sites of interest in the Galati county are represented by 19 habitat types and a number of species of flora and fauna, such as: 5 species of invertebrates: *Callimorpha quadripunctaria*, Erannis ankeraria, Cerambyx cerdo, Lucanus cervus, Vertigo angustior;* 11 species of fish: *Aspius aspius, Misgurnis fossilis, Cobitis taenia, Gobio albipinnatus, Rhodeus sericeus amarus, Zingel streber, Zingel zingel, Gobio kessleri, Gymnocephalus schraetzer, Pelecus cultratus, Sabanejewia aurata;* 4 species of reptiles and amphibians: *Bombina bombina, Emys orbicularis, Triturus dobrogicus, Triturus cristatus;* 4 mammal species: *Lutra lutra, Spermophillus citellus, Sicista subtilis, Mustela eversmannii;* 4 plant species: *Equim russicum, Iris aphylla ssp.hungarica, Pulsatilla granubis, Crambe tataria.*

An increasing number of plants and animals once found in abundance in these areas have become rare, some threatened with extinction. We mention only some species of birds affected numerically according to data from the Romanian Ornithological Society: Winter Grebe (*Podiceps grisegena*), Bittern (*Botaurus stellaris*), spearmen duck (*Anas acuta)*, Shelduck (*Tadorna tadorna)*, Little Grebe (*Tachybaptus ruficollis),* pelican (*Pelecanus onocrotalus)*, white stork (*Ciconia ciconia)*, black stork (*Ciconia nigra)*, red-necked duck (Branta *ruficollis*), etc.. The following became absolute rarities: red-necked duck (*Branta ruficollis*). Reduced numbers were recorded also for black stork (*Ciconia nigra*). Other vertebrate species recorded low numbers, such as species of amphibians and reptiles: bittern red-bellied toad (*Bombina Bombina*), European tree frog (*Hyla arborea*), agile frog (*Rana dalmatina*), green frog lake (*Rana esculenta*), the crested newt (*Triturus cristatus*). Populations of mammals *Lutra lutra* and *Sicista subtilis*, included in the European red List, also record decreases.

In **Tulcea** County almost all the relief types in Romania are present, starting with the Macin Mountains – the oldest mountains in Romania and among the oldest in Europe and up to Danube Delta – a land under the process of formation, the newest land in the country. Tulcea County is a very important area in terms of biogeography, through its great stationary and altitudinal variety of the area, which lead to the concentration of a number of species of flora and fauna of conservative interest, and at the same time, to the interference of floral species from the Central European, Mediterranean and Asian areals. The Danube Delta is important and famous for the impressive diversity of habitats and life forms it hosts, being a real museum of biodiversity, a natural bank of genes of inestimable value for the universal natural patrimony. On the other hand, in the continental part of the county there are landscapes of steppe and forest-steppe unique in Europe, which makes this area to be recognized as one of the most beautiful regions of the country. Here we find the largest area of Natura 2000

protected areas and sites in the country and one of the largest in the European Union, representative for steppe and pontic bioregions. The county is 60% covered with natural and semi-natural ecosystems, a number of 38 natural habitat types of Community interest being identified, included in Annex I of the Habitats Directive, and for which the 8 sites of Community Importance were established. Danube Delta holds 18 of those habitats that are not found in other areas of the county. Also in the marine area of the Danube Delta two specific habitat types are to be found and also, habitat 1180, "*Submarine structures made by leaking gases* " unique at country level.

Regarding flora, it is considered that Dobrudja concentrates 1911 species, of which 420 are threatened nationally, 14 are included in the *European Red List* and 4 are endemic to Dobrudja, which means that the flora of this province is very rich and is comparable with the Mediterranean islands of Crete and Corsica (Dihoru, 1970). In terms of importance at European level in Tulcea County 9 plant species of community interest were identified, whose conservation requires the designation of special areas of conservation according to Annex 3 of the *Government Emergency Ordinance no. 57/2007 on the regime of protected natural areas, conservation of natural habitats, of wild flora and fauna*, approved with amendments by *Law no. 49/2011*, namely: *Marsilea quadrifolia* (four leaf clover), *Agrimonia pilosa* (hairy agrimony), *Campanula romanica* (Dobrudja bellflower), *Echium Russicum* (snake head), *Moehringia jankae* (sandwort), *Centaurea jankae* (knapweeds), *Potentilla Emilii-popii* (cinquefoils), *Aldrovanda vesiculosa* (waterwheel plant), *Centaurea Pontica* (hemp flower). Among the species of wild flora identified nationally two are present in Annex 4 B of GEO 57/2007 with subsequent amendments: *Dianthus dobrogensis* (Dobrudja Dianthus) and *Paeonia tenuifolia* (Fernleaf peony). In the Red List of Macin Mountains National Park, carried out under LIFE Nature project, are included 136 species of wild flora listed according with similar endangered categories as IUCN, as follows: 4 species considered extinct, 3 endangered, 48 vulnerable species, 8 species with a less alarming conservation status, 73 species for which information is lacking.

In terms of fauna, at Tulcea county level one can find an important number of species of conservation interest at national and European level. Thus, a number of 163 species of Community interest were identified, listed in annex 3 of GEO 57/2007 with subsequent amendments and 110 species of national interest that require strict protection under Annex 4B of the same act. Among invertebrates, we can mention 9 species of community interest whose conservation requires the designation of special areas of conservation according to Annex 3 of the Emergency no. 57/2007, as amended and supplemented. Regarding the national importance, we can specify that a number of insect species are new alerts for the Romanian fauna frm Macin Mountains area, three of them being new species for science: *Polia cherrung, Chersotis laeta macini* şi *Chersotis fimbriata niculescui*. Of amphibians and reptiles in the county, we can find 7 species of community interest whose conservation requires the designation of special areas of conservation according to Annex 3 of GEO 57/2007, with subsequent amendments. Birds enjoy a large variety in the Dobrudja region and especially in the north, where the most important nesting and feeding areas for most species are to be found: the Danube Delta and Razim - Sinoe complex, Macin Mountains, Niculitel Forest and Babadag Forest. According to Annex 3 of GEO 57/2007, as amended and supplemented, Tulcea County has 100 bird species of Community interest whose conservation requires the designation of Special Avifaunistic Protection. In the Macin Mountains many protected species are considered rare or vulnerable: *Apus apus* (Swift), *Caprimulgus europaeus* (European nightjar), *Coracias garrulus* (Roller), *Lanius senator* (red headed shrike), *Merops apiaster* (eater), *Monticola saxatilis* (blackbird stone), *Oenanthe isabellina* (Eastern mason), *Oenanthe pleschanka* (black mason), *Haliaeetus albicilla* (white-tailed).

The mammal species in Tulcea County include 10 species of community interest whose conservation requires the designation of special areas of conservation according to Annex 3 of the GEO no. 57/2007, with subsequent amendments and supplements: greater horseshoe bat (*Rhinolophus ferrumequinum*), common bat (*Myotis myotis*), ground squirrel (*Spemophilus citellus*), small grivan (*Mesocricetus newtons*), mouse jumper steppe (*Sicista subtilis*), wolf (*Canis lupus*), otter (*Lutra lutra*), mink (*Mustela lutreola*), stained ferret (*Vormela peregusna*) and steppe polecat (*Mustela eversmanni*).

Vrancea County is characterized by all major forms and relief environments, arranged in decreasing order of altitude and located at the crossroads of different climatic, soil and biological areas. The County overlaps 3 bioregions (in terms of surface, mostly occupied by the Continental biogeographical region - about 60%) and has a remarkable biological diversity, through the presence of areas with extremely compact, inaccessible forest habitats, ideal habitat for large carnivores (wolf, lynx, bear), Vrancea ranks second nationally in terms of dense large carnivores. These species of priority interest for the European Union are subject to in situ conservation projects funded under LIFE Nature programme. In addition, Magura Odobeşti and Siret Valley regions come as areas of great importance for the avifauna. There were established, in the areas considered representative of Vrancea County, 5 major habitat types, presented in order of their representation in the area.

Most habitat types of Community interest identified in Vrancea County, were major argument in the proposal and designation of Natura 2000 sites: forest habitats (beech forests and in altitude, pine-beech forests or pine-beech-spruce forests on acid soils with *Luzula luzuloides, Polytrichum formosum, Deschampsia flexuosa* and often*, Vaccinium myrtillus, Pteridium aquilinum, Fagus sylvatica forests, and in the high mountains, Fagus sylvatica-Abies alba or, Fagus sylvatica-Abies alba-Picea abies, Alnus glutinosa alluvial forests and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion alba, Quercus petraea and Carpinus betulus Pannonian forests etc.)*,

grassy habitats (grasslands and thickets), peatland habitats and wetlands (Wind grass meadows with red fescue, red fescue grasslands), peat bog habitats, habitats hydrophilic. The spontaneous flora of Vrancea, 1,375 species and 99 subspecies of superior plants belonging to 109 families and 515 genres, were identified, of which 34 are ferns, 9 gymnosperms and 1332 angiosperms. Were determined over 150 plant associations, and in mountain and hill area stands out the presence of numerous endemic species among which: *Campanula carpatica, Dianthus kitaibelii ssp. spiculifolius, Ranunculus carpaticus, Sesleria heufferiana etc.* The following species stand out: *Cypripendium calceolus* (protected species whose certain identification was made in the Cenaru area and Tişiţa waterbed) and *Leontopodium alpinum* (declared natural monument – in Tisita gorges one can find it at the lowest elevation in the country. Previously, it existed over the entire sector of Tisita Gorges, but now it can be found only on the eastern slopes in the middle sector of Tişiţa stream).

Vrancea overlaps some of the most important areas of concentration of viable populations of wildlife in Romania. Many species, among which *Triturus cristatus, Triturus montandoni, Salamadra salamander, Bombina variegata, Hyla arborea, Pericallia matronula, Lutra lutra, Rupicapra Rupicapra, Lynx lynx, Canis lupus, Ursus arctos* present in the county, are in themselves elements which justify the setting up of protection regime for habitas where populations with significant levels were identified.

In the South-Muntenia Region 3 bio-geographical regions meet: alpine, continental, and steppe. In the mountains to the north of the region, there are a great number of rare, relict and endemic species concentrated. The fauna of the northern area of the region is rich and diverse, consisting of over 3500 species of animals and extremely numerous species of insects. In the central-southern area of the region, the wild flora and fauna have a less diverse and numerous level of representation due to anthropic interferences. In total, on the territory of the South-Muntenia Region, there have been identified a number of 55 species of flora of national interest and 41 species of flora of community interest, as well as a number of 405 species of fauna of national interest and a number of 372 species of fauna of community interest. The predominant types of natural habitats in the region are: meadow and bush habitats, forest habitats, rock and cave habitats, freshwater habitats, moorland and swamp habitats. Totally, a number of 61 habitats of national interest and 105 habitats of community interest were identified. In the South-Muntenia Region, the Danube passes through the counties: Teleorman – 87 km; Giurgiu – 76 km; Călăraşi – 150 km; Ialomiţa – Dunărea – 75 km and the Borcea arm – 48 km. In Calarasi County, it splits into two arms - Borcea to the left and Dunarea Veche to the right - which enclose Balta Ialomitei.

Due to its geographical position, ***Arges County*** has a rich and varied biodiversity, expressed both at the ecosystem level and at the level of plant and animal species of wildlife flora and fauna, some priceless in value and their uniqueness. Pe teritoriul judeţului In Arges County are found three of the five biogeographical regions in Romania: alpine area, the continental steppe area.

Forests cover 42% of the County. The high degree of afforestation of the County, particularly in Sub-Carpathian mountain area, offers optimal living conditions for many species of plants and animals for scientific interest and economic landscape. In general, the county maintains the natural quality natural parameters, with the conditions necessary for the conservation of biological diversity.

The forest runs from 150 m to 1800 m and occupies 42% of the county. The high degree of afforestation of the county, especially in the Sub-Carpathian mountain area offers optimal conditions of life for many species of plants and animals for scientific interest and economic landscape. There are found: flasks forests *(Quercus frainetto)* with *Genista tinctoria, Carex praecox*, Turkey oak forests *(Quercus cerris)* and flasks *(Q. frainetto)*. In the mixture may appear other tree species, such as *Quercus pedunculiflora* (gray oak) in the southern parts of the county, *Ulmus minor, Quercus robur, Carpinus betulus, Tilia tomentosa, Acer tataricum, Acer campestre*. The shrub layer consists of: *Crataegus monogyna, C. pentagyna, Prunus spinosa, Rosa dumetorum, Euonymus verrucosus, Cornus mas, Cornus sanguinea, Ligustrum vulgare*.

The grass stratum is evenly distributed and often continues and in the mesh forest grow meadow species. The species most common are: *Poa angustifolia* (narrow-leaved meadow), *Valesiaca Festuca* (fescue), *Lychnis coronaria* (opăţel), *Potentilla argentea* (scrântitoarea), *Geum urbanum* (common bennet), *Fragaria viridis* (forest strawberries), *Clinopodium vulgar*, *Achillea setacea* (yarrow). At the edge of the forest, especially on deforested lands, through thickets, appear vernal species such as: *Scilla bifolia* (violets), *Corydalis cava* species which give a characteristic note of these forest types. Grass vegetation zone: *Dichantium ischaemum, Festuca valesiaca, Lotus corniculatus, Agrimonia eupatoria, Cichorium intybus, Poa bulbosa, Lolium perenne, Agrostis capillaris, Prunella laciniata, Inula britannica* etc.

The mixture of steppe fescue and alfalfa: *Medicagini –Festucetum valesiacae* is confined in the arid coasts exposed to the south, east and west, and on flat land. The top layer consists of the dominant species of *Festuca valesiaca*, followed by *Dorycnium pentaphyllum subsp herbaceum*, *Dichantium ischaemum, Xeranthemum foetidum* etc. Woody vegetation is represented in Arges county, mostly by oak forests, creating a maximum width between Olt-Argeş-Dâmboviţa. The tree layer has a low coverage, consisting of: *Crataegus monogyna, Ligustrum vulgare, Corylus avellana,* more rarely *Prunus spinosa, Cornus mas, Euonymus europaeus, E. verrucosus* etc. Grass vegetation is represented by a large number of species, of which the most representative are: *Galium schultesii, Cardamine bulbifera, Lathyrus vernus, L. niger, Brachypodium sylvaticum, Polygonatum latifolium, Anemone ranunculoides, Veronica officinalis, Potentilla micrantha* etc. On the valleys and slopes with higher moisture

appear: *Pulmonaria officinalis, Carex sylvatica, Euphorbia amygdaloides, Galium odoratum, Asarum europaeum*. Are found in the mountain ranges between 900-1200 m altitude from Arges, on the sunny slopes and moderately inclined. This mixture is found in varying co-dominant ratios *Fagus sylvatica* and *Abies alba* (fir). Beech forests with fir, found in Piatra Craiului, towards Tămăşel (Iezer-Păpuşa) have a relatively high proportion of spruce dissemination. It is developed both on limestone, and on the crystalline schists. Hedges erected along the valleys belong to those identified by *Sambucetum racemate*. In glades and cuts are mostly found the phytocoenosis associations of *Fragario-Rubetum idaei* and *Calamagrostio-Spiraeetum ulmifoliae*. Wider in size are the berries developed on the site of spruce forests and placed in the *Campanulo-Vaccinietum myrtilli mixture*. The subalpine floor or juniper is well represented, stretching from old spruce forests. It is characterized by mountain pine and juniper shrubs, to which are added those of: blueberry, smardar, cranberry etc. These shrubs are common in Piatra Craiului, Iezer, Leaota, Făgăraş, where they occupy relatively large areas. Are also found the associations: *Rhododendro myrtifolii – Vaccinietum*, association identified in Iezer-Păpuşa, Buda, Râiosu, Piatra Craiului, *Rhododendro myrtifolii - Pinetum mugo* very common in the Arges sub-alpine floor, frequent on sunny slopes, *Campanulo abietinae–Juniperetum nanae.*. In the lower floor in Iezer-Păpuşa, above mountain pines, especially on the northern slopes, shorter shrubs form a nearly continuous band that can go up as patches of *Rhododendron and Vaccinium*, associated with *Dryas octopetala* and S*aponaria pumila,* up to the ridges and plateaus of Iezerul Mare, Bătrâna and Păpuşa mountains. By practicing intensive grazing, the *Festuca airoides* grasslands degrade and evolve towards *Nardo-Festucetum rubrae* (in this association are found the characteristic species *Potentillo-Nardion*).

Natural habitat types prevalent in the region are grassland and scrub habitats, forest habitats, rocky habitats and caves, freshwater habitats, habitats of marshes and bogs. In total, we identified 61 habitats of national interest and 105 habitats of Community interest.

Flora of Arges County is characterized, compared with the flora of Romania, by the predominance of Eurasian elements (28.3% and 26.6%), with some tendencies towards continentality, followed by Europe (13.75% and 11.9%), circumpolar (12.8% and 7.5%) and central Europe (11.3% and 8.4%). A large number of species of Alpine-Carpathian origin (3.05%) and the Alpine-Carpatho-Balkan (2.8%), Carpathian with endemic value (3.1%) and the Carpatho-Balkan (2.8%), few items are included in other categories, which account for reduced representation. În masivele muntoase din nordul regiunii, este concentrat un număr mare de specii rare, relicte şi endemisme. The mountain ranges in the northern region concentrate a large number of rare species, relicts and endemics. Fauna is rich and diverse, comprising over 3500 species of animals and very many species of insects. It can be considered that the conservation status of species and habitats is in its largest part favourable.

Calarasi County is made, in terms of habitat, of anthropogenic life environments in percentage of 98%, the dominant being plain. Most common habitats are grasslands, forest and freshwater, of which predominant are: Oligotrophic to mesotrophic standing waters with vegetation of *Littorelletea iniflorae* and/or *Isoeto - Nanojuncetea,* strongly mesotrophic waters with benthic vegetation of *Chara* species, rivers with muddy banks with *Chenopodion rubri* and *Bidention* vegetation; *Cnidion dubii* alluvial meadows. In the Danube Valley and habitat islands most often we find 92A0 coded habitat, called on the European level, Warbles with *Salix alba* (white willow) and *Populus alba* (white poplar) with *Rubis caesius* (blackberry stubble), and on the banks and very high islands a different type of habitat, the one coded 91F0 and named Mixed Riparian Forest with *Quercus robur* (English oak), *Ulmus laevis* (white elm), *Ulmus minor* (field elm), *Fraxinus angustifolia* (ash field). This third type of habitat, encoded 91E0 * is the Alluvial Forests with *Alnus glutinosa* (black alder) and *Fraxinus excelsior* (common ash) or *Fraxinus angustifolia* (narrow leafed ash). In the Danube Valley, this habitat corresponds to black poplar warbles, with *Rubus caesius* as black poplar forest along the Danube has the same role as black alder forest along rivers in mountain and hill. Flora and fauna of Calarasi county are characteristic to steppe and forest steppe zone, being directly influenced by the state of the environment in the county and not only. In Calarasi County there are 7 habitats of national interest, 1 habitat of community interest.

Calarasi fauna includes species of hunting interest, of which we mention boar, deer, pheasant, hare, and fox. In the ponds and lakes one can find wild ducks and geese. Among the fish that inhabit the waters of lakes and ponds we mention crucian carp, bream, perch, zander and pike, and in the Danube and Borcea we find cat fish, sturgeon and Danube mackerel. Were identified 21 national interest species of flora and 2 plant species of community interest, as well as 173 national interest and species of fauna and 66 Community interest species of fauna.

Dâmboviţa County has a rich and varied biological diversity expressed both at the level of the ecosystems and at the level of plants and animals of the wild flora and fauna, some of them invaluable through their value and uniqueness. In the absence of specific studies, it is not known exactly how many habitat types there are in Dâmboviţa County, but it is known that there is a concentration of habitats with a high number of endemic, rare and relict species in Bucegi and Leaota mountain ranges. The main types of natural terrestrial and aquatic habitats are: grasslands and scrub habitats (alpine meadows at 2,000 m, with alpine vegetation or association of dwarf or creeping vegetation *Agrostis rupestris, Dryas octopetala*, *Primula minima, Salix reticulata*, thickets of mountain pine (*Pinus mugo*), juniper (*Juniperus sibirica*), smardar (*Rhododendron kotschyi, Rhododendron*

myrtifolium etc.), forest habitats (spruce forests with *Vaccinium sp*. and *Polytrichum sp.,* spruce with *Pinus cembra* (bison), mix of coniferous and beech with *Festuca altissima* (fescue), medium edaphic sessile oak podzolit with graminaceae and *Luzula* (coastal sessile oak with graminaceae and *Luzula luzuloides,* cvercete with oak, brown, pseudo-glazed podzolit, edaphic large (mixture of pedunculate oak, sessile oak, Turkey oak and spruce etc.); rocky habitats and caves (Ialomiţei Cave, Pustnicul Cave, Urşilor Cave, Rătei Cave, Onicăi Cave; turistically unexplored caves, limestone grottos etc.), freshwater habitats (mountain streams and rivers: Ialomiţa, Brătei, Rătei, Cocora, Horoaba, Lăptici, Coteanu, Ialomicioara and other tributaries of Ialomia in the mountain area); habitats of marshes and bogs (eutrophic wetlands; oligotrophic wetlands - bogs in the mountains, ex. *Tinovul Lăptici* that encloses numerous relict species that were maintained in these habitats even during glaciation etc.).

So far, 1693 species of superior plants are identified. In Bucegi Mountains, the study conducted by the Bucharest Institute of Biology revealed the existence of 3037plant species, including all large species, from algae to cormophyte. Many endemic plants, rare or relics are put under protection in natural reservations in Bucegi mountains. The most representative endemic species of wildlife flora are: *Athamantha turbith subsp*. *hungarica* (Breiul) *Dianthus glacialis subsp. gelidus* (Dianthus) (Omu Peak, Mount Batrana), *Draba haynaldii* (whitlow grasses) (Babele, Batrana, Omu Peak), *Eritrichium Nanum* (snake's eye), (flagstones) *Festuca bucegiensis* (Carpathian fescue) (Omu Peak, Obârşia, Doamnele). Another category particularly interesting for wild flora of the county are the relict plants. The most significant point out : - tertiary relicts - *Hepatica transsilvanica* (liverleaf) - glacial relicts - *Salix myrtilloides* (swamp willow) and *Salix phylicifolia* (Tinovul Laptici in Bucegi Mountains), *Pinus cembra* (Swiss pine) (Horoabei Valley, Mount Batrana, Mount Cocora); *Hildenbrandtia rivularis* (red algae) (springs at Corbii Ciungi).

Wildlife is rich and diverse, as a result of the variety of aquatic and terrestrial ecosystems. The high degree of forestation of the county, particularly in the mountain and sub-Carpathian area ensures better living conditions for many species of wildlife of scientific and hunting interest. In the mountains, especially in Bucegi Mountains, so far over 3500 species of animals from rotifers to mammals, are known. 149 species of wildlife that are included in annexes of various international conventions on nature protection were inventoried. Invertebrate fauna is represented by: rotifers, gastropods, oligochaeta, tardigrades, crustaceans, millipedes, arachnids and insects, the latter two classes being the most representative for Bucegi Mountain. Of aquatic fauna, *Salmo trutta fario* (mountain trout) species inhabits the mountain waters, being represented especially in Ialomita river. Another class specific to mountain area is the amphibian class, of which we mention the species: *Salamandra salamandra* (salamander), *Triturus cristatus* (crested triton), Triturus montandoni (triton), *Bufo bufo* (common toad) . The reptiles present in Bucegi Mountains fauna are represented by species of the order of Sauria. Among vertebrates, birds class is represented by 129 species. Avifauna mountain area can be divided into alpine fauna and forest avifauna. Of the 129 species reported, 50 nest in the area and we can consider them to be specific to Bucegi: *Corvus corax* (raven), *Turdus merula* (blackbird), *Prunella collaris* (alpine accentor), *Prunella modularis* (dunnock), *Alauda arvensis* (lark), *Troglodytes troglodytes* (wren), *Anthus spinolleta* (Water Pipit), etc. . Most of these species have Palearctic spread. Mammalian fauna is represented by 45 species that inhabit the forests surrounding foothills and Sub-Carpathians, continuing with the sub-alpine and alpine zone to the alpine plateau area, the area of chamois (*Rupicapra Rupicapra*) . Of these, the most representative are: *Cervus elaphus* (red deer), *Ursus arctos* (bear), *linx linx* (lynx), *Felix silvestris* (wild cat), *Sus scrofa* (wild boar), *Capreolus capreolus* (roe), *Canis lupus* (wolf), *Rupicapra Rupicapra* (chamois), etc. The bison (*Bison bonasus*) - rare animal, protected by law, disappeared from our country's forests for more than a century, lives only in reservations. The biggest reservation of bisons in semi-freedom in Romania is Black Reservation, in the Bucsani Forestry Administration, managed by Dâmboviţa Forestry Department. The reservation has an area of 162 ha and 47 bisons, as of 1st of January, 2013.

In Giurgiu County, to prevent loss of biodiversity, several categories of protected areas were established as follows: six protected areas of national interest and nine protected areas of Community interest. Protected natural areas of community interest cover 16.34% of the county. The main types of coverings in Giurgiu county are forests, agricultural lands and water bodies. Forests play an important role in the evolution of the biodiversity and distribution of the ecosystem services. They provide natural habitat for plant and animal life, protection against soil erosion and flooding, climate regulation, with high recreational value. In the county of Giurgiu 10% of its surface is covered by forest and its conservation status is favorable.

Ialomita County has different natural habitats, landscape dominated by large tabular fields and meadows, steppe vegetation has character throughout the county. In fact, the primary steppes currently are gone because of grubbing and plowing. From the secondary formations of the steppe, today very degraded too, small fragments are to be found on the territory of the communes Cocora, Sălcioara, Movila, on land unsuitable for agriculture. They fall into the category of Western Pontic steppe with grasses (*Stipa ucrainica, Stipa lessingiana*) and dicotyledonated with *Caragana mollis*. Forest ecosystems, through the photosynthesis of trees, produce oxygen and gross phytomass, which partly accumulates by maintaining a continuous growth of the vegetative and reproductive organs and some parts of it are lost through breathing; the annual fall of foliage mass, branches, fruit, scaly, bark by drying of a part of the root in the soil, and by consumption of zoofage and

phytophagous organisms. For Ialomita county, there are no studies showing that areas and number of habitats, of national and Community interest. Annex 5 of Minister's Order 1964/2007, Reference list of habitat types and species of Community interest for which the sites were declared of Community importance, 21 types of habitats of community interest could be identified in steppe areas.

Of the many *xerothermophilous* species of this association by overgrazing and soil treading today only species with no forage value remained. The SW part of the county is the forest steppe area, with a number of large forests (Groasa, Odaia Călugarului, Sineşti, Stroiasca, Deleanca, Morăreanca), where stands of downy oak (*Quercus pubescens*) are still preserved and especially the gray one (*Quercus pedunculiflora*) and even Italian oak (*Quercus frainetto*) or Turkey oak (*Quercus cerris*) along with locust. In coppice, forests have in spontaneous flora dog rose (*Rosa canina*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*) which are also harvested for commercial purposes, wild privet (*Ligustrum vulgare*), cornelian cherry (*Cornus mas*), dogwood (*Cornus saguinea*) . The floodplains of Danube and Ialomiţa rivers contains vegetation debris with reed, bulrush and sedge as South European type warbles with willow and poplar, and large forests of willow, poplar and oak are found in Bărcăneşti, Alexeni, Slobozia Andrasesti, in Ialomiţei meadow and at Bordușani, Săltava, Balaban in the Danube meadow.

Fauna is represented by steppe species : gopher (*Citellus citellus*), hamster (*Cricetus cricetus*), lesser mole rat (*Spalax leucodon*), field mouse (*Mesocricetus Newtons*), steppe polecat (*Mustela eversmani*), hare (*Lepus europaeus*), quail (*Coturnix coturnix*), partridge (*Perdix perdix*), garden mouse (*Mus musculus spigilegus*), weasel (*Mustela nivalis*), and forest species : deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), foxes (*Vulpes vulpes*), wood mouse (*Apodemus sylvaticus*), badger (*Meles Meles*) . Among reptiles we mention Caspian whipsnake (*Coluber caspius*), lizard (*Lacerta taurica*), sand lizard (*Lacerta agilis chersonensis*). Birds are the most numerous: bee eater (*Merops apiaster*), redshank (*Tringa totanus*), Roller (*Coracias garrulus*), Skylark (*Melanocory - phycalandra*), crow (*Corvus corone*), magpie (*Pica pica*), sparrow (*Paser domesticus*), starling (*Sturnus vulgaris*), turtle dove (*Streptopelia turtur*), collared dove (*Streptopelia decaocto*), ring necked pheasant (*Phasianus colchicus*).

Prahova county is covered by continental and alpine regions and show a variety of habitats (territories), often unique, fulfilling the requirements to be included in this network. Due to great diversity of biotopes and habitats, Prahova County enjoys a rich inventory of species of flora and fauna, not missing endemisms, rare species, glacial relics, species of Community interest. Unfortunately, pressure from human activities (the need to extend the built area for some settlements, tourism development projects, and traditional activities such as grazing and wood exploitation) threatens to restrict the area for many of these species.

Natural heritage value of Prahova County is proved by the existence of elements of European importance in areas that have been introduced in Natura 2000 European ecological network.

In **Teleorman County** the good state of forest prevails(20330 ha), a small area (4472 ha) is in bad condition due to the phenomenon of drying and abusive cutting in private property. The forests occupy 24 708 ha (4.3% of the county's area).

In the *South-Vest Region*, biodiversity is characterised by the existence of several types of natural habitats, as well as numerous species o national interest & species of community interest. Of the types of habitats, we mentioned: meadow and bush habitats in the mountain areas-alpine plains "at over 2000 m altitude", mountain pine, juniper, rose bay bushes and sub-alpine meadows, mountain hayfields, forest habitats, rock and cave habitats: these are found in the mountain areas of the region, as caves and vaults, next to rocky slopes, canyons, calcareous slabs, sweet water habitats: rivers and small rivers, natural lakes and ponds, swamp habitats, agricultural habitats. At regional level, the following types of habitats of community interest have been identified, on the basis of which the European Ecological Network Natura 2000 was founded, as follows: dune habitats; sweet water habitats; meadow and bush habitats; swamp and moorland habitats, rock and cave habitats, forest habitats. As concerns the fauna, the following species were identified: fish - *Barbus meridionalis* (Mediterranean Barbel), *Cottus gobio* (bullhead), *Eudontomyzon danfordi* (Carpathian brook lamprey), *Gobio uranoscopus* (Danube gudgeon) etc, amphibians and reptiles - *Bombina variegata* (yellow-bellied toad), *Triturus cristatus* (great crested newt) etc, mammals - *Canis lupus* (wolf), *Lutra lutra* (otter), *Lynx lynx* (lynx), *Miniopterus schreibersi* (long-winged bat), *Myotis blythii* (lesser mouse-eared bat,) etc, birds - *Ardea purpurea*, *Ardeola ralloides*, *Aythya nyroca, Botaurus stellaris, Charadrius alexandrinus, Chlidonias hybridus, Chlidonias niger, Circus aeroginosus, Cygnus cygnus, Ciconia ciconia***,** *Egretta alba, Egretta garzetta* etc, invertebrates- *Callimorpha quadripunctaria*, *Cerambyx cerdo* (great capricorn beetle), *Colias myrmidone, Leptidea morsei, Lucanus cervus* (stag beetle), *Lycaena dispar, Ophiogomphus cecilia, Osmoderma eremita* (hermit beetle) etc.

Dolj County is characterized by the presence of natural habitats specific to steppe and silvo-steppe. In the north, hilly area, are found Turkey oak and spruce forests (*Quercus cerris, Quercus frainetto*), and forest types where sessile oak is present *(Quercus petraea)* whose area of distribution is placed on the entire northern half of the Getic Plateau. Besides there are many other deciduous species specific to lower altitude hills and plains. In

the central part of the county, up to the line Pleniţa-Segarcea-Apele Vii, the are is represented by all the Turkey oak and spruce forests, covering larger areas in the triangle Craiova-Segarcea-Perişor. These forests are either Cerato-Garni, sometimes mixed with gray oak *(Quercus pedunculiflora)* and downy oak *(Quercus pubescens)* indicating a shift towards the silvo-steppe. The surfaces are covered with meadows of associations of *Festuca sulcata, Festuca vallesiaca, Andropogon ischaemum, Chriysopogon gryllus* etc. The plain of the southern County, an area of silvo-steppe, today has only a few patches of oak forest clearing in the north and higher plain and gray oak (north of Bistreţ and near Boureni). The Danube Valley suffered lately great transformations such as embankments, drainage and irrigation that totally changed its appearance.

Many valuable habitats in the county are the result of traditional land use and the process for their conservation depends on maintaining traditional practices and skills. 4 habitats of national interest are identified: marshes with sources rich in mineral salts, wooded grassland, deciduous swamp forests, Natural dystrophic lakes and ponds) and 19 habitats of community interest such as: grassland and Ponto-Pannonian and Sarmatian salt marshes; oligotrophic to mesotrophic stagnant waters with vegetation of *Littorelletea uniflorae* and/or *Isoëto - Nanojuncetea* ; Pannonian and west-pontic grasslands on sands; eurosiberian steppe vegetation with *Quercus spp*; dunes with *Hippophae rhamnoides*, intra-dune wet depressions, natural eutrophic lakes with vegetation of *Magnopotamion* or *Hzdrocharition* type.

170 species of national interest and a number of 86 species of Community interest have been identified. Among the species of flora and fauna of national interest are 56 are plant species and 114 are animal species (17 species of national interest mammals, 43 species of birds of national interest, 14 reptile species of national interest, 13 amphibians of national interest, 9 fish species of national interest, 18 species of invertebrates of national interest). Also, species of community interest have been identified, including: 2 mammalian species of Community interest, 50 wild bird species of Community interest, 12 reptile species of Community interest, 12 fish species of Community interest, five invertebrate species of Community interest, three plant species of Community interest.

Specific biodiversity in **Mehedinţi County**, the variety of ecosystems, especially those in the Danube Gorge, are defining arguments for this picturesque area. Natural habitats continue to suffer a differential impact on territorial areas and landforms due to natural and anthropogenic environmental factors. Tere were identified the following habitat types: meadows and scrubland habitats, forest, rocky, caves and wetland habitats. Status of wild flora and fauna is directly linked to the state of natural habitats, by the impact caused by the action of other environmental factors. From the research conducted to date indicates that the county has great floristic diversity, over 4000 taxa, belonging to the phylums: *Phycophyta, Lychenophyta, Fungi, Bryophyta, Cormophyta* . Endemic species are around 28 in the *Iron Gates Natural Park* and 23 in *Domogled-Cerna Valley National Park*. A large number of plant species are rare, endangered and endemic, whose area is only in the Iron Gates Natural Park, thus requiring special measures of protection. These include: *Stipa danubialis*, Iron Gates apiaceae (*Prangos carinata*), Rhodope tulip (*Tulipa hungarica*), bluebell (*Campanula crassipes*) etc.

The research conducted so far on the fauna of the Mehedinti has revealed a great diversity of species of vertebrates and invertebrates. Among vertebrate animals the situation so far is as follows: Pisces Class, Amphibians Class, Birds Class, Mammals class. Avifauna consists of a large number of species of birds, mostly concentrated in Iron Gates Natural Park and two wetlands in the county. The great number of species present is due to the variety of biotopes in this area, on a small area a large number of species can be found, which is rare in our country.

The **Olt County** is characterized by a moderate level of biodiversity - in terms of number of species, habitats and ecosystems they form and in terms of land held by them, but the current changes of scenery highlight serious threats: intensification of agricultural activities affecting especially productive areas and the abandonment of farming that is manifested especially in less productive areas. Regarding flora, in Olt County there are 2,700 plant species identified, of which 3 are declared natural monuments, 9 are endangered, 17 vulnerable and 35 rare. Natural and semi-natural ecosystems cover 17% of the county. 13 types of habitats specific to wetland, 1 habitat specific to pastures and meadows, six forest habitats have been identified and characterized. Habitats in the county are characterized by a certain composition of flora and fauna, biocenosis components and are influenced by various climatic and soil factors . Climate influences, of the south west arid areas, to the temperate continental in northern part of the county, as well as climatic differences between the south and the north imposed by terrain elevation, resulted in a large number of habitats. The following habitats have been identified: Pontic- Sarmatian deciduous shrubs, eurosiberian forest steppe vegetation with *Quercus spp*, alluvial grasslands in *Cnidion dubii*, Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion alba*), mixed riparian forests with *Quercus robur, Ulmus laevis, Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*), warblers with *Salix alba* and *Populus alba*, Ponto-Sarmatian forest vegetation with pubescent oak, oak and hornbeam Dacian forests, Balkan-Pannonian forests of sky and oak, eurosiberian steppe vegetation with *Quercus spp*.

Avifauna of Olt County consists of species: *Ardea purpurea, Ardeola ralloides, Aythya nyroca, Botaurus stellaris, Charadrius alexandrinus, Chlidonias hybridus, Chlidonias niger, Ciconia ciconia, Circus aeruginosus, Cygnus*

cygnus, Egretta alba, Egretta garzetta, Himantopus himantopus, Ixobrychus minutus, Mergus albellus, Milvus migrans, Nycticorax nycticorax, Pelecanus crispus, Phalacrocorax pygmeus, Philomachus pugnax, Platalea leucorodia, Sterna albifrons, Plegadis falcinellus, Porzana porzana, Recurvirostra avosetta, Sterna hirundo, Tringa glareola.

Valcea County enjoys a large diversity both in terms of the landscape and the biological diversity. A total of 32 habitat types of community interest were inventoried in the county.: 3220 - Herbaceous vegetation on mountain rivers banks; 3240- wooden vegetation with *Salix eleagnos* along mountain rivers; 4060 - Alpine and boreal shrubs; 4070* - shrubs with *Pinus mugo* and *Rhododendron myrtifolium*; 6110* - Alciphile rupicole communities or basiphil meadows from white *Alysso-Sedion*; 6170 – Alpine and subalpine calciphile meadows; 6520- Mountain hay; 7220* - Petrifying springs with travertine formations; 9180* - Forests of *Tilio-Acerion* on steep slopes, detritus and ravines etc.

The flora and fauna does not show ecological imbalances generated by the development of a species to the detriment of other species. Nor were recorded disasters or fires, or other phenomena that irreversibly affect fauna and flora protected by law reserves and national parks in the county of Valcea. There has been identified a number of 54 species of flora and 67 species of fauna of national interest, respectively 7 species of flora nd 19 species of flora of Community interest. Among the species of flora of Community interest in the county of Valcea we mention: *Campanula serrata* (Bell flower), *Cypripedium calceolus* (lady's slipper orchid), *Iris aphylla ssp hungarica* (Iris), *Liparis loeselii* (Fen orchid), *Poa granitica ssp disparilis* (mountain bluegrass).

It is noticed a proliferation of aquatic avifauna in artificial reservoirs on the river Olt. In the conditions of installation and expansion of areas occupied by pond vegetation, especially in areas along the banks, favorable conditions for the installation of natural habitats, populated both in winter and warm with specific water birds species that have wetlands as habitats, were created. These areas are ecological corridors for passage birds and provide food and nesting conditions for an increasingly wide range of bird species, a situation facilitated by low human intervention. Many bird species protected at Community level or bird species for which conservation was necessary to designate Special Protection Areas - SPA Lower Oltului Valley, were identified. Species of ducks and geese : coot, moor hen, and cormorant cormorants, gray heron, great and small egret, summer and winter swan, black stork, dabchick, species of gulls; the current trend is to diversify both the number of species as well as the increase in the number of individuals in the species.

There have been identified 1 specie of fish, 11 species of amphibians, 6 species of reptiles, 32 birds, 17 mammals. Among the fauna of Community interest in the Valcea county, mammals were identified: *Canis lupus* (wolf) *Lynx lynx* (Lynx), *Ursus arctos* (brown bear), *Myotis myotis* (Common bat); *Rhinolophus ferrumequinum* (greater horseshoe bat), *Barbastella barbastellus* (bat), *Myotis blythii* (Common small bat); Amphibians and reptiles: *Bombina variegata* (Yellow-bellied toad), *Triturus cristatus* (great crested newt); fish: *Barbus meridionalis* (southern barbel), *Cottus gobio* (bullhead), *Sabanejewia aurata* (ray finned fish); invertebrates: *Carabus variolosus* (ground beetle), *Cerambyx cerdo* (great capricorn beetle), *Isophya harzi* (Grasshoper), *Lucanus cervus* (stag beetle), *Morimus funereus* (morimus asper beetle), *Odontopodisma rubripes* (mountain grasshopper) *Pholidoptera transsylvanica* (bush cricket).

West Region

Geological features, soil, hydrological and climatic peculiarities of **Arad County** determines flora and fauna; therefore, floristic peculiarities are highlighted by both rare and thermophilic, meridional elements, present a remarkable number 20.1%, giving vegetation mosaic shade, reason for which flora of the County falls into the Eastern-Carpathian Province, Codru-Zărand-Trascău District, West Plains Land . The zonal steppe formations prevail (associated on small areas, even with steppe and forest formations), the azonal floodplain formations and anthropic vegetation; 44% of the county is occupied by proper natural vegetation, or minimally processed (this includes forest, pasture and hay), the remaining 56% being replaced by growing vegetation. The forest vegetation (26% of the county) occupies large areas in the mountains and the hills . The forest steppe vegetation in the west end of Arad Plain is characterized by the predominance of herbaceous formations, rarely clumps of woody vegetation being encountered. Ruderalised steppe grasslands, xerofile, mesophilic salting and steppe were restricted due to the expansion of arable land. The azonal meadow vegetation with mesophilic and hydrophilic character consists of several characteristic herbaceous and woody species (willow, poplar, alder) . On some lake areas white and yellow water lilies are met . Habitat types of national importance were identified, such as: continental salt meadows, dry meadows, caves not exploited by tourism, wooded pastures, woods with English oak, alluvial forests with Alnus glutinosa and Fraxinus excelsior, etc. Also, in accordance with European Directives *Asperulo - Fagetum* beech forests were identified; subatlantic and medioeuropean oak forests and oak with hornbeam from *Carpinion betuli*, alluvial forests with *Alnus glutinosa and Fraxinus excelsior* (*Alno Padion, Alnio incane, Silicion alba*), beech forests of Luzulo -Fagetum type, natural eutrophic lakes with *Hydrocharition* or *Magnopotamion* vegetation type, water meadows with *Salix alba* and *Populus alba*, etc. Species of wild flora, of international importance under the Habitats Directive 92/43/EEC and Birds Directive 79/403/CEE, identified in Arad are : *Cirsium brachycephalum, Galanthus nivalis, Lindernia procumbens, Salvinia natans, Trapa natans*.

Fauna falls into Euro-Siberian subregion, Carpathian sub-province, faunal groups specific to steppe and forest steppe, sub xerophile forests of Turkey oak and Italian oak, mesophilic forest with predominant oak, beech and those and aquatic areas. Thus, the county's wildlife belongs to associations specific to big stages of relief, geographically distributed and establishing a direct link to the main levels of vegetation. Fish and fauna of the lowland sector specific to major rivers, includes areas of barbel and carp and in small rivers is characterized by the chub and the perch . In the steppe and forest steppe, the presence of rodents is noted, among the birds we mention the bustard and quail; in the sub xerophile woods, we find the field shrew, pheasant, gray lizard and in the mesophilic ones, we find the wolf, fox, wild boar, wild cat, thrush, and in beech, oak forests we meet the bear, deer, marten, squirrel, grouse, woodcock, brown frog etc**.** Both the intense process of human intervention and poaching led to the disappearance of the Great Bustard (*Otis tarda*) in the communes Socodor, Pilu, Vărşand, Zerind, Iermata Neagră.

The ichthyofauna of the lowland sector specific to major rivers, includes areas of carp and barbell and small rivers in the area are characterized by chub and perch.

On **Caras-Severin county** territory, 62 habitats of national interest and a number of 51 habitats of community interest were identified, of which 13 priority habitats in European (eg.: 3130 oligotrophic to mesotrophic still waters with vegetation of *Littorelletea uniflorae* and / or *Isoëto-Nanojuncetea*; 3140 oligo-mesotrophic waters with benthic vegetation of *Chara* species; 3230 wood vegetation with *Myricaria germanica* along mountain rivers ; 3240 wood vegetation with *Salix eleagnos* along mountain rivers, 4070 *Bushes with *Pinus mugo* and *Rhododendron myrtifolium*; 6210 * Semi-natural dry grasslands and scrubland facies on calcareous substrate - *Festuco Brometalia*; 7240 * Alpine pioneer formations of *Caricion bicoloris-atrofuscae* ; 9530 * Sub-Mediterranean forest vegetation with endemic *Pinus nigra ssp. Banatica.* etc.); 218 plant species of national interest and 18 plant species of Community interest.

Following research conducted in the area of the Nera Beuşniţa National Park, 1086 species of superior plants, including 108 rare species and 13 endemic species. According to the management plan there have been identified and inventoried by specialists the following habitats: 9070 Wooded Grassland - 11.1 km; 5130 *Juniperus comunis* formations in calcareous grassland or areas of 5.3 km; 7220 Petrifying springs with travertine formations - 0.278415 kilometers; 8210 Calcareous rocky slopes with chasmophytic vegetation - 54,27km; 8240 Screes and limestone slabs - 23.249 km; 8310 Touristically unexplored caves - 27km. Domogled-Cerna Valley National Park is characterized by a remarkable floristic diversity, the rich floristic inventory totaling about 1110 species of vascular plants (superior) of which 66 species (belonging to 23 families) are endangered taxa, rare and partly endemic. In Semenic-Carasului Gorges National Park, inferior plants are represented by a number of 270 taxa belonging to micophytes and 18 taxa belonging to the group of lichens. The best investigated is the *Cormophyta* group, represented by a total of 1277 species, from different biotopes. In the project *"Study and Protection of Mediterranean habitats of endangered thermophilic shrubs in Semenic National Park-Caras Gorge"* having as coordinator the Explorers Speleological Association during 2006 - 2007 was identified the habitat: 8210 Rocky slopes with chasmophytic vegetation with an area of 278 286 ha. The whole flora of Iron Gates Natural Park is represented by all five phyla of the plant kingdom, as follows: *Phycophyta*, 71 families, 171 genres and 549 species; *Lychenophyta* with 34 families, 67 genres and 375 species; *Fungi,* 48 families, 252 genres and 1077 species; *Bryophita*, 31 families, 98 genres and 296 species; *Cormophyta* with 67 orders with 114 families, 540 genres, 1395 species, 272 subspecies and 5 varieties.

The wildlife that can be found in the county of Caras- Severin consists of a total of 230 species of national and 70 species of Community interest identified so far. Fauna of the *Iron Gates Natural Park* consists of 5205 taxa, including 4873 invertebrates and 332 vertebrates. Among vertebrates, Aves class has a high presence, with 205 representatives, followed by the class *Pisces*, with 63 representatives, the least represented class is *Amfibia*, with only 12 taxa.

In Nera Beusnitei Gorges National Park, a number of invertebrate 1,890 taxa and 124 taxa of the vertebrates were identified. Domogled-Cerna Valley National Park is the area with the highest biodiversity of Lepidoptera, nearly 1,500 species of butterflies (1463) can be found here, 45% of the Lepidoptera fauna of the country is concentrated here. Through the variety, richness and originality, fauna of this land with a unique climate has a great importance and also for many species it represents the northern limit of the area of distribution. The diversity of elements is primarily due to the variety of habitats which led to the existence of many species and even low plain steppe, water meadows, and numerous elements characteristic to hilly, karst and mountainous regions.

In the Anina Mountains researches showed that this area is a refuge during glaciations that allowed survival of tertiary species as: *Amphimellania holandri* - among invertebrates and *Cobitis elongata* - of vertebrates. The invertebrate fauna is dominated by beetles and opilionide, followed by springtails, arahnee, chilopods, isopods, Orthoptera, formicide, gastropods, dipterous larvae etc. Some gastropods as: *Carpathica langi, Zenobiella umbrosa* are endemic and of plecoptere some are considered Carpathian endemic: *Nemoura carpathica*, *Chloroperla kisi* . Among invertebrates 17 species of community interest including 9 priority were identified, such as : *Rosalia alpina*, *Cerambix cerdo, Carabus variolus, Lucanus cervus, Oxyporus mannerheimii, Pilemia tigrina, Theodoxus transversalis, Buprestis splendens, Callimorpha quadripunctaria* . The pronounced

continental climate with Mediterranean influences favored especially in the Danube wetlands and Balta Nera wetland and Islands Ostrov and Randall wetlands, Divici Pojejena – life of many birds with many southern and western Asian elements . This area is one of the few areas in the country where species diversity of rare items can be observed and where, on a small area such a large number of species of birds can be seen: winter visitors, summer visitors, passage species and sedentary species. Some of the inventories of birds are of community interest or are included in the Wetlands Convention and other international treaties to which Romania is a party. Among the bird species protected under the provisions of Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds, we mention: *Anas querquedula, Ciconia ciconia, Egretta garzetta, Ardea purpurea, and Falco Naumanni Phalacrocorax pygmaeus*. These birds are subject to the protection and preservation regime established in the special avifauna conservation areas: Ostrov Moldova Veche wetland, Ostrov-Calinovat wetland, Pojejena Divici wetland and Balta Nera wetland. These areas are included in the SPA Natura 2000 site proposal.

Ichthyofauna is represented by species: *Zingel streber, Zingel zingel*. The European mudminnow (*Umbra krameri*) is a freshwater fish, bentopelagic, non-migratory, belonging to Esociformes, found in small stagnant waters, with plenty of vegetation and mud. It is an endemic species of the Danube and Nistru hidrographic basin. It lays its eggs in small nests dug in the sand, in March-April. It feeds on plankton formed by large crustaceans and invertebrate larvae. Reptiles - is represented by thermophilic elements, many of which are rare but vulnerable such as *Lacerta muralis*, *Testudo hermanni*, *Vipera ammodytes ammodytes*, *Emys orbicularis*. Mammals are mainly represented by 10 species common in general to all mountain chains in our country and many other species that live only in the south - west of the country. Fauna species present in our county and protected at European level: *Canis lupus* (wolf), *Ursus arctos* (brown bear), *Aquila chrysaetos* (golden eagle), *Rhinolophus ferrumequinum* (great horseshoe bat), *Myotis capaccinii* (long fingered bat), *Cobitis elongata* (Balkan Loach), *Callimorpha quadripunctaria* (striped butterfly).

Hunedoara County is covered 70% by natural and semi-natural ecosystems (forest vegetation, pastures and natural meadows, rivers and lakes). Relief, predominantly hilly and mountainous determined only accentuated anthropogenic development along major rivers and wide valleys, otherwise, the human footprint on nature was discontinuous in time and area, species of spontaneous flora and wild fauna being able to occupy their typical habitats . The mountain ranges in the south and east of the county have virgin and quasi - virgin forests and the west county contains acres of compact, mature woodland all of which being natural ecosystems with a great variety of species of mammals, birds and invertebrates. The greatest diversity of species of flora and fauna is found in natural protected areas : *Retezat National Park* houses over 1,100 species of plants (of which 38 are endemic), 50 species of mammals (including wolves, lynx, bears, chamois, fallow deer, marmots and otters), around 160 species of birds (golden eagles, spotted eagle, golden eagle, lesser spotted eagle, owl, great, pygmy owl, woodpecker with three fingers, white-backed woodpecker) 9 species of reptiles and 5 species of amphibians. Grădiştea Muncelului - Cioclovina Natural Park conserves thermophilic species of flora and fauna occupying limestone massifs here. In Jiu Valley National Park insect species declared extinct for over a century in Western Europe were identified, and the Hateg County Dinosaur Geopark complements the biological palette of the County with relict species of flora from its wet meadows and, of course, with the reptilian paleofauna from the Haţegului Depression deposits, famous around the world. Habitats of European interest (50 types) are those for which sites of Community importance in the Hunedoara county were declared, to which another 11 habitat types were added, identified by park administrators or custodians of the reservations overlaid to those sites. The wild flora of Hunedoara County didn't undergo significant changes in 2013 in terms of composition and development of the area. The negative influences observed especially last year, caused by fluctuations in temperature and drought, extended in duration until fall, did not affect its development. In Haţegului Depression the xerophile, mesophilic and hydrophilic meadows developed very well with *Festuca valesiaca, Botriochloa ishaemum, Koeleria cristata, Festuca sulcata* etc. At the Slivut forest edge (the edge from the bison reserve) were identified isolated specimens of *Hepatica transilvanica and H. media*; same endemic species have been identified in a large number on Jigureasa valley (near Dealul and Peştera Bolii).

In addition to wildlife species of national and community interest mentioned, the protected areas of Hunedoara County shelter also other wildlife species protected by international conventions and regulations. For example, in *Bejan Forest Natural Reservation* 50 bird species that are found on the lists of the Bern Convention were reported. Lepidoptera and odonata appear in large numbers in all wet meadows in the mountain and sub-mountain area and at the forest edge of checked areas "Narcissus meadows Nucşoara, Poieni Peak, Bejan Forest, Gemenele Scientific Reservation, Magura Uroiului, Secular Forests of the valleys Dobrişoarei and Prisloapei, the Arboretum from Simeria, Vulcan Mountain, Slivut Forest).

In **Timis County**, the natural vegetation of the central and western plain area falls in the silvo-steppe category though, amid climate aridity, there is an extension of the specific elements of the steppe: *Festuca valesiaca species, Festuca suleata, Festuca pseudovina* and other xeromezofile herbs that make up the steppe meadows. In meadows are identified soft grass meadows, pir, foxtail and various hydrophilic associations, respectively, grasslands dominated by *Agrostis stolonifera* and *Poa Pratensis* or with *Alopecurus pratensis*. The silvo-steppe zone is represented by associations that are intertwined with the cultivated land. It extends deep

into the plains and hills on the wide corridors of the valley. In the hilly area, thanks to an intensive process of populating the area, that led to the removal of natural vegetation for land use for agricultural purposes, has attracted the reduction of the surface occupied by forests typical to silvo-steppe, they being found in only a few clumps near Pişchia, Banloc, Denta, Deta, Macedonia. Therefore, the hills that belong to the forest area, oak subarea, have today only remnants of sessile oak forests, pedunculate oak forests, Turkey oak and Hungarian oak. Climatic oceanic influences, in the western part of the country and climatic differences between plains and mountains, imposed by relief altitude, plus the chemical composition of rocks from the substrate, have led to a large number of habitats.

In Timis county, habitats of community interest were identified, habitats described in the standard formulations of Natura 2000 sites, as follows: sweet water habitats, habitats of humid meadows and communities of high semi-natural hays, habitats of mesophyll meadows, habitats of continental halophilic and gypsophilia steppe, habitats common to the temperate broadleaf forest, habitats common to Mediterranean broadleaf forests and habitat common to temperate bushes, meadows habitats and panonic and ponto-sarmatic salty marshes habitats, Balkan-panonic forests habitats of quercus cerris and sessile, sub-panonic steppe meadows habitats. Also, in Timiş County the following types of habitats of national interest (corresponding to the Natura 2000 described or whose presence was specified in the county "Habitats from Romania" developed by Doniţă et al., 2005) were identified: habitats of marshes, shrubbery steppes and halophilic forests, freshwater stagnant water habitats, habitat of saline and brackish water bodies, habitats of temperate heaths and thickets, habitats of meadows and tall herb communities (weeds), mesophilic grassland habitats, habitat of temperate deciduous forest with falling leaves, habitats of meadow forests and bushes, marshes habitats and habitats characteristic to water edges vegetation.

In Timis County we meet a number of species of flora and fauna characteristic to plains, wetlands, forest areas, natural grasslands. Among the species of flora identified and with ecological significance we mention: *Frittilaria meleagris* – variegated tulip (natural reservation 2.736 Pogănişului Meadow), *Narcissus poeticus ssp. stellaris* – daffodil (natural reservation 2.747 Daffodil Meadow at Băteşti), *Stipa capillata* – perennial bunchgrass şi *Agropyron cristatum* – crested grass (natural reservation 2.737 Şişitak Mound). The plant species of Community interest identified are: *Salvinia natans* – floating fern and *Trapa natans* – water caltrop. These species were identified in Satchinez Marshes protected area.

The Timiş County avifauna is represented by many species of which: *Ardea cinerea* - gray heron, *Ardeola ralloides* - yellow heron, *Nycticorax nycticorax* - Night Heron, *Botaurus stellaris* - bittern pond, *Ardea purpurea* - red heron, *Ixobrychus minutus* – little bittern, *Egretta alba* – large egret, *Egretta garzetta* - little egret, *Ardea purpurea* - red heron, *Podiceps cristatus* – great crested grebe, *Podiceps nigricollis* - Black-necked grebe, *Phalacrocorax pygmeus* - pygmy cormorant, *Anas querquedula* - garganey, *Anas strepera* – gadwall, *Aythya ferina* – common pochard, *Aythya nyroca* - ferruginous duck, *Anas crecca* – common teal, *Anas clypeata* - Northern Shoveler, *Anas penelope* - widgeon, *Circus aeruginosus* - Western marsh-harrier, *Circus cyaneus* - Northern harrier, *Falco subbuteo* - hobby, *Falco vespertinus* - red-footed Falcon, *Falco tinnunculus* - kestrel, *Buteo buteo* - common buzzard, *Buteo lagopus* – rough legged buzzard, *Accipiter nisus* – northern sparrowhawk, *Accipiter gentilis* - northern goshawk, *Perdix perdix* - partridge etc.

Ichthyofauna of Timis County is represented by the species : *Aspius aspius* (asp), *Zingel zingel* (common zingel), *Gymnocephalus baloni* (Balon's ruffe), *Gobio albipinnatus* (white fin gudgeon), *Rhodeus sericeus amarus* (amur bilterling), *Misgurnus fossilis* (eel), *Sabajewia aurata* (golden loach), *Cobitis taenia* (spined loach), *Zingel streber* (streber), *Gobio Kessleri* (Kessler's gudgeon) . Among the species of amphibians and reptiles : *Bombina Bombina* (fire bellied toad), *Emys orbicularis* (pond turtle), *Salamandra salamandra* (salamander), *Triturus dobrogicus* (Danube crested newt). Invertebrate species: *Carabus hungaricus, Lycaena disappear*, *Gortyna borelii lunata, Arytrura musculus*. Strictly protected fauna species present in the Timis County are: *Lynx lynx* - lynx, *Ursus arctos* - Brown bear, Lupus canis - Wolf and *Felis silvestris* - Wild cat.

The North-West Region

In **Bihor county** of the five biogeographical regions present at national level, are interwoven three: Alpine, continental and Pannonian. Wild flora species of national interest, entered into the Natura 2000 database are in a number of 267. Wild flora species of Community interest, entered into the Natura 2000 database are in a number of 16, 2 of which are priority species (*Campanula serrata, Pulsatilla pratensis ssp. hungarica*).

Regarding the wildlife, we mention: birds of national interest, validated within Natura 2000 sites: 120 species; bird species of Community interest validated in the Natura 2000 database: 86 species; national interest species of mammals entered in the Nature 2000 database: 38 species; mammal species of Community interest entered in the Natura 2000 database: 17 species, of which 2 priority species *(Canis lupus, Ursus arctos)* amphibians of national interest entered in the Natura 2000 database: 14 species; reptiles of national interest entered in the Natura 2000 database: 12 species; amphibian and reptile species of Community interest entered in the Natura 2000 database: 6 species; fish species introduced in the national interest Natura 2000 database: 15 species; fish species of Community interest entered in the Natura 2000 database: 15 species; invertebrate species of national interest entered in the Natura 2000 database: 25 species; invertebrate species of Community

interest entered in the Natura 2000 database: 17 species, of which 2 priority *(Austropotamobius torrentium, Callimorpha quadripunctaria).*

In **Bistrita-Nasaud County** were identified 32 habitats of Community interest of various types: coastal, marine and dune habitats, grassland and scrubland habitats, habitats of peat and marshes, rocky and caves habitats, forest habitats. These habitats are found in the 6 sites of Community importance, Natura 2000, which overlap in the county of Bistrita - Năsăud. Regarding surface of habitats of Community interest, they have not yet been mapped, the exact area within the county is not known. The Ecosystems / habitats are complemented by remarkable diversity of species. There are ten species of plants listed in Annex II of Directive 92/43/EEC for which Sites of Community Importance in the Bistrita- Năsăud have been declared. Among the species of plants that have been declared Sites of Community Importance in the Bistrita- Năsăud mention: *Campanula serata* (bell), *Dicranium viride* (moss), *Drepanocladus vernicosus* (moss), *Poa granitica ssp. disparilis* (mountain meadowgrass), *Tozzia carpatica*, *Ligularia sibirica*, *Buxbaum viridis* (Buxbaum sedge), *Meese longiseta* (moss), *Crambe tatarica*.

As regards fauna, in the county there are a large number of mammalian species : *Canis lupus* (wolf), *Lynx lynx* (lynx), *Ursus arctos* (brown bear), *Micotus tatricus* (Tatra vole), *Rhinolophus hipposideros* (lesser horseshoe bat), *Myotis myotis* (common bat), *Myotis blythii* (small common bat), *Myotis emarginatus* (Geoffroy's bat), *Lutra lutra* (otter), amphibians and reptiles : *Bombina Bombina* (fire bellied toad), *Bombina variegata* (yellow belly toad), *Triturus cristatus* (crested newt), *Triturus Alpine* (alpine newt), *Emys orbicularis* (water turtle); fish: *Rhodeus sericeus amarus* (European bitterling), *Aspius aspius* (asp), *Gobio albipinnatus* (white fin gudgeon), *Gobio Kessleri* (Kessler's gudgeon), *Cottus gobio* (bullhead), *Eudontomyzon danfordi* (Carpathian brook lamprey) *Gobio uranoscopus* (Danube gudgeon), *Barbus meridionalis* (barbel), *Sabanejewia aurata* (golden loach); invertebrates : *Calliomorpha quadripunctaria* (striped butterfly), *Carabus hampei* (beetle), *Carabus variolosus* (ground beetle), *Carabus zawadaszkii* (caraba), *Pholidoptera transsylvanica* (bush cricket), *Rosalia alpina* (rosalia longicorn), *Leptidea morsei* (Fenton's wood white), *Lycaena dispar* (large copper), *Euphydryas maturna* (scarce fritillary), *Colias myrmidone* (Danube clouded yellow), *Pseudogaurotina excellens* (long horned beetle), *Cordulegaster heros* (dragonfly). Representative for Bistrita- Năsăud is the presence of large carnivores which are in a favorable conservation status. Annual estimates of large carnivores (brown bear, wolf and lynx) and wild cat are a basis of conservation of biodiversity and wildlife management decision. The necessity for information that lies at the basis of the managerial decision for the sustainable use of this resource and our country's obligations in the international ecological conventions Romania is part of, determines the development of annual estimates of herds of large carnivores and wild cat. Compared to 2012 there is a slight increase in the number of brown bear, wolf and the wildcat, and a decrease in the number of lynx. A consequence of the increase in the stock of brown bear and wolf represents the intensified attacks on domestic animals.

Due to its geographical position (including alpine and continental bioregions) and the fact that in certain areas of the county traditional agriculture is still practiced, **Cluj** is a county with a high biological diversity, expressed both at the level of ecosystems and at level of species. Natural habitats characteristic of county's biogeographic space are: freshwater habitats (water courses, natural and anthropogenic lakes); meadows and thickets habitats (alluvial meadows of rivers, calcareous, alpine and subalpine meadows, juniper trees, mountainous and wooded hayfields); peatland and swamps habitats (oligotrophic and mesotrophic); habitats of rocks and caves (rocky, calcareous slopes, natural caves and excavations); forest habitats (old forests, wooded pastures, alpine and subalpine forests, forests with pedunculate oaks, alluvial forests, mixed forests). Among habitats of Community interest for which each site in Cluj county was declared of Community importance we mention: herbaceous vegetation on mountain rivers, woody vegetation with *Salix eleagnos* along the mountain rivers, water courses in the plain areas up to the mountain areas, with vegetation of *Ranunculion fluitantis* and *Callitricho - Batrachion*, European dry scrub, alpine and boreal scrub, *Juniperus communis* formations on scrubland or limestone grassland; calciphile rupicole communities or basiphyte meadows of *Alysso - Sedion albi*; boreal and alpine meadows on the siliceous substrate, alpine and subalpine calciphile meadows, rocky Pannonian grasslands (*Stipo - Festucetalia pallentis*); semi-natural dry grasslands and facies with shrubbery on calcareous substrate (*Festuco Brometalia*); mountain meadows of *Nardus* rich in species on siliceous substrate, sub-panonic steppe meadows, peri-panonic subcontinental shrubs ; beech forests of *Asperulo–Fagetum* type ; calcareous marshes with *Cladium mariscus*, alkaline marshes, forests of oak and hornbeam of *Galio – Carpinetum* type, Active bogs, forest vegetation with Quercus pubescens etc.

Among the flora species of Community interest for which has been declared each site of Community importance in Cluj, we mention: *Pulsatilla patens, Dracocephalum austriacum, Ferula sadleriana*, *Echium russicum, Serratula lycopifolia*, *Iris aphylla* ssp. *hungarica*, *Iris humilis, Crambe tataria, Syringa josikaea, Adenophora lilifolia*, *Ligularia sibirica*, *Eleocharis carniolica*, *Liparis loeselii, Meesia longiseta***,** *Dracocephalum austriacum etc.*

Among the species of Community interest for which each site in Cluj was declared of Community importance we mention the species: mammals (*Barbastella barbastellus*, *Sicista subtilis, Rhinolophus hipposideros*, *Rhinolophus ferrumequinum*, *Myotis blythii, Lutra lutra, Canis lupus*, *Lynx lynx, Ursus arctos, Miniopterus schreibersi*), amphibians and reptiles (*Triturus cristatus*, *Bombina variegata, Bombina bombina, Emys*

orbicularis, Vipera ursinii rakosiensis), invertebrates (*Euphydryas maturna, Leptidea morsei, Callimorpha quadripunctaria*, *Austropotamobius torrentium, Lycaena dispar, Isophya costata, Carabus variolosus, Lucanus cervus Pholidoptera transsylvanica, Catopta thrips*), peşti (*Barbus meridionalis*, *Cottus gobio*, *Eudontomyzon danfordi*, *Gobio uranoscopus, Rhodeus sericeus amarus)* etc.

Cluj County Avifauna is represented by the following species: *Ixobrychus minutus, Ciconia ciconia, Aquila chrysaetos, Circus aeruginosus, Circus cyaneus, Falco vespertinus, Crex crex, Tringa glareola, Alcedo atthis, Dendrocopos syriacus, Anthus campestris, Sylvia nisoria, Lanius minor, Lanius collurio etc.*

Biodiversity in **Maramures County** is in a good state of preservation, being represented by many different types of habitats and species of flora and fauna, both of community and national interest. Of the many types of habitats in the county of Maramures, we include: *Luzulo -Fagetum* type forests, *Asperulo -Fagetum* type beech forests, *Galio – Carpinetum* type oak and hornbeam forests, alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno - Padion, Alnion incanae, Salicion alba*), Dacian beech forests (*Symphyto - Fagion*), woody vegetation with *Salix elaeagnos* along the mountain rivers, water courses in the plain areas up to the mountain areas, with vegetation of *Ranunculion fluitantis* and *Callitricho - Batrachion,* grassland with *Nardus* rich in species, on siliceous substrates in mountain areas, petrifying springs with formation of travertine (*Cratoneurion*), alkaline bogs, alpine pioneer formations of *Caricion bicoloris - atrofuscae*, siliceous scree from the mountain to alpine floor (*Androsacetalia alpinae* and *Galeopsietalia ladani*) etc. Among the species of wild flora we mention: *Campanula serrata, Ligularia sibirica, Carex echinata, Carex limosa, Carex pauciflora, Empetrum nigrum ssp. Nigrum, Gladiolus imbricatus, Molinia caerulea ssp. Caerulea, Pinus mugo, Dicranum viride, Ligularia sibirica, Eleocharis carniolica, Cypripedium calceolus, Liparis loeselii, Agrimonia pilosa, Campanula serrata, Tozzia carpathica, Dicranum viride, Drepanocladus vernicosus, Poa granitica ssp. Disparilis, etc:.*

The fauna is composed of species of invertebrates (*Odontopodisma rubripes, Stenobothrus eurasius, Carabus variolosus, Rosalia alpina, Pseudogaurotina excellens, Pholidoptera transsylvanica, Lycaena dispar etc),* amphibians and reptiles (*Bombina variegata, Triturus montandoni, Rana dalmatina, Rana temporaria, Salamandra salamandra, Triturus alpestris, Anguis fragilis, Vipera berus, Emys orbicularis, etc.*), mammals (*Ursus arctos, Lynx lynx, Microtus tatricus, Martes martes, Rhinolophus hipposideros, Rhinolophus ferrumequinum, Myotis blythii, Myotis myotis, Canis lupus, Ursus arctos, Lutra lutra, etc.*), fish(*Hucho hucho, Gobio uranoscopus, Leuciscus souffia, Barbus meridionalis, Sabanejewia aurata, Cottus gobio, Eudontomyzon danfordi, etc.*). Among the bird species we mention: *Dendrocopos leucotos, Picoides tridactylus, Bonasa bonasia, Glaucidium passerinum, Strix uralensis, Ficedula albicollis, Lanius collurio, Aquila chrysaetosk, Tetrao urogallus, Aquila chrysaetos, Pernis apivorus, Picoides tridactylus, Ciconia nigra, Accipiter gentilis, Accipiter nisus, Actitis hypoleucos, Aegithalos caudatus, Alauda arvensis, Anas crecca, Anas platyrhynchos, Anas querquedula, Anthus spinoletta, Anthus trivialis, Aquila pomarina, Asio otus, Athene noctua, Buteo buteo, Buteo lagopus, Caprimulgus europaeus, Carduelis chloris, Carduelis spinus, Certhia familiaris, Ciconia ciconia, Cinclus cinclus, Circaetus gallicus, Lullula arborea, Hyla arborea, etc..*

Biodiversity of **Salaj County** is given by the location of the county, for the most part, at the overlaying of the physical-geographical unit that connects the Apuseni Mountains and Eastern Carpathians represented by Somes platform. Regarding habitats of Community interest in Salaj County 22 community habitats were identified, among which: Touristically unexplored caves; Dacian forests of oak and hornbeam; *Asperulo -Fagetum* type beech forests*, Luzulo -Fagetum* type forests; *Galio – Carpinetum* type oak and hornbeam forests; alkan-Pannonian forests of Turkey oak and evergreen oak; water courses in the plain areas up to the mountain areas, with vegetation of *Ranunculion fluitantis* and *Callitricho - Batrachion*; rivers with muddy banks with vegetation from *Chenopodion rubri pp* and *Bidention pp*; peri- Pannonian sub-continental shrubs, subpanonic steppe grassland; edge of woods communities with tall hydrophilic grass from the plains to mountain and alpine floors, low altitude meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Degraded peat bogs capable of natural regeneration ; rocky slopes with chasmophytic vegetation on calcareous rocks, medio-european beech forests of *Cephalanthero – Fagion;* alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno - Padion, Alnion incanae, Salicion albae*) Balkan- Pannonian forests of evergreen oak and Turkey oak ; Dacian forests of oak and hornbeam, forests with *Castanea sativa*, eurosiberian forests with *Quercus robur*. On Salaj County, the field studies and scientific studies identified a total of 286 species of flora of national interest. Of these species, 5 species are of Community interest:: *Sphagnum magellanicum, Sphagnum subsecundum, Sphagnum ambliphyllum* - peat moss, located on the territory of the "Mlastina de la Iaz – Moors" protected area on the territory of the locality of Iaz, Plopiş commune; *Arnica Montana* - mountain arnica, located in the Meseş mountains, Almaşului Valley, Somes Valley, *Gentiana lutea* – great yellow gentian, scientifically located on the wooded pastures of Meseş mountains area, natural protected area of Racâş – Hida, site of Community Interest.

Wildlife, due to the variety of habitats and ecosystems existing in Salaj county, also presents a variety ecological, both specifically and systematically. Following various studies over time a total of 197 species of national interest were determined and inventoried. Of these species of animals, a number of 18 species are listed in Annex 3 of the Ordinance No. 57/20.06.2007, in the category of animal species whose conservation requires the determination of Special Areas of Conservation and Protection.

The natural capital of Satu Mare County is varied due to the interaction of existing landforms (plains, hills and mountains) and climate factors that caused the formation of 3 biogeographical regions, namely: the Pannonian, Continental and Alpine regions, each characterized by a type of vegetation and fauna. So far, about 1,550 species of plants, over 180 plant associations and over 5,200 species of fauna existing in the county of Satu Mare have been inventoried. In Satu Mare, in 2013, 6 specimens of brown bear, 30 specimens of wolf and 212 specimens of wild cat were inventoried. Compared with the assessment in 2012 it is found that the number of bears is constant, a slight decrease in the number of wolf (- 2 specimens) and those of wildcat (- 17 specimens), but the latter two species the numbers recorded are larger than the optimal numbers for the hunting funds in Satu Mare County.

Geobotanically, most of the Satu Mare territory belongs to steppe zone of Western Plain . Spontaneous vegetation occupies only 1/3 of the county (grassland - 18%, forests - 15%), the rest being crops. The county meets 3 types of ecosystems: terrestrial, aquatic and underground. To these the anthropic areas are added. Terrestrial ecosystems occupy the largest part of the county of Satu Mare and is characterized by communities of organisms (plants and animals), specific and interrelated. mong major ecosystems we mention: forest ecosystems (forests consist of associations of *Querco – Ulmetum, Convallaria – Quercetum roboris, Festuco – Quercetum robori* and *Querco robori – Carpinetum, Querco robori – Caricetum brisoides, Querco cerris – Carpinetum, Quercetum petreae – cerris, Quercetum petreae, Asperulo-Fagetu, Pinetum sylvestris);* shrub ecosystems (intermediate between forest and meadows with associations of *Pruno spinosae – Crataegetum, Coryletum avellanae, Rubo (caesii) – Prunetum spinosae, Pterido – Crataegetum monogynae* etc.); ecosystems of grasslands (pastures and meadows totaling 77.821 ha, with mixtures of *Caricetum elatae*, B*rometum tectorum* and *Potentillo – Festucetum pseudovinae*, A*grostetum albae, Alopecuretum pratensis* and *Festucetum pratensis, Hordeetum hystrictis, Puccinellietum distantis, Achilleo – Festucetum pseudovinae, Caricetum acutiformis – ripariae etc);* aquatic ecosystems (lowland freshwater ecosystems - rivers Someş, Crasna, Homorod, Tur and Ier are characterized by a slow flow; mountain freshwater ecosystems - Tur River with its tributaries from the Turulung, still water ecosystems) etc.

28 types of habitats of conservation importance and 25 habitat of national interest with a total area of about 30,000 ha, were inventoried. Local natural conditions of relief, climate and extremely varied edaphic conditions (three biogeographical regions: Alpine, Continental and Pannonian), caused great diversity of flora in Satu Mare county. The wildflowers protected from Satu Mare County includes a number of flora species of national interest (3), a number of species of flora of Community interest (27), economically exploited wild species (111). Analyzing the structure of ecological county flora, it results that in terms of requirements for soil moisture the most numerous are the and mezoxerophytes mesophytes, in terms of temperature the mezothermes, and regarding the soil reaction are more numerous the neutrophils and eurionic plants species. Among the plants that grow spontaneously in the county about 50 species are rare flora in Romania. Some of them are on the endemism, relicts and protected species list . Of the phytogeographical elements the largest share is held by eurasians (*Achillea ptarmica, Blysmus compressus, Erythronium dens-canis, Holoschoemus romanus* subsp.*Holoschoemus* etc. – 42.7%). Eurasians with continental character (*Aster amellus, Euclidium syriacum, Ranunculus pedatus* etc. – 8,2%) mainly inhabit grassy resorts. According to the relief and geographical coordinates of the county, the percentage of European breeds (*Hottonia palustris, Nymphaea alba, Saxifraga tridactylites, Trollius europaeus* etc.- 12.3%) is quite significant, standing aut also those which are Central-European, which are represented especially by forest plants (*Aposeris foetida, Cerastium sylvaticum, Ranunculus lanuginosus, Vicia pisiformis* etc.-7,0%).

Fauna of Satu Mare can be classified on vegetation storeys, as follows: *boreal floor fauna* (spruce stands - pine forest: birds, molluscs and insects. Mammals do not have typical representatives because deer and roebuck live in deciduous forests and forest rodents, like the squirrel and Parsees are species typical of deciduous forests. Coniferous forests are home to a rich and characteristic fauna of birds, some of which live only in this biotope. From the woodpeckers we meet: “negraica”, motley woodpecker; night raptors: owl, little eagle owl, large eagle owl (winter guest); corvide: dormouse, raven, turbidae: mountain thrush (winter guest), collar blackbird, blackbird, mistletoe thrush; singing birds: mountain black capped chickadee, crested titmouse, small wren, yellow head kinglet (winter guest) . Among reptiles we can find: mountain lizard, common adder (rarely) and of amphibians: Carpathian salamander, common salamander, brown frog etc . Extremely rich is the invertebrate fauna composed of : shellfish, insects and millipedes); *nemoral floor fauna* (beech and evergreen oak forest) : wild mammals found in this level: deer, roebuck, tree marten, wolf, wild boar, badger, hare, grubbing mouse, field mouse. Fauna of the birds: grouse, small spotted eagle, buzzard, goshawk, cuckoo, little owl, large woodpecker, little warbler, mistletoe thrush, garden redstart, tree pipit, common chafinch. Fauna of beech forests includes a large number of insects that live in leaves and are represented by numerous species of coleopters, protures, springtails, hymenoptera, and diptera. Insects are present either in the larval stage or in their adult stage. Sessile fauna consists of mammals, birds, reptiles, amphibians. Mammals that live in these forests are not typical inhabitants thereof: oak parse, hare, wolf, fox, wild boar, deer (very common), squirrel (rare), wild cat (rare). Ornithofauna of sessiles is very rich and consists of: wild pigeons, turtle, red kite, sparrowhawk pigeon, partridge, pheasant, cuckoo, nightingale, chaffinch, blackbird, oriole, goldfinch, woodcock, greenfinch. The reptiles include: blind snake, grass snake, leaves snake, sand lizard, and green lizard. Amphibians are present in evergreen ground by: agile frog, toad, green toad, tree frog (plain species less numerous). Among invertebrates we can find in forest foliage : snails, spiders, insects, earthworms, millipedes, springtails), *forest*

steppe fauna (mammals characteristic of rodents : squirrel, hamster, harvest mouse, field mouse, mole rat, hare and lowland waters we meet: water rat and muskrat. Ornithofauna consists of: bustard (accidentally), quail, partridge, field hen, goshawk, Long-eared Owl, barn owl, cushat, tawny pipit, lark, black crow, warbler, house sparrow, jackdaw. Reptiles are poorly represented both as a species and as individuals: grass snake, water snake, field lizard, and the frogs: common toad, land frog, marsh frog, tree frog, etc.. The fauna of this steppe area includes many species of insects predominantly Orthoptera (locusts, pasture grasshoppers, forest grasshopper, mantis) and coleoptera); *azonal fauna* (reptiles, insects and gastropods, amphibians, typical glacial relicts, species of protozoa, rotifers, tardigrade and gastotrichi, mammals (muskrat, otter, water rat, fox, wild boar, etc. . Avifauna consists of: white stork, sandpiper, black tailed godwit, thrush nightingale, sand martin, cuckoo, wagtails etc.), *Anthropized areas fauna* (fauna of localities and farmland). The protected wildlife in Satu Mare County includes a number of fauna species of national interest identified in the county (69), a number of species of community interest (256), a number of wildlife species economically exploited (31).

In the ***Central Region***, **Alba County**, due to the diversity of landforms, is among the few in the country where there is a very diverse fauna and flora. The conservation status of species and habitats present in Alba County is generally good. In 2013 there were no significant reductions in the surface of habitats of Community interest in the 20 sites listed in Natura 2000 in Alba County. Small areas of grassland habitats of Community interest were sown in order to increase the area of arable land in ROSCI0187 Grasslands of Suciu. The area of grassland habitats of Community interest is decreasing slightly due to the expansion of bush vegetation on some lands used as pastures. Abandoning grazing and lack of pasture care works is therefore favoring the expansion of shrubs among which *Rosa canina, Prunus spinosa, Berberis sp., Crataegus sp. species*.

With regard to plant species of Community interest was found that some species mentioned in the standard form are not found in the field, such as species of orchid *Liparis loeselii* of ROSCI0004 Băgău.

Animal species of the large carnivores category, respectively the bear, wolf, wild cat are characterized by a favorable conservation status, their number is growing also in 2013. The specimens approved for harvesting by order of the Minister of Environment and Climate Change, were collected from the sites ROSCI0253 Trascău and ROSCI0085 Frumoasa. For carnivores in ROSCI0253 Trascău we signal the emergence of a competing carnivore species, the jackal, that most likely came in through the Mureş corridor from the Hungarian steppe zone.

By 2013, the sites located on Mures Valley, respectively ROSPA0139 Piedmont of the Metaliferi Mountains - Vinţu and ROSCI0382 Târnava Mare River between Copşa Mica and Mihalt, were subjected to anthropogenic pressures falling in the category "exploitation of mineral aggregates" by the opening of pits. In 2013 there weren't approved any new exploitation perimeters in these protected areas. The completion of management plans for ROSCI0085 Frumoasa, ROSPA0043 Frumoasa, ROSCI0253 Trascău ROSPA0087 Trascăului Mountains will enforce some conservation measures for forest habitats, dominant in surface in these sites. Currently, forest managers of these sites are not aware of the conservation requirements for the animal species dependent on forest habitats. Most suffer animal species that require the presence of dead wood in the forest and that of old trees with hollows. A potential threat that can reduce the surface of natural habitats of Community interest is the invasion of alien plant species, among which: *Reynoutria japonica, Ailanthus altissima, Ambrosia artemisiifolia*. The presence of *Reynoutria japonica, Ailanthus altissima* was found in ROSCI0253 Trascău. *Ambrosia artemsiifolia* was reported in Mures Valley in ROSPA ROSPA0139 Piedmont of the Metaliferi Mountains - Vinţu.

Brasov County is at the interference of two biogeographical zones: alpine and continental. Natural habitats found in the county are characteristic of terrestrial, aquatic and groundwater ecosystems/ Aquatic habitats (fresh water-stagnant and streams) are in good condition, due to the decrease of pollution in the river system. Fish species have had a normal development. Flora and fauna that grow in aquatic habitats have not suffered. Eutrophic marshes in the county have suffered due to the alternation of periods of drought with moisture. Terrestrial habitat consists of grassland and forests. Forests run from 200m to 1700m altitude, occupying an area of 165.000 ha. They are divided into *oak floor* (sub-areas with evergreen oak, oak, Turkey oak and Italian oak) occupying an area of 16,500 ha representing 10% of the total area occupied by forests, *beech forest floor* – altitudes between 600m - 1300m, occupying an area of 66,000 ha and 40% of the area occupied by forest. This habitat is least affected by environmental conditions either natural or anthropogenic. Beech forests are home to major wild mammals. The relative good health of these habitats has created conditions of maintaining effective wildlife species relatively constant; *resinous floor* – lies between 1300 m – 1700 m and occupies an area of 82,500 ha representing 50% of the area covered by forest. These habitats suffer from defoliation and drying phenomena. The causes could be the drought in previous years and release of noxious industrial enterprises into the atmosphere. Habitats in the Brasov, Rasnov, and Fagaras are affected. The alpine meadows are located in the upper mountains between 1600m - 2500m. These habitats are specific to massifs: Bucegi, Piatra Craiului, Ciucaş, Fagaras, Postăvarul, Piatra Mare. In the meadows, a large area is occupied by grasslands that in Brasov account to 119,980 ha. Grasslands are the most subjected to degradation by especially by anthropogenic activities (intensive grazing throughout the year) and soil water deficit. Areas with denser population and access roads in the mountains area (Bran area) on pastures in Piatra Craiului and Bucegi Massifs, animals load per hectare is 2-3 times higher than grassland maintenance possibilities. Underground habitats (caves) comprise a multitude of caves but only 4 of them are declared protected areas (Liliecilor, Comana, Barlogul Ursilor, Valea Cetatii caves).

The great variety of the landscape together with the climatic conditions of **Covasna County** allowed the diversified development of flora and fauna. From the Olt river valleys and the Black River to the highest peaks, on the surface of the county are encountered unaccountable species of plants, invertebrates, amphibians, mammals and birds, some of which are endemic, rare or found only in this region . Excess moisture in the Olt River and Black River creates an optimal development for eutrophic wetlands. Among the most representative are the marshes from Reci and Chichiș. The large diversity of species allows the existance of complex ecosystems in a well preserved state, that spann on considerable areas. Due to the physico-geographical conditions in the county of Covasna, two major biogeographical regions of the five existing in the country are found, namely continental and alpine. In Covasna County all major natural habitats can be found, except for coastal and marine habitats, of which we mention: still water, oligotrophic to mesotrophic waters with vegetation of *Littorelletea uniflorae* and / or *Isoeto-Nanojuncetea*; Natural eutrophic lakes with vegetation type of *Hydrocharition Magnopotamion*; Water courses in the plains up to the mountain level, with vegetation made of *Ranunculion fluitantis and Callitricho-Batrachion*; Ponto Pannonian dwarf almond scrubs; Formations with *Juniperus commnunis* in limestone areas or meadows; Xerice meadows and calcified on the sands; Active bogs; Rocky slopes with chasmophytic vegetation on limestone; Caves closed to the public; *Luzulo-Fagetum* beech forests; *Asperulo-Fagetum* beech forests; Dacian oak and hornbeam forests etc.

Among the species of fauna, we mention: invertebrates (*Pholidoptera transsylvanica, Carabus variolosus, Rosalia alpina, Lycaene dispar, Hypnophele lycaon, Graphoderus zonatus, Anthocaris cardamines, Aphantopus hyperantus, Erebia medusa, Hepialus humuli, Limenitis camilla, Maniola jurtina, Triodia sylvina, Apatura iris, Argynnis paphia, Leptidea sinapis, Sphynx ligustri* etc.); amphibians and reptiles: (*Triturus cristatus, Triturus montandoni, Bombina variegata, Emys orbicularis, Rana temporaria, Bufo bufo, Hyla arborea, Rana arvalis, Rana lessone, Bufo viridis, Pelobates fuscus, Rana dalmatina, Triturus alpestris, Salamandra salamandra* etc.); mammals: (*Ursus arctos, Canis lupus, Lynx lynx, Rhinolophus hipposideros, Rhinolophus ferrumequinum, Myothis blythii, Barbastella barbastellus, Miniopterus schreibersi, Myotis emarginatus, Myotis bechsteini, Myotis myotis, Lutra lutra, Castor fiber, Nyctalus noctula, Plecotus auritus, Pipistrellus pipistrellus, Plecotus austriacus, Erinaceus europeus, Martes martes, Mustella nivalis, Sciurus vulgaris, Cervus elaphus, Felis silvestris, Meles meles*, etc.); fish: (*Barbus meridionalis petenyi, Cottus gobio, Umbra crameri, Hucho hucho, Tinca tinca, Lota lota, Eudontomyzon danfordii*); păsări: *(Tetrao tetrix, Gavia stellata, Gavia arctica, Podiceps ruficollis, Podiceps griseigena, Podiceps cristatus, Ixobrychus minutus, Pluvialis apricaria, Calidris alba, Calidris minuta, Calidris temminckii, Calidris ferruginea, Limosa limosa, Numenius arquata, Phalatopus lobatus, Crex crex, Gallinago gallinago, Scolopax rusticola, Perdix perdix, Larus ridibundus, Larus argentatus, Chlinodias niger, Riparia riparia, Hirundo rustica, Delichon urbica, Oriolus oriolus, Garrulus glandarius, Pica pica, Nucifraga caryocatactes, Corvus monedula, Corvus frugilegus, Corvus cornix, Corvus corax, Parus palustris, Parus montanus, Parus cristatus, Parus ater, Parus caeruleus, Parus major, Aegithalos caudatus, Sitta europaea, Certhia familiaris, Cinclus cinclus, Troglodytes troglodytes, Saxicola torquata, Saxicola rubetra, Oenanthe oenanthe, Monticola saxatilis, Phoenicurus ochruros, Falco peregrinus, Falco subbuteo, Falco tinnunculus, Aquila pomarina, Aquila clanga, Circaetus gallicus, Circus aeruginosus, Circus pygargus, Circus cyaneus, Aquila chrysaetos* etc.)

Due to the physico-geographical conditions in the **county of Harghita**, two major biogeographical regions of the five existing in the country are found, namely continental and alpine. In Harghita County all major natural habitats can be found, except for coastal and marine habitats. 28 natural habitat with protection regime included in the national lists and EU directives were identified, the area of habitats of national and community interest being approx. 12,000 ha, such as: continental salt meadows, natural dystrophic lakes and ponds, alpine rivers and their ligneous vegetation with Myricaria germanica, alpine and boreal grasslands, bushes with Pinus mugo and Rhododendron myrtifolium (Rhododendron myrtifolii - Pinetum mugi), natural dry grasslands and facies on covered with bushes on calcareous substrates. Skirt associations with hydrophilic tall grasses, mountain hayfields, active peat lands, alkaline bogs, limestone scree and calcareous shale of the mountain floors up to the alpine ones (*Thlaspietea rotundifolii*), calcareous rocky slopes with chasmophytic vegetation English oak forests with *Carpinion betuli* etc. Flora of the county is rich in glacial relicts, endemic plants and other plants included in different IUCN categories of endangerment. The number of flora species of national interest identified in the county: 17, and the number of species of Community interest identified in county: 5. Plants of community interest identified in Harghita County : *Saxifraga hirculus* – marsh saxifrage, *Ligularia sibirica* - mountain cabbage, calendula, *Cypripedium calceolus* – lady's slipper orchid, *Iris aphylla ssp hungarica* (*Iris hungarica*) – Iris, *Angelica palustris* - besser. Were identified 6 priority habitat types at Community level: * 91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-padion, Alnion incanae, Salicion albae);* 91D0 * - Bogs with forest vegetation; 7110 * - Active bogs; 7220 * Petrifying springs with travertine formations; 6210 * natural dry grasslands and scrubland facies on calcareous substrate *(Festuco Brometalia)*; 9180 * Forests of *Tilio-Acerion* on steep slopes, screes and ravines.

The county's fauna consists of species of mammals*: Erinaceus europaeus, Sorex sp., Crocidura sp., Talpa europaea, Myotis myotis, Myotis blythii, Myotis nattereri, Myotis emarginatus, Myotis daubentonii, Myotis bechsteini, Eptesicus serotinus, Nyctalus noctula, Plecotus austriacus, Plecotus auritus, Vespertilio murinus, Pipistrellus pipistrellus, Pipistrellus pygmeus, Rhinolophus ferrumequinum, Rhinolophus hipposideros, Barbastella*

barbastellus, Miniopterus schreibersii, Lepus europaeus, Sciurus vulgaris, Castor fiber, Microtus sp., Ondatra zibethicus, Apodemus sp., Rattus rattus, Glis glis, Muscardinus avellanarius, Dryomys nitedula, Ursus arctos, Lynx lynx, Felis silvestris Canis lupus, Vulpes vulpes, Lutra lutra, Martes foina, Mustela nivalis, Mustela putorius, Mustela lutreola, Mustela erminea, Martes martes, Sus scrofa, Cervus elaphus, Capreolus capreolus, Rupicapra rupicapra; păsări: *Tetrao tetrix, Gavia stellata, Gavia arctica, Podiceps ruficollis, Podiceps griseigena, Podiceps cristatus, Ixobrychus minutus, Nycticorax nycticorax, Ardeola ralloides, Egretta garzetta, Ardea cinerea, Ardea purpurea, Tetrao urogallus, Ciconia nigra, Ciconia ciconia, Plegadis falcinellus, Anser albifrons, Mergus albellus, Anas platyrhynchos, Anas clypeata, Anas penelope, Anas acuta, Anas querquedula, Aythia ferina, Aythia nyorca, Rallus aquqticus, Porzana porzana, Pluvialis apricaria, Calidris alba, Calidris minuta, Calidris temminckii, Calidris ferruginea, Limosa limosa, Numenius arquata, Phalatopus lobatus, Crex crex, Gallinago gallinago, Scolopax rusticola, Perdix perdix, Coturnix coturnix, Gallinula chloropus, Charadrius dubius, Charadrius hiaticula, Vanellus vanellus, Philomachus pugnax, Tringa totanus, Tringa nebularia, Tringa ochropus, Tringa glareola, Tringa hypoleucos, Larus ridibundus, Larus argentatus, Chlinodias niger, Columba palumbus, Streptopelia decaocto, Streptopelia turtur, Cuculus canorus, Caprimulgus europaeus, Apus apus Apus melba, Alcedo atthis, Merops apiaster, Upupa epops, Jynx torquilla, Picus viridis, Picus canus, Dryocopus martius, Dendrocopus major, Dendrocopus medius, Dendrocopus minor, Dendrocopos leucotos, Picoides tridactylus, Galerida cristata, Lulula arborea, Alauda arvensis, Riparia riparia, Hirundo rustica, Delichon urbica, Oriolus oriolus, Garrulus glandarius, Pica pica, Nucifraga caryocatactes, Corvus monedula, Corvus frugilegus, Corvus cornix, Corvus corax, Parus palustris, Parus montanus, Parus cristatus, Parus ater, Parus caeruleus, Parus major, Aegithalos caudatus, Sitta europaea, Certhia familiaris, Cinclus cinclus, Troglodytes troglodytes,* etc; amfibieni: *Rana arvalis, Rana temporaria, Rana esculenta, Hyla arborea, Pelobates fuscus, Bombina variegata, Bufo bufo, Bufo viridis, Triturus alpestris, Triturus vulgaris, Triturus cristatus, Triturus montandoni, Salamandra salamandra; reptile: Emys orbicularis, Lacerta viridis, Lacerta muralis, Lacerta agilis, Lacerta vivipara, Anguis fragilis, Vipera berus, Natrix natrix, Natrix tessellata, Coronella austriaca, Elaphe longissima;* peşti: *Hucho hucho, Tinca tinca, Lota lota, Eudontomyzon danfordii, Barbus meridionalis petenyi;* nevertebrate: *Hemydiaptomus amblyodon, Chirocephalus shadini, Drepanosurus hankoi, Tanymastix stagnalis; Leuctra carpathica, Nemoura ovidealis, Nemoura hamata, Siphonoperla transylvanica, Izophia pienensis, Pholidoptera aptera, Odontopodisma carpathica, Siocornis umrinus, Rhacognathus punctatus, Chlorophorus herbsti, Paleochryzophanus hippothoe, Eumedonia eumedon, Parnassius apollo transsylvanicus, Clossania titania transsilvanica, Erebia melas carpathicola, Erebia aethiops ssp. jigodina, Zygaena nevadensis gheorghenica, Ochropleura musiva, Euxoa birivia, Euchalcia variabilis, Melitaea diamina, Vanessa io, Vanessa antiopa, Saturnia pyri, Saturnia pavonia.* A number of species of wildfauna of national interest were identified in the county (330) as well as of community interest (123).

On the Mures County territory are found the alpine, steppe bioregions and small islands. The general condition of the biodiversity in this county is in slight decline, the condition of habitats and species of community interest could be considered less favorable. We mention natural habitat types identified in Natura 2000: Molinia meadows on calcareous, peaty or clayey soils *(Molinion caeruleae);* Alluvial meadows of *Cnidion dubii*; Alpine pioneer formations of *Caricion bicoloris-atrofuscae*; Forests of *Tilio-Acerion* on steep slopes, screes and ravines; Alpine and boreal bushes; *Pinus mugo* and Rhododendron myrtifolium bushes; Nardus grasslands rich in species on siliceous substrates; Mountain meadows; Subpanonnian steppe meadows; Low altitude meadows (*Alopecurus pratensis Sanguisorba officinalis*);Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* vegetation; *Luzulo-Fagetum* beech forests; *Asperulo-Fagetum* beech forests; *Alnus glutinosa* and *Fraxinus excelsior* alluvial forests *(Alno-Padion, Alnion incanae, Salicion albae*);; Forests of *Larix decidua* and / or *Pinus cembra* in the mountainous region; Pannonian forest vegetation with *Quercus pubescens*; Eurosiberian steppe vegetation with *Quercus spp*., etc.

Among the flora species of Community interest we mention: *Drepanocladus vernicosus, Marsilea quadrifolia, Angelica palustris, Ligularia sibirica, Cypripedium calceolus, Campanula serrata, Iris aphylla ssp. Hungarica, Tozzia carpathica, Cypripedium calceolus, Echium russicum, Crambe tataria, Adenophora lilifolia, Iris aphylla ssp. Hungarica, Agrimonia pilosa.*

Mures County wildlife is composed of: mammals (*Miniopterus schreibersi, Canis lupus, Ursus arctos, Lynx lynx, Rhinolophus ferrumequinum, Myotis blythii, Barbastella barbastellus, Myotis myotis, Lutra lutra, Rhinolophus hipposideros* etc.); amphibians and reptiles (*Triturus cristatus, Bombina variegata, Triturus montandoni*) ; fish (*Sabanejewia aurata, Cottus gobio, Eudontomyzon danfordi, Hucho hucho, Gobio uranoscopus, Gobio kessleri, Barbus meridionalis*); invertebrates (*Nymphalis vaualbum, Euphydryas maturna, Lycaena dispar, Rosalia alpina, Carabus hampei, Lucanus cervus, Cucujus cinnaberinus, Euphydryas aurinia, Euphydryas maturna, Eriogaster catax, Callimorpha quadripunctaria,, Cochylimorpha subwoliniana, Cochylimorpha fucatana, Aethes caucasica, Epibactra sareptana, Scotopteryx ignorata, Autophila dilucida, Cucullia xeranthemi, Oncocnemis confusa, Epimecia ustula, Mesotrosta signalis, Muschampia cribrellum,Colias chrysotheme, Plebejus sephirus etc.*).

Avifauna is composed of: *Corncrake (Crex crex), lesser spotted eagle (Aquila pomarina), honey buzzard (Pernis apivorus), black stork (Ciconia nigra), sea eagle owl (Strix uralensis), nightjar (Caprimulgus europaeus), oak woodpecker (Dendrocopos medius), Red-backed shrike (Lanius collurio), forest lark (Lullula arborea), winter falcon (Falco columbarius), capercaillie (Tetrao urogallus), hazel (Bonasa bonasia) Ciuvică (Glaucidium passerinum)*

huhurez high (Strix uralensis), Wonderland (Aegolius funereus), black woodpecker (Dryocopus martius), mountain woodpecker (Picoides tridactylus), collared flycatcher (Ficedula albicollis), small flycatcher (Ficedula parva), white stork (Ciconia ciconia), hazel (Bonasa bonasia) capercaillie (Tetrao urogallus), Ciuvică (Glaucidium passerinum), Alcedo atthis, Ferruginous duck, Botaurus stellaris, Circus aeruginosus, Ixobrychus minutus, Porzana parva, Nycticorax nycticorax, Gavia arctica, Branta ruficollis, Phalacrocorax pygmeus, Egretta garzetta, Egretta alba, Pluvialis apricaria, Tringa Glareola, Himantopus himantopus, Recurvirostra avosetta, Chlidonias niger etc.

There have been reported problems in the assessment of the state of biodiversity. We recall 2 cases that require urgent and firm measures for a protected species and a national reservation. The huchen (*Hucho hucho*), priority species within the Călimani - Gurghiu Natura 2000 site could not be monitored any longer, it is endangered, continuously affected by poaching in Mures Gorge, even in the areas prohibited for fishing Mures Gorge Natural Park. In the Mociar Forest, secular oak reservation, that exceeded 800 and even 900 years, the vitality of the trees is diminished and most of them were dried in recent years. The assessment of the state of biodiversity will contribute to a more accurate assessment and are carried out on over 90% of the natural protected areas, exceeding 200,000 ha.

Sibiu County contributes to natural capital of Romania with alpine continental bioregions and small islands of steppe vegetation - ROSCI0093 Sura Mica - Slimnic steppe islands, representative populations of large carnivores, quasi virgin forests and valuable landscapes with high biodiversity. There is a great diversity of ecosystems, habitats and wildlife due to the natural variety; it has a biodiversity higher than the national average. The configuration of relief and altitudinal differences make the area to have different floors of vegetation in the south of the county, where we distinguish the deciduous forests floor, mixed forests floor, coniferous forests floor, subalpine and alpine meadows bushes, while the central and northern part falls in the nemoral area, the deciduous forest floor intertwining on the highest floodplains.

Although Sibiu county has only 2.3% of Romania, its geographical position, the diversity of landforms and its great altitudinal amplitude (about 2,265m), with repercussions on the types of climate, but also due to the over two centuries of botanical research in the county, led to the identification of 63% of the national cormoflora species (C. Drăgulescu, 2003 C*ormoflora of Sibiu County*). Biodiversity assessment in the county of Sibiu was carried out mostly based on numerous specialty studies, which have generally focused on the mountainous area of the county. A high concentration of habitats with a high number of rare species and endemic relict was identified in Fagaras, Cindrel mountain ranges. The monitoring activities carried out in protected areas in Sibiu county show a good conservation of species and habitats present.

The inventories flora in Sibiu includes 2,455 species of cormophyte (belonging to 637 genuses and 124 families), 528 species of bryophytes and 459 lichen species. Of cormophyte, a number of over 40 species are *endemic* to the Carpathian Mountains, including: mountain daisy (*Achillea schurii*), columbine (*Aquilegia transsilvanica*), mouse ear chickweed (*Cerastium transsilvanicum*), gilly flowers (*Erysinum transsilvanicum*) etc. . Among the extremely rare species at national level one can mention: hoary plantain (*Plantago maxima*), Siberian polygala (*Polygala sibirica*), *Angelica palustris* – besser, marshcala (*Calla palustris*), common restharrow (*Osonis repens*), fool's water cress (*Apium nodiflorum*) etc. Other plant species found on the red lists are : *Ribes alpinum, Veronica bachofenii, Symphyandra wanneri, Gymnodenia conopsea, Listeria ovata, Neottia nidus – avis, Angelica archangel Dianthus glacialis ssp gelidus, Doronicum carpaticum, Trollius europaeus, Botrychium matricariifolium Veronica baumgartenii* and so on. Plant species of Community interest identified in the county are: *Echium Russicum, Crambe tatarica, Campanula serrata, Tozzi alpina ssp Carpathian, Cirsium brachycephalum Angelica palustris, Meese longiseta, Drepanocladus vernicosus, Buxbaum viridis, Dicranum viride*.

The inventoried vertebrate fauna includes 60 species of mammals, 258 species of birds, 34 species of fish, 15 species of amphibians and 12 species of reptiles and numerous species of invertebrates. Of the 258 bird species, a total of 194 species are found in the Birds Directive (75 species in Appendix I), 252 species are among the species protected by the Bern Convention (Law no. 13/1993 on the conservation of wildlife and natural habitats in Europe), 81 species are in the Hague Convention (Law no. 89/2000 for the Conservation of Migratory African-Eurasian Water Birds) and 110 species through the Bonn Convention (Law no. 13/1998 on conservation of Migratory Species of Wild Animals) . Of these, according to Ord.1198/2005, 122 species are of international interest and 46 species are of national interest.

Among vertebrate species, other than birds, that have been identified in the county of Sibiu, 26 species of mammals, 8 species of reptiles, 11 species of amphibians and 9 species of fish, are found in the Habitats Directive; 45 mammals, 12 species of reptiles, 15 species of amphibians and 11 species of fish are listed in the Berne Convention, 9 species of bats are found in the Appendices of the Bonn Convention. Compared to the species listed in the Order no. 1198/2005, Sibiu county preserves 46 species of international interest and 22 species of national interest.

Bucharest - Ilfov Region.

In the absence of a scientific study on the flora and fauna of **Bucharest Municipality,** the number of species is not accurately known, but wild plants are found mainly in the periphery of agricultural land. Among the plants grown around the blocks included are: ash, catalpa, linden, walnut, willow, poplar, peach, cherry, Prunus cerasifera, vines,

honeysuckle, jasmine, forsythia, privet, Spirea, Hibiscus, barberry, rose etc., some of them are forming true hedges. In densely built areas, even roofs are planted with vines but more common is putting wild of culture vine on exterior walls or. Some of these herbs are natural monuments: *Aesculus hippocastanum* (red chestnut), *Torreya nucifera* (kaya) and *Sophora japonica* (Japanese acacia), and so on, and are included in the list of protected trees in Bucharest.

In terms of wildlife, domestic animals predominate in number, especially stray dogs, cats, etc. .,but wildlife that has adapted to the urban environment can also be encountered. Species of wild birds that can be seen on lakes and parks are in number of 89, of which 15 species are on Annex 3, 13 on Appendix 4B and 5 in Appendix 5C (their hunting is allowed); of Picidae family we meet 5 species of woodpeckers, of which 4 are protected by GEO No. 57/2007 - Annex 3 and *Picus veridis* is also on Annex 4B - species requiring strict protection. There are also 19 species of fish identified in local lakes, such as: bream, roach, perch, rudd, eel (protected species), and so on, and 4 species of bats - *Myotis daubentonii* (water bat), *Vespertilio murinus* (bicolor bat), *Nyctalus noctula* (common noctule), *Pipistrellus pipistrellus* (pipistrelle bat) - protected by Law. 13/1993 and Law no. 90/2000. They are met in parks with hollow trees, attics of houses, churches, rock crevices, etc.

The Bucharest Zoo has a total area of 67,057 square meters, maintains and exhibits collections of live wild, native and exotic animals, holding, at the end of 2013, a total of 1805 copies, grouped into 219 species. The purpose of the Bucharest Zoo is to contribute to the conservation of fauna and training, education and recreation of visitors.

Economically exploited species in Bucharest are grown in greenhouses and nurseries. Also, during the winter holidays season, are capitalized the resinous trees such as fir, spruce, but they are brought from outside Bucharest.

In 2011, the Bucharest City Hall completed the green cadastre of Bucharest. According to this document, the capital has 23.21 square meters of green space per capita, and the largest area of green spaces is in District 1 - 77.19 sqm / capita. From this surface, 3174.1 ha is represented by isolated green spaces (plantations in line, green spaces related to residential comlexes, adjacent to educational or cultural institutions, hospitals, etc.), 669.6 ha are parks and 668,4 forest parks. The Green Cadastre assumed the inventory of all trees and green spaces in the public domain. Were considered green spaces the trees, grass and cemeteries, parks, squares, trees planted in line etc, remaining to be inventoried also the green space found on private properties.

Table 5.1.1.1. *The situation of green space in the Buvharest Municipality*

District	Square meter per capita	Number of trees	Green spaces area	Deteriorated green spaces
District 1	77,19	555.366	1.757,7	88,6
District 2	12,43	196.340	444	19,1
District 3	16,27	253.221	649,7	2,2
District 4	21,12	233.887	634,2	224,7 (with the former Văcăreşti lake)
District 5	12,8	198.638	369,6	16,1
District 6	17,71	279.887	657	17,0

Data source: P.M.B. –2011

We have 1.7 million trees, of which 194,000 in the woods; there are 110 protected trees. Comparing the data listed with the number of inhabitants, we fiind that the Bucharest average is of 0.88 tree, compared to the EU recommendation of 3 trees per capita. The closest to this recommendation is found in District 1 with 2.55 trees per capita, the opposite being District 2 with 0.55 trees per capita.

During 2013 a number of 1501 trees and shrubs have been planted and 1,515,070 pieces of floricol material managed by ALPAB in Bucharest: 240 specimens of lime trees and 357 specimens (maple, oak, acacia) in Tineretului Park; 30 specimens of Paulownia in the Circul de Stat Park; 24 specimens of Sycamore trees on the north-south axis; 121 specimens of maple on Şos. Panduri, district 5; 29 specimens of maple on Spaiul Unirii - Dâmboviţa 700 different tree species in the Tineretului Park - planted within the "the Capital Grows Green" campaign held by the Department of Environment of the Bucharest City Hall.

In 2013 was launched the public procurement procedure for the project on "Inventory of private green spaces and updating the green areas register of Bucharest", according to Law no. 24/2007 and MDRT Order no. 1466/2010.

Also in 2013, on the Bucharest City Hall website, Maps section, has been posted the Bucharest Green Cadastre.

Although it is located in the immediate vicinity of the capital, subject to a continuous process of urbanization, **Ilfov County** is characterized by a very high biodiversity, with species of protected flora and fauna found in the 8 existing protected areas in the county. The following types of natural habitats are found: areas of acclimatised Indian lotus (characteristic of Lake Snagov), dystrophic lakes and ponds (near settlements of Buftea, Mogoşoaia, Chitila, Cernica, Grădiştea, Snagov, Balta Neagra, Tiganesti Monastery) reed, rush,

acclimatised Indian water lily (*Nymphea lotus*) with other species of lilies: white water lily (*Nymphea alba*) and yellow water lily (*Nuphar luteum*) (vegetation specific to lakes in Ilfov county).

As for birds, Bucharest-Ilfov region stands out by the following birds species: garganey (*Anas querquedula*), mallard (*Anas platyrhyncos*), teal (*Anas crecca*), greater white-fronted goose (*Anser albifrons*), moorhen (*Gallinula chloropus*), coot (*Fulica atra*), northern lapwing (*Vanellus vanellus*), purple heron (*Ardea purpurea*), cuckoo (*Cucullus canorus*), long-eared owl (*Asio otus*), barn owl (*Tyto alba*), little owl (*Athene noctua*), short-eared owl (*Asio flammeus*), bee-eater (*Merops apiaster*), swift (*Apus apus*), hoopoe (*Upupa epops*), kingfisher (*Alcedo atthis*), grey-headed woodpecker (*Picus canus*), syrian woodpecker (*Dendrocopos syriacus*), middle spotted woodpecker (*Dendrocopos medius*), barn swallow (*Hirundo rustica*), house martin (*Delichon urbica*), sand martin (*Riparia riparia*), white wagtail (*Motacilla alba*), red-backed shrike (*Lanius collurio*), great cormorant (*Phalacrocorax carbo*), little egret (*Egretta garzetta).*

An important area in terms of biodiversity is the Caldarusani Lake area. This area is ideal environment for the optimal development of fauna and especially avifauna, in light of the fact that, along with the large area of the lake, we also have the forest habitat. In the area of Caldarusani Lake there are common avifauna species nesting or transiting, as well as protected or strictly protected species, such as: Pygmy cormorant (*Phalacrocorax pygmeus*), black-crowned night-heron (*Nycticorax nycticorax*), great egret (*Egretta alba*), little egret (*Egretta garzetta*), white stork (*Ciconia alba*), black stork (*Ciconia nigra*), mallard (*Anas platyrhynchos*), buzzard (*Buteo buteo*), kestrel (*Falco tinnunculus*), moorhen (*Gallinula chloropus*), hoopoe (*Upupa epops*), great spotted woodpecker (*Dendrocopos major*), purple heron (*Ardea purpurea*), squacco heron (*Ardeola ralloides*) etc.

Wild fauna in Ilfov county is represented by mammals and reptiles like: polecat (*Putorius putorius*), otter (*Lutra lutra*), European pine marten (*Martes martes*), least weasel (*Mustela nivalis*), muskrat (*Ondrata zibethica*), deer (*Capreolus capreolus*), boar (*Sus scrofa*), canidae - fox (*Vulpes vulpes*), lepuridae - hare (*Lepus europaeus*), reptiles: emydidae - pond turtle (*Emys orbicularis*), lacertidae - green lizard (*Lacerta viridis*), sand lizard (*Lacerta agilis*), colubridae – house snake, water snake (*Natrix tesselata*). Fish fauna: crucian carp (*Carassius carassius*), tench (*Tinca tinca*), rudd (*Scardinius erythrorhtalmus*), perch (*Perca fluviatilis*), carp (*Cyprinus carpio*), bream (*Abramis brama*), zander (*Stizostedion lucioperca*), catfish (*Silurus glanis*), gobies (*Gobius sp.,* and *Broteshoryns sp*. - endemic).

5.1.2 IMPACT

Biodiversity monitoring aims to provide a basis for long-term evaluation of the status of biodiversity in the area, in order to improve the implementation of measures of protection, conservation of natural habitats and of wild flora and fauna. Monitoring includes baseline assessments of natural factors in the implementation of the plan/project to quantify the impact by its implementation, and/or resources required to operate the business. Comparisons can not always be made on the issue, either due to the lack of same indicators from one period to another or due to irrelevance of data available.

All activities which could have a significant impact on biodiversity are subject to specific assessments (environmental assessment for plans and programs, environmental impact assessment and appropriate assessment projects) and the regulatory act is issued only after proving, by reports drafted by companies or individuals certified by the Ministry of Environment and Climate Change, that such activities do not have significant impact on the environment and biodiversity.

By implementing appropriate assessment requirements of the potential effects of the plans and projects on protected natural areas of community interest, it is ensured that no plan or project can significantly affect the protected area of community interest, alone or in combination with other plans/projects, which are under the regulatory procedure or are provided for in the development strategies. Also, the monitoring indicators of species and habitats for activities carried out in protected areas are established and checked.

The biological diversity is continuously threatened due to the increase of the economic activities which put pressure on the environment. The evaluation of the impact on biodiversity is based on evaluation criteria which refer to:

- The degree of effect on the species and natural habitats from the territory of impact;
- Changing in the ecosystem's parameters;
- Fragmentation of the ecosystem;
- Measures to decrease the impact.

The major consequences on biodiversity are shown in a series of significant changes of quality and quantity in the structure and functioning of the ecosystems. From the perspective of the conservation principles and targets of sustainable use of the components of biodiversity, the main relevant consequences are: the existence of an active erosion process of the biological diversity which is expressed through the extinction or reduction of the number of some species, mostly birds and mammals; fragmentation of the habitats of a lot of

species and a longitudinal connectivity discontinuance (by blocking the water courses) and a lateral one (by setting barriers in the floodable areas, blocking or considerably decreasing the migration routes of the species of fish and the access to the proper places for feeding and breeding); decrease in or elimination of some types of habitats or ecosystems from the areas of transition (forest curtains, tree lines, humid areas from the structure of big agricultural exploitation or big lot systems) with profound negative effects on the biological diversity and on the control functions of the diffuse pollution, soil erosion, surface leaks and the evolution of the flood wave, biological control of the crops pest populations, recharges of the reserves or the underground sources of water; ample changes, sometimes below the critical level, of the structural configuration of the hydrographical basins and water courses, associated with the significant reducing of the aquatic systems' capacity to absorb the pressure of the human factors which operate at the level of the hydrographical basin and with the increase of the vulnerability and of the social and economic systems that depend on it; the deconstruction and reduction of the production capacity and of the components of the biodiversity in the agricultural sector; the impact on the landscape, at each of its 3 components: cultural elements (settlements, infrastructure, buildings, human activities), biodiversity and geomorphological structure (relief, geological, hydrological characteristics).

Interventions with a negative impact on the landscape, depending on severity are:

1. ***destruction*** - significant losses in all the 3 components of the landscape. These are mainly caused by inadequate intensive urban development to the environment and local architecture, changing of the function of land, deforestation, radical transformation of traditional settlements tissues (thickening, demolition, change of functions).
2. ***degradation*** - powerful transformations in the components, but that do not change the unitary character. These are caused by: deterioration of biodiversity (urban landscaping with alien species, neglect and abandonment of public spaces for road traffic), cultural losses (transformations of building elements with exemptions from legislation, intensive unsustainable urban planning, without strategic planning, suburban neighborhoods which lack identity, infrastructure and integration into the body of the city, abandoning traditions), pollution (accumulation of waste, air, water and land pollution).
3. ***aggression*** - punctual actions with mpact on all components. These are caused by economic and tourist activities such as quarries, gravel pits, forestry, ski slopes etc. - which are carried out in an unsustainable mannaer and cause changes in landforms, accumulation of waste, imbalances in the ecosystem, lack of continuity in landscaping policies.

Uncontrolled tourism practiced intensely creates a negative impact of intensity through the deterioration and degradation of the wild fauna, causing stress to the animal species, degradation of the soils in slope through not-following the marked routes, as well as through camping and opened fires in restricted areas, disposal of wastes in places not destined for this purpose. All these elements put a great pressure on the natural environment, causing its degradation, therefore being necessary the implementation of the ecotourism concept, not only in the natural protected areas, but outside of those as well.

The activities which passed the environmental acceptance procedures have assumed the protection and conservation measures enforced in order to decrease the impact.

The expanding of the city limits inside the natural protected areas or in their vicinity causes a great pressure on the natural protected areas.

Without considering the needs of future generations, the excessive exploitation of some natural resources and fragmentation of some natural habitats endangers the wild life.

Therefore, the conservation of biodiversity has to be made under an efficient, sustainable management of the components of the natural capital, and the insurance of a protection regime for the vulnerable, endemic, endangered species can be achieved through the setting up of protected natural areas.

Considering the great importance of the natural capital and the sustainable development of the human establishments, it is necessary to conserve the biodiversity as a fundamental condition for the development of future generations.

5.2. ANTHROPIC PRESSURE ON THE BIODIVERSITY

Current concerns for stopping the destruction of biodiversity are justified by an unprecedented rate with which this is lost, entire categories of its components being in danger of extinction. The species that survive suffer a reduction in genetic variability. The destruction of biodiversity components reduce future options of humanity and threatens the very possibility of continuity of the human society.

Within the last three decades it has become more obvious that the diversification, acceleration, globalisation and chronicization are dominant features of the deterioration process of the natural capital. The deterioration of the natural capital is a real process, very complex, taking a long time and with an evolution strictly in accordance with the rhythm, forms and forces of the development of social and economic systems

a. Direct threats:

- Loss of habitats and fragmentation of habitats due to urbanisation, infrastructure development, exploitation of natural resources;
- Draining of swamps or using them for cultures of allochtonous species (common osier, culture euro-American poplar, acacia), in view of obtaining economic gains;
- Abandoning the traditional systems of using the lands, especially in what concerns pastures and hayfields, burning the stubble, excessive grazing;
- Reducing the underground water reserves, due to hydro technical works, has led to the partial or total dry out of tenths of ha of forest;
- The overexploitation of ecosystems and species: the industrial agriculture decreases the soil resources and lead to severe erosion of the slopes and the degradation of ecosystems;
- Improper organisation of the activities of harvesting forest fruits and hunting;
- Loss of wet areas following their transformation into agrarian lands, improper use of wet areas etc;
- The danger of invasive plants.
- Pollution: acid rains affect forests, and eutrophication exerts a negative pressure on the wet areas;
- Using surface waters in microhydroplant type systems, without maintaining the auxiliary debit;
- Deforestation

Adventive species invasion is recognized today, as one of the major threats to biodiversity, structure and function of ecosystems, conservation of protected areas and causes high costs in agriculture, forestry, fisheries and other sectors of the economy, and in human health.

One of invasive species reported in Satu-Mare is *Ambrosia artemisiifolia* (ragweed). Satu-Mare Environmental Protection Agency, in collaboration with the Public Health Directorate and local authorities initiated the program called "*Ambrosia - risk factor for health and environment*." Following the evaluations carried out by Satu-Mare EPA in collaboration with Charles Karacsonyi, botanist, it was found that practically this species is widespread all over the plains and hills of Satu Mare.

This invasive plant can have implications for both the loss of biodiversity, especially in open meadows in the sand areas and on the health of the population due to the allergic effect of pollen grains released into the atmosphere during plant flowering (August-October) and in agricultural crops it can cause significant loss of production, in particular in crops of sunflowers, corn, wheat.

Given the impact of this plant species on the environment and health of people, Satu Mare Environmental Protection Agency, in collaboration with the Public Health Directorate and a number of municipalities have organized a campaign against this plant in urban area by repeated mowing or weeding of this plant, both on privately owned land and public land and information and awareness actions on the impact of pollen on human health in urban area.

Satu-Mare Public Health Authority continues to monitor the allergic reactions in individuals sensitive to the pollen of this plant. ther invasive plant species reported in Satu-Mare, with a growing trend of the occupied areas: *Reynoutria (Fallopia) japonica, Helianthus tuberosus* (topinabur), *Echinocystis lobata* (wild cucumber), *Amorpha fructicosa* (desert false indigo), *Robinia pseudoacacia* (black locust), *Asclepias syriaca* (common milk weed), *Solidago canadensis* (Canada goldenrod) etc.

b. Indirect threats:

- Uncontrolled storage of wastes in protected areas;
- Wind farms: the main impact discussed for protecting the environment is the impact of birds with moving wind generator rotors, as well as disturbances of the habitat (at ground level), if there are significant colonies of birds in the areal;
- The existence of a conflict between different users of the lands: privatisation of forests, the weak implementation and strengthening of the legislation concerning nature protection, the lack of financial and organisational results of the institutions involved in the conservation of biodiversity

- Weak awareness of the public;
- Improper attention offered to ecological education in schools.

Also, it has to be mentioned that the pressures of some natural causes such as extreme meteorological phenomena – very high temperatures, powerful storms, ice raining, with short impact (tree breakdown, destruction of vegetation, death of animals, etc.) as well as long term through global warming phenomena which may cause changes on vast areal and the permanent destruction of some species of animals and plants.

Considering the great importance of the natural capital for the sustainable development of the human communities in terms of ensuring the renewable resources (water, air, food, clothes, medicines, air and water recycling, etc.) the landscape and recreation, of protection value and ecological balance necessary in order to keep a healthy environment, results in the absolute necessity of conserving the biodiversity as a necessary condition for the development of future generations in harmony.

5.2.1. INCREASE IN LAND COVERAGE

The extension of the agricultural surfaces to the detriment of natural hayfields and grass fields has affected some species belonging to these ecosystems. The conversion of lands for urban, industrial, agricultural or transportation development is the main cause of the biodiversity loss, causing the degradation, destruction and fragmentation of the habitats. In addition, touristic activities that aren't regulated in accordance with EU requirements may have a major impact over the sensitive habitats.

In many cases, the climate, the technology, the economy seem to be major factors for causing the change of land use on different time and space scales. At the same time, the land transformation seems to be an adaptable feedback mechanism which the farmers use in order to ease the impact of climatic variations, especially during the very dry or humid periods. The changes of land use are often associated with the change of land coverage and associated with carbon emissions. The carbon reserves in the soil will also be affected; however this effect will depend on the further treatment of the land. After the compensation, the carbon reserves in the biomass over the ground may increase again, depending on the type of coverage of the soil associated with the use of new land. The necessary time for covering new lands may be tens of years.

In what concerns the areas taken out of the agriculture circuit, they have received other uses, especially for building sewage systems for wastes waters and treatment stations for used waters, wind farms, mobile telephone stations, as well as for other buildings. All big investments, but also small ones, located in natural areas, have to consider the negative impact on the wild flora and fauna first. Therefore, well-documented impact studies are necessary, elaborated by specialists in the field with emphasis on the medium and long term effects.

The extension of the city area in the vicinity of natural protected areas or even inside them with the purpose of further building residential areas or even touristic resorts generates a great pressure on the protected natural areas

As a result of the cumulative actions of the pollution factors together with the deficit of humidity, pest attacks, intensive grazing, and the phenomena of partial drying of the forests has increased

Many times, the effects of anthropic actions are not easy to see, but in certain circumstances, when they affect entire biocenoses, they can be catastrophic for the existence of the human populations in those areas. The disappearance or decrease down to a critical level of the species is caused by overexploitation (hunting, fishing, overgrazing) but, many times it is the consequence of the destruction of their habitats by building urban and industrial buildings the excessive exploitation of natural resources, as well as the fragmentation of natural habitats leads to the endangerment of the wild life

The lands with agricultural destination are reducing in terms of surface, but their management is intensified. The main objective is providing food products. It is forgotten the that the agricultural lands offer a lot of ecosystem services, therefore the traditional agricultural landscapes represent a major cultural asset which attracts tourism and offers possibilities of open-air recreation. The intensive agriculture may, in many cases, compromise the other services offered by the ecosystem.

The agriculture is characterised by a double trend: wide scale intensification in some regions and the abandonment of lands in other regions.

The conversion of lands leads to the loss of biodiversity and the degradation of the soil functions.

As it can be noticed, the use of lands has changed a little over the years, the “lost” lands being mostly used for building homes (residential areas) and industrial areas.

In Dâmbovița, in 2013, the distribution of land use by usage type, is as follows:

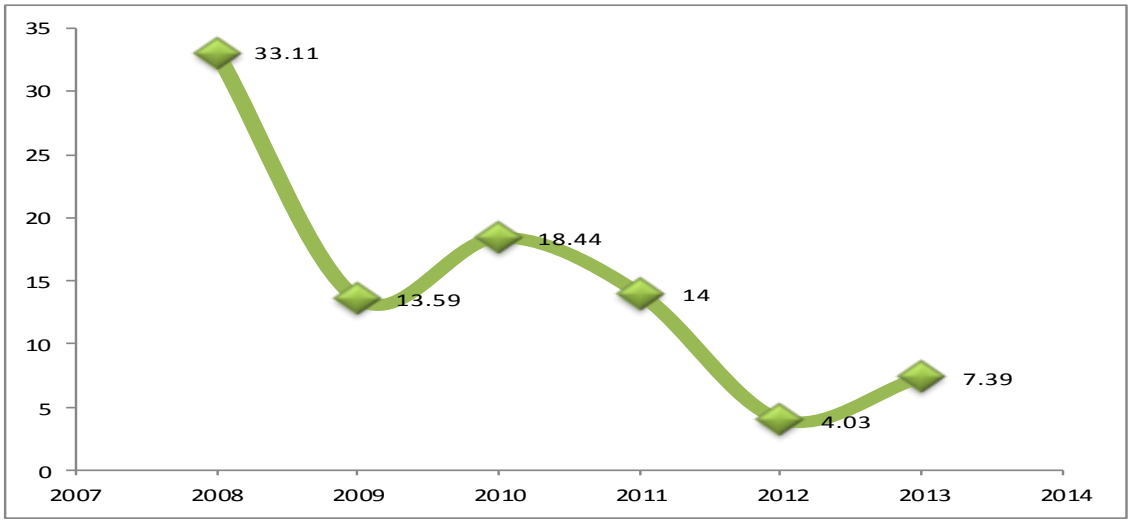
Table 5.2.1.1. *Distribution of agricultural lands by usage type in Dâmbovița County*

County	Agricultural land (ha)	%	Remarks
Dâmbovița	247.681	100	In 2013, there were carried out studies and inventories by OJSPA on the state of agrigultural land for an area of 3594 ha farmland.

Source : Dâmbovița County Department of Agriculture and OJSPA Dâmbovița

According to data provided by the Department of Agriculture of Bistrita - Nasaud County, in 2013 there were permanently taken out from the agricultural circuit 7.39 ha, the main cause being the construction of houses, holiday homes or shelters for animals. Over the recent years, there has been a downward trend in both areas removed from the agrigultural circuit, both from the inner and outer areas of the localities.

Figure 5.2.1. -1 *Evolution of agricultural lands taken out from the agricultural circuit in Bistrita Nasaud County (in ha)*



Source: Department of Agriculture Bistrița-Năsăud County

Harghita Environmental Protection Agency has made a study on the change in the occupancy percentace of agricultural areas, natural and semi-natural, which was intended to really expand the urban built-up areas on a sample sample of 15 thousand hectares around Miercurea Ciuc.

Table 5.2.1.2. *Occupancy percentage of agricultural areas, natural and semi-natural around Miercurea Ciuc County*

Year	Occupied land	Percentage of occupied land	Changes(ha)	Changes (%)
1985	1279	8,53	-	100,00
2005	1577	10,51	+298	123,30
2011	1712	11,41	+433	133,86

Source: Harghita Environmental Protection Agency

The study shows an increase of 133.86%. Although, due to a lack of resources, the study was not carried out on the entire surface of Harghita County, we can consider that the trends that were highlighted in this study are available also more widely, especially when referring to the areas around major towns and municipalities. We realize that in the period 2005-2011 the pace of expansion of municipalities and cities was lower compared to previous periods, instead adjacent localities grew at a faster rate.

Due to the expansion of residential, commercial and industrial areas (especially in the northern area of the city), there is a continuous pressure on forest areas and green spaces. Reduced weight of wooded areas near the capital and lack of environmental education programs, still cause pressure on the environment and affect the health of the population.

5.2.2 POPULATION INCREASE

Together with the development and evolution of human society, the natural ecosystems have represented an obstacle for the development of agriculture and animal breeding, which have been progressively destroyed, actions which still continue today. Today, with the increase in the need of resources in close connection with the increase of the population, their exploitation is diversified on larger and larger spaces, thus leading to the presence of a danger of overexploitation of all the basic components of the environment.

In the last decades, for a big part of the population, the level of life has increased but at the price of losing the biodiversity. If in the past the increase of the city limits was caused by the increase of the urban population, now, a variety of factors lead to this phenomenon. Among them we mention not only the change of opinions in what concerns the habitation typology, moving from collective housing to individual ones, but also the commercial typology, the passage from street commerce to hypermarkets. At the same time a reconsideration of the periurban area is noticed due to the low costs of the land, in comparison with the ones from the urban area, the existence of a more permissive technical conditions and the benefit of an area with a recreational profile.

Even though decreased, impact of population on the environment cannot be neglected. People consume natural resources in direct proportion with their lifestyle, as people put more pressure on non-renewable resources (higher water consumption), more waste, habitation areas extended inside natural areas, so an increased impact on the environment and, implicitly, on biodiversity.

We provide a few examples, below, about the demographic evolution of the counties of Călăraşi, Giurgiu and Bucureşti-Ilfov region.

Table 5.2.2.1. *The number of inhabitants in Calarasi County during 2006-2013*

Year	Călăraşi County
2006	316294
2007	315187
2008	313626
2009	312879
2010	311898
2012	309800
2013	307180

Source: Department of Statistics, Calarasi

Table no. 5.2.2.2. *Population by gender between 2009 -2013 in Giurgiu County*

Year	County total			Urban			Countyside		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
2009	281204	137182	144022	87608	42151	45457	193596	95031	98565
2010	280125	136682	143443	87420	42036	45384	192705	94646	98059
2011	279172	136303	142869	87054	41856	45198	192118	94447	97671
2012	278863	136220	142643	86946	41810	45136	191917	94410	97507
2013	276687	135444	141243	86126	41381	44745	190561	94063	96498

Source: Department of Statistics, Giurgiu

Table 5.2.2.3. *Stable population in the Bucharest - Ilfov*

Population	Bucharest-Ilfov Region	Bucharest Municipality
Both genders	2260546	1912515
Male	1061285	891615
Female	1199261	1020900
Inhabitants/km2	1241,4	8035,8

Source: Department of Statistics, Bucharest, Statistical Yearbook 2013

5.2.3 CHANGE OF THE LANDSCAPE AND ECOSYSTEMS

The landscape represents a part of nature which differentiates through its own grouping of the comprising elements resulting from the combination of the natural and human created factors. The landscape protection includes actions of conservation and maintaining of the significant or characteristic aspects of a landscape justified through its patrimonial value coming from its natural configuration and/or human intervention.

The management of landscapes consists in actions aiming for, in a sustainable development perspective, the maintenance of the landscape with the purpose of directing and harmonising the transformations caused by the social, economic and environmental evolution. *Law no. 451 dated July 8, 2002*, through which Romania ratified the European landscape Convention, adopted at Florence in 2000, mentions the obligations that need to be undertaken. The objectives of the convention are: promoting environment protection, their management, maintenance and organisation of the European cooperation in this field.

Over the last decades, the natural conditions and the landscape of Romania have been influenced especially by the evolution of economic activities to which the economic growth of the last years is added, based on an excessive exploitation of the natural resources. Under these circumstances, a lot of species of plants and animals are threatened with extinction and the landscape change is the first indicator of the degradation of the environment. A special attention has to be awarded to the impact on the landscape at the level of each of its 3 components: cultural elements (settlements, infrastructure, constructions, and human activities), biodiversity and the geomorphologic structure (relief, geological and hydrological characteristics).

The ecosystems consisting of a great variety of species show a higher probability of staying stable when some losses or deteriorations are registered than the ecosystems with reduced functions. The fragmentation of the habitats is caused by an entire series of different factors related to the changes in the land usage among which are the urban development, transportation infrastructures and the intensification of the agricultural or forest exploitations. The loss of the natural areas has repercussions that extend beyond the disappearance of the rare species.

Thus, it is imperative to ensure the necessary natural conditions through an integrated approach of land usage by:

- Improving the connection between the existing natural areas in order to fight against the fragmentation and to emphasize their ecological coherence, for example by protecting the green fences, the vegetation strips next to the fields or small water courses;
- Emphasising the landscape penetrability in order to support the dispersal of the species, migration and circulation, for example, by using the lands in a way that is favourable to the flora and fauna or introducing some ecological, agricultural or sylvan schemes which support the extensive agricultural practices
- Identifying the multifunctional areas. In such areas, the compatible use of lands, which supports the healthy ecosystems, is encouraged to the detriment of destructive practices. For example, these can be areas in which the agriculture, forestry, recreation activities and conservation of the ecosystem all function in the same space. This kind of combinations with advantages for both parts or with a few disadvantages and a lot of advantages may bring multiple benefits not only to those using the lands (farmers, foresters, tourism service suppliers etc.), but also to the entire society, by offering valuable services of the ecosystem such as water purification or soil improvement and creating attracting resting spaces for people to enjoy;
- Rearranging the territory with emphasis on the development of infrastructure outside of sensitive sites, thus reducing the risk of additional fragmentation of habitats

Some water courses that go across the natural reservations have become “access ways” into the area for domestic wastes disposed from the human establishments found upstream. The consequences of occasional tourists passing by have also been noticed through the deterioration of the information panels, increase of pathways and illegal fire traces from the protected areas. Another negative aspect consists in the collection by the tourists of some protected species of wild flora such as *Rhododendron flowers, juniper sprouts, edelweiss, Ruscus aculeatus* etc. Thus, the lack of a civic conscience - by means of lack of information and awareness in the public, the lack of an ecological way of thinking - leads to the incorrect use of natural resources, as well as damages to the biodiversity.

Through the implementation of the plans/projects approved/under approval the landscape will be changed by new human components which come to complete the existing ones.

5.3 NATURAL PROTECTED AREAS

Romania, in order to ensure the special protection and in situ conservation measures for the goods belonging to the natural patrimony; the following categories of natural protected areas have been designated:

a) of national interest: scientific reservations, national parks, natural monuments, natural reservations, natural parks
b) of international interest: natural sites of the universal natural patrimony ,geological parks, humid areas of international importance, reservations of the biosphere
c) of community's interest or "Natura 2000" sites: sites of community importance, special conservation areas, special avifaunistic protection areas
d) of county and local interest: established only on the public/private domain of territorial units, depending on the case

5.3.1. NATURAL PROTECTED AREAS OF NATIONAL INTEREST

In accordance with reporting to EEA-EIONET- CDDA of 15th of March 2013, in the year 2012 there were **978** protected natural areas of national interest. In Romania, in 2013 no other natural area of national interest was designated

The legal grounds for declaring areas of national interest is: Law no. 5/2000 regarding the arrangement of the natural territory, section III, protected areas; G.D. no. 2.151/2004 174 regarding the status of protected natural area for new areas; G. D. no. 1581/2005 on the creation of the protected area for new areas; G.D. no. 1.143/2007 regarding the setting up of new protected natural areas, GD 1066/2010 regarding the setting up of the status of protected natural area for some areas in the "Danube Delta" Biosphere Reservation and their placement in the category of scientific reservations; GD 1217/2010 regarding the setting up of the status of protected natural area for Cefa Natural Park.

In accordance with the management categories IUCN of the protected natural areas, in Romania, according to EIONET - CCDA reporting, there are a number of:

- 45 protected natural areas of national interest under category I
- 13 protected natural areas of national interest under category II
- 206 protected natural areas of national interest under category III
- 671 protected natural areas of national interest under category IV
- 15 protected natural areas of national interest under category V

Fig. 5.3.1. *Natural Reservations and Monuments in Romania in 2013*

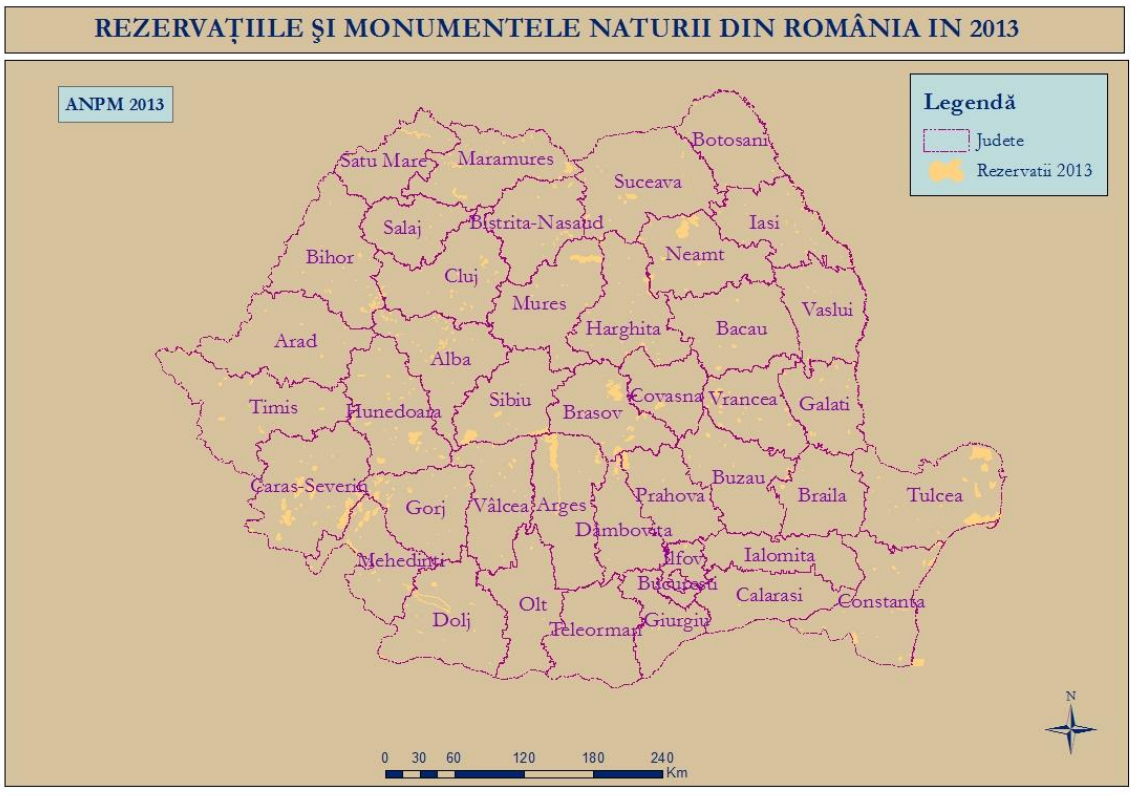


Fig. 5.3.2. *National and Natural Parks in 2013*

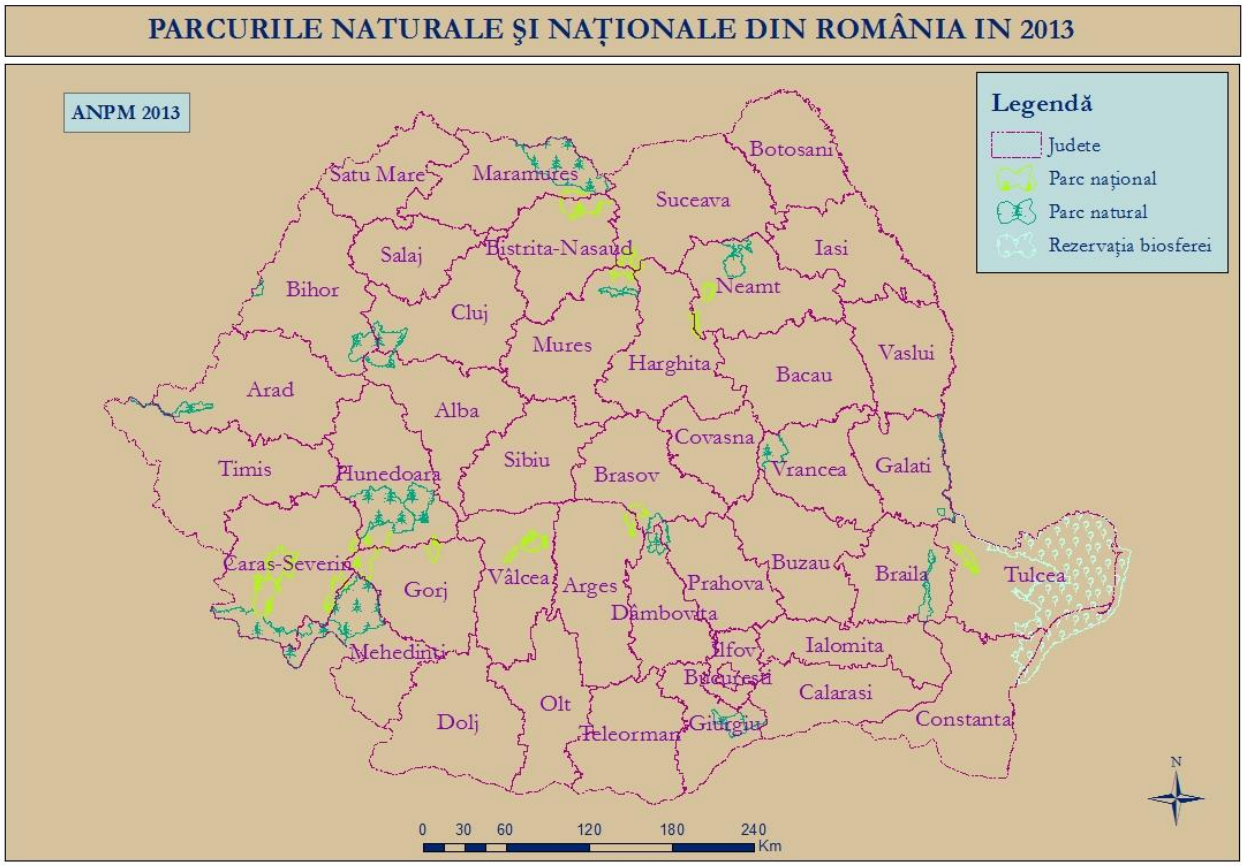


Table 5.3.1. The area of protected areas in Romania in 2013

Categories of natural protected areas	Number	Area (ha)
Scientific reservations	45	24654
National Parks	13	316872
Natural Monuments	206	15413
Natural Reservations	671	324182
Natural Parks	15	772810

NEPA has fulfilled its annual EIONET-CDDA reporting obligation to the European Environment Agency, regarding the protected natural areas. With the purpose of facilitating Romania's reporting obligations to the European Commission and the European Environmental Agency, NEPA has implemented, during 2010, The Technical Assistance Project 2007.19343.04.03 *„Establishment of the Integrated National Register of the flora, wild fauna species and natural habitats of community interest in Romania",* the result of which was the setting up of an on-line application known as RNI – IBIS available for the public at www.ibis.anpm.ro. The application integrates 4 modules, among which one observes the protected natural areas of national interest.

In 2013, ANPM started to implement the project ***Integrated Informatics Environmental System*** within which the Conservation of Nature subsystem is being performed, aiming to develop online informatics/ database applications for the following topics:

- Natural protected areas;
- Natura 2000 sites (Special Conservation Areas and Areas for Special Avifaunistic Protection);
- Enforcing the natural protected area regime;
- Management of the natural protected areas network;
- Natural habitats;
- Wild flora and fauna;
- National Registry of zoological gardens and public aquaria;
- Electronic Registry on waivers from protection measures of wild flora and fauna species, according to provisions of art. 38 para. (1) in the Government Emergency ordinance no. 57/2007 regarding the regime of natural protected areas, conservation of natural habitats, of wild flora and fauna, with subsequent amendment and supplements;

- National Registry of accidental catch and killing of all bird species, as well as strictly protected species provided in annexes no. 4A and 4B to the Government Emergency ordinance no. 57/2007;
- Electronic Registry of breeding and wild specimens mentioned in Regulation (CE) no. 338/97, with subsequent amendments, owned or detained;

The online application for natural protected areas in Romania, which is being developed within ***SIM*** project, shall be made considering the provisions of the legislative framework for natural protected areas – Government Emergency ordinance no.57/2007 on the natural protected areas regime, conservation of natural habitats, wild flora and fauna with subsequent amendments and supplements and subsequent legislation.

The database for natural protected areas shall contain the following elements:

- Categories of natural protected areas;
- Categories established on national level: scientific reservations, national parks, monuments of nature, natural reservation and natural parks;
- Categories established through international regulations: national sites of the universal natural patrimony, humid areas of international importance, biosphere reservations, special conservation areas, areas of special avifaunistic conservation;
- Space characteristics of protected areas: name, characteristic number, legal status, IUCN category, location (county/counties);
- geological, pedological, climate, hydrogeological aspects;
- habitats;
- flora and fauna;
- human activities: grazing, agriculture, irrigations, drainage, pisciculture, fishing, hydrological drainage, tourism, wood processing, etc. – impact of anthropic activities;
- deterioration: cause, stage, dynamics;
- land registration: number of lots, surface, length, owner, use;
- arrangements;

The natural protected areas database will be available to the public on Internet and it shall be also used to prepare reporting for the European Environmental Agency and to supply information on the natural protected areas to various national and international bodies.

The development of the natural protected areas database of national interest inside SIM shall be made starting from what was already achieved in the National Integrated Registry of Flora – Fauna – Habitat (RNI-IBIS).

The EIONET-CDDA annual reporting obligation concerning the natural protected areas of national interest to the European Environmental Agency was achieved by NEPA.

Table 5.3.2. *National Parks in Romania in 2013*

No.	Name of the national park	County	Area (ha)
1	DOMOGLED - VALEA CERNEI	CARAŞ - SEVERIN, MEHEDINŢI, GORJ	61190.03
2	RODNA	BISTRIŢA - NĂSĂUD, MARAMUREŞ, SUCEAVA	47207
3	RETEZAT	HUNEDOARA	38115.16681
4	CHEILE NEREI - BEUŞNIŢA	CARAŞ - SEVERIN	36706.99
5	SEMENIC - CHEILE CARAŞULUI	CARAŞ - SEVERIN	36219.39
6	CĂLIMANI	BISTRIŢA - NĂSĂUD, HARGHITA, MUREŞ, SUCEAVA	24518.65218
7	COZIA	VÂLCEA	16720.65
8	PIATRA CRAIULUI	ARGEŞ, BRAŞOV	14781.33
9	DEFILEUL JIULUI	GORJ, HUNEDOARA	11135.84
10	MUNŢII MĂCINULUI	TULCEA	11114.15
11	CEAHLĂU	NEAMŢ	7739.05
12	CHEILE BICAZULUI - HĂŞMAŞ	HARGHITA, NEAMŢ	6933.23
13	BUILA - VÂNTURARIŢA	VÂLCEA	4490.5
TOTAL AREA			**316871.979**

Table 5.3.3. *Natural Parks in Romania in 2013*

No.	Name of natural park	County	Area (ha)
1	APUSENI	ALBA, BIHOR, CLUJ	76022.34
2	PORŢILE DE FIER	CARAŞ-SEVERIN, MEHEDINŢI	128196.22
3	GRĂDIŞTEA MUNCELULUI - CIOCLOVINA	HUNEDOARA	38116.34
4	BUCEGI	ARGEŞ, BRAŞOV, DAMBOVIŢA, PRAHOVA	32496.8369
5	BALTA MICĂ A BRĂILEI	BRĂILA	24399.62809
6	VÂNĂTORI NEAMŢ	NEAMŢ	30840.87
7	LUNCA MUREŞULUI	ARAD, TIMIŞ	17428.19922
8	LUNCA JOASĂ A PRUTULUI INFERIOR	GALAŢI	7260.76
9	COMANA	GIURGIU	24962.86
10	GEOPARCUL DINOZAURILOR ŢARA HAŢEGULUI	HUNEDOARA	100486.72
11	MUNŢII MARAMUREŞULUI	MARAMUREŞ	133419
12	GEOPARCUL PLATOUL MEHEDINŢI	MEHEDINŢI	106491.61
13	PUTNA - VRANCEA	VRANCEA	38190.01
14	DEFILEUL MUREŞULUI SUPERIOR	MUREŞ	9494.06
15	CEFA		5003.800339
TOTAL AREA			**772809.25**

5.3.2. NATURAL PROTECTED AREAS OF INTERNATIONAL INTEREST

At international level, three biosphere reservations were declared - Danube Delta (1991), Retezat (1979), Pietrosul Rodnei (1979) and 19 Ramsar sites - Danube Delta (1991), Small Island of Brăila (2001), Lunca Mureşului (2006), Dumbrăviţa Fishery Complex (2006), Techirghiol Lake (2006), Portile de Fier – Iron Gates Natural Park (2011), Poian Stampei Tinov (2011), Comana National Park (2011), Bistret (2012), Iezerul (lake) Calarasi (2012), Olt-Danube confluence (2012), Suhaia (2012), Blahniţa (2013), Borcea Arm (2013), Calafat-Ciuperceni-Danube (2013), Canaralele from Hârşova (2013), Jiu-Danube confluence (2013), the Old Danube - Macin Arm (2013) and The Danube - Bugeac - Iortmac Islets (2013).

Biosphere reservations

Of the national network of protected natural areas, *The* ***Danube Delta Reservation*** distinguishes itself both as area, as well as at the level of biological diversity, having a triple international status: Biosphere reservation, Ramsar Site (humid area of international importance), Natural and Cultural World Heritage Site. The concept and the name of "Biosphere Reservation" have been promoted over 25 years ago (1971) through the "*Man and Biosphere*" Programme (MAB) under the auspices of UNESCO. The concept was intended to preserve specific natural areas, representative ecosystems capable of maintaining and extending some endangered or almost disappeared species of plants and animals

The actual Delta of Danube is the biggest component of the reservation with a total surface of about 4.178 km^2, most of which is on the Romanian territory (about 82%), the rest (about 18%), being located on the left side of the Chilia arm including its secondary delta, in Ukraine.

In accordance with the organisation status of the reservation, it is divided in three categories of specific areas:

- areas with the status of complete protection (18 natural areas have been isolated with a total surface of about 50.600 ha, representing 8,7% of the total area of the reservation);
- buffer areas (with a total surface of about 223.000 ha, representing 38,4% of the total area of the reservation); economic or transition areas (with a surface of about 306.100 ha, representing 52,9% of the reservation's area); this category also comprises the areas degraded by the anthropic impact, intended to be reconstructed from an ecological perspective (about 11.425 ha – 2%).

On the reservation's territory there is a wide variety of wild species of flora and fauna with social and economic importance, being a true museum of biodiversity, with 30 types of ecosystems, 5.137 species, of which 1.689 species of flora and 3.448 species of fauna. Some of them are species protected under the Bern Convention

The Danube Delta is a true paradise for birds, being a natural halt for the migrating birds, some of them rare species, endangered in other areas of the world: Dalmatian pelican, white stork, great egret, little egret, red-breasted goose, pygmy cormorant.

The White Pelican is the most representative bird in the Danube Delta, being the spoilt one in this paradise for birds.

***Retezat National Park*,** being also a Biosphere Reservation, included in the international network of the biosphere reservations by UNESCO Committee "Man and Biosphere"(1979), is located in the West side of Romania (it is the oldest national park of Romania, being declared as such, by law, in 1935). The park is destined for conserving the beauties of these mountains and of the endemic flora found here. The altitudes vary between 794 m and 2,509 m. The heart of the reservation is the glacial lake Bucura where in 1955 a scientific area was established (integral reservation) where grazing, fishing, hunting, forest exploitation are forbidden.

Retezat Park is well-known through its flower diversity, hosting almost 1,190 species of superior plants of the 3,450 known in Romania. The fauna is represented by the stag, deer, black goat, male deer, female deer, chamois, marmot, wild pig, bear, marten, wild cat, blackcock, hazel grouse, eagle, golden eagle.

In the calcareous areas we encounter the viper. The trouts are populating the lakes and rivers. In the park, researches are conducted on the flora, vegetation, fauna and hunting fauna.

Rodna Mountains National Park represents the biggest protected area located in the northern group of the Eastern Carpathians, covering a surface of over 46,399 ha, of which 900 ha were declared in 1979 as a Biosphere Reservation, under UESCO-MAB programme.

The reservation was established in 1932 – at the beginning only the empty area around Pietrosu Peak (183 ha) being protected. Later, the surface of the reservation was extended, reaching 3.300 ha. Presently, the Biosphere Reservation has a surface of 44,000 ha, of which 8,200 ha is an area of integral protection, 11,800 ha a buffer area and 24.000 ha is a transition area. In what concerns the present legal background, the Biosphere Reservation is superposed on the same surface with The Rodna Mountains National Park, with a surface of 46,399 ha.

Ramsar Sites

Wet areas have been defined as ponds, swamps, natural or artificial water surfaces, permanent or temporary, where the water is still or running, sweet or salty, including the surfaces of marine waters with a depth under reflux no higher than six m

February 2nd was established as the International Day of Wet Areas by signing, at Ramsar in Iran in 1971, the Convention on the wet areas of international importance, especially as habitat for the aquatic birds.

In 2013, Romania holds 19 Ramsar sites.

Table 5.3.2.1. *Ramsar Sites in Romania in 2013*

NAME	COUNTY	AREA (ha)
Total		**1089448**
Delta Dunării	Tulcea, Constanţa	580000
Portile de Fier – Iron Gates Natural Park	Caraş-Severin, Mehedinţi	115666
Danube Islets - Bugeac - Iortmac	Călăraşi, Constanţa	82832
Olt-Danube confluence	Olt, Teleorman	46623
Blahniţa	Dolj	45286
Calafat-Ciuperceni-Dunăre	Dolj	29206
Bistreţ	Dolj	27482
Old Danube – Măcin Arm	Brăila, Tulcea, Constanţa	26792
Comana Natural Park	Giurgiu	24963
Braţul Borcea	Călăraşi, Ialomiţa	21529
Jiu-Dunăre Confluence	Dolj	19800
Suhaia	Teleorman	19594
Balta Mică a Brăilei – Braila's Small Pond	Brăila	17586
Mureşului Everglades	Arad,Timiş	17166

NAME	COUNTY	AREA (ha)
Canaralele from Hârşova	Ialomiţa, Constanţa	7406
Călăraşi Iezer	Călăraşi	5001
Techirghiol lake	Constanţa	1462
Poiana Stampei Tinov	Suceava	640
Dumbrăviţa Fishery Complex	Braşov	414

Insula Mica a Brailei – "Braila's Small Island" is a complex reservation, located in the west and south of Balta Brailei, between the Danube at west and the Valciu arm at east, being an integrant part of the Lower Danube's System. This site is a regional complex of ecologic systems including: two eco regions, 16 major types of components (local complexes) at least 67 types of ecosystems and 35 abiotic compartments and trophodynamic modules in the structure of the ecosystems, ensuring the existence of more than 1,688 species of plants and 3,735 species of animals.

The park integrates all the 10 islets located between the Danube's arms: Vărsătura, Popa, Crăcănel (Chiciul), Orbul, Calia (Lupului), Fundu Mare, Arapu, as well as the adjacent arms of the Danube. This may be called an inner delta on the lower channel of Lower Danube.

In accordance with the current laws, this protected area (Insula Mica a Brailei - Small Island of Braila) is mentioned as a surface of 17,529 ha. In accordance with the last evaluations through the project LIFE 99 NAT/RO/006400, the surface of Natural Park Balta Mica a Brailei is of 21,074 ha (including the arms of the Danube), under different forms of property. In spite of all the changes, both in the structure of the integrating ecological systems, as well as at its level, Balta Mica a Brailei preserves important ecological values, being an important component of the Lower Danube System, located upstream of the Biosphere Reservation Danube Delta. It is the only area left in a natural hydrologic regime (floodable area) after the 75% dam up of the former Braila Marsh and the establishment of the agricultural area Insula Mare a Brailei.

Due to its attributes of humid area in a natural hydrological regime, complex of ecosystems under different stages and buffer area, the Balta Mica a Brailei represents a system of reference of the former inner delta and the base for the ecological reconstruction of the Lower Danube system. Of the total surface, about 53,6% is represented by alluvial forests, 6% grass fields, 12,84% humid areas and 27,5% lakes (lakes, ponds).

This area is well-known for its ornithological importance, since it is located on the most important migrating route of the birds in the lower pan of the Lower Delta, at the middle of the migrating routes between the nesting areas in northern Europe and the winter refuges in Africa. A great number of birds have been observed, of which 169 are internationally protected species, through the Bern, Bonn and Ramsar Conventions, representing half of the migrating bird species characteristic to Romania. Because a big part of them are aquatic birds, in 2001 Balta Mica was declared Ramsar site (position 1,074 on the Ramsar list) the second after Danube Delta.

Lunca Muresului – "Muresului everglades" with a surface of 17,166 ha, located in the west of the country on the territory of Arad and Timiş counties, represents a typical ecosystem of humid area of great diversity with still and running waters, with forests (pediculate oak tree, ash) galleries of willows and poplars, coppices and mixed plane foliage forests. There are surfaces with rare or endangered plants (xeranthenum), a quite big number being part of *„The Red List of the superior plants in Romania"* as vulnerable species: crossbill, linnet, Peucedanum officinale, Platanthera bifolia, and trapa natans. The fish fauna has a great diversity; only here, on the Mures, we encounter Abramis sapa, Carassius carassius, Vimba Vimba, Ameiurus Nebulosus, Aspro Steber. All 6 species of reptiles and 9 species of amphibians identified until now are protected species, including on international level. A number of over 200 species of birds have their nesting and passage place in the Natural Park Lunca Muresului, almost all of them being included in the annexes of the Bern Convention as protected species: spotted eagle, great cormorant, night heron as well as large numbers of grey heron, black-headed gull, little grebe, European bee-eater, the biggest colony of sand martins on the entire course of the river. Among the mammals the otter stands out, along with a great number of Carpathian stag, fallow deer, buck, wild pig.

Techirghiol lake, with a surface of 1,462 ha, located on the territory of Constanţa county, was declared, at the end of March 2006, a Ramsar site, being included on the List of Wet Areas of international importance, especially as a habitat of water birds.

Techirghiol lake is a priority location for the conservation of two species endangered at global level (*Branta ruficollis and Oxyura leucocephala*), as well as other European species. During winter, the lake is used as main nesting place by *Branta ruficollis*, because the water does not freeze. The maximum number of gooses numbered on the Techirghiol lake in January 2009 was of 27,000 (31% of the global population). An average number of 11,800 of those birds (13,4% of the global population) are present here only in January, when the

goose population concentrates here. Also the lake represents an important stationing area for the migrating birds, on their way from Russia to Africa.

Dumbrăviţa Fish Complex, with a surface of only 414 ha, located on the Territory of Braşov County, was declared as Ramsar site on February 2, 2006.

The importance of this site consists in the species and populations of wild birds met here during the year, but also in the wonderful landscapes which are reminiscent of the Danube Delta. The area was rightfully named „Brasov's Delta" or "The Delta between the Mountains". The purpose of its declaration as protected area was mainly due to the richness in bird species, however, other environment components were considered such as flora, other species of animals, the existence of important habitats etc.

This protected natural area consists of two main sectors, one in the prolongation of the other, namely a barrier lake and a complex of fish ponds. Therefore, the origin of the site is mostly anthropic but still keeping elements of the natural ecosystems existing before the human interventions.

The Dumbravita lake and ponds are located in the central part of Depresiunea Bârsei in Homorodului Perşanilor (Hamaradia) waterside and have a relative east – west orientation. From an administrative point of view, the area belongs to Dumbrăviţa commune, Braşov county.

Both the invertebrate fauna as well as the vertebrate one are well represented. Between the invertebrates there is a notable presence of a great number of lake shells (*Anodonta cygnea*). The vertebrates are represented by several classes of animals, of which the most important are the birds. Among the birds species for which the area was declared protected as an avifaunistic interest area, are mainly comprised by the nesting ones (Eurasian bittern, little bittern, red bittern etc.). Among the important passage species we mention: Red-throated Loon, Polar Loon, small egret, great egret etc.

In terms of vegetation, only the western bank is surrounded by a 'band' of reed and reed mace. On this side the vegetation spreads on strips on different surfaces. In the north western side of the lake an eutrophic swamp was formed where rare species of plants are growing such as: Moor-king (*Pedicularis sceptrum-carolinum*), buckbean (*Menyanthes trifoliata*), Swamp Cinquefoil (*Comarum palustre*), globe-flower (*Trolius europaeus*) etc.

Among the most important types of habitats for birds we mention: the water surface, the immersed flooded vegetation (especially the reed and reed mace), the mud areas from the fish harvesting period (especially in autumn), humid hayfields and swamps.

Comana Natural Park, is a unique reservation on European level, including dozens of plant and animal species that are protected by international laws and considered as the second delta of Romania. At a couple of tens of kilometres from the capital, located in the southern part of Romania, on approximately equal distance between Bucharest and Giurgiu, is the biggest protected area in Câmpia Română. It lies on 25,000 ha and includes an ecosystem characteristic to delta, known from the ancient times as Comana Lake. Specialists claim that the „Delta near Bucharest" is on second place, as regards biodiversity, after Danube Delta Reservation.

Comana Lake, the third humid area in the country, after the Small Lake of Brăila and Danube Delta, and second as biodiversity, after the Danube Delta, is home to 141 bird species and 13 fish species out of which – the mud minnow and the Comana chub can only be found in this natural habitat.

The park was founded by Government decree no. 2151/2004, the decision of founding the natural area was adopted on the basis of technical and scientific documentation drafted by the Academy of Romania even since 1954. Fifty years back, scientists wanted to delimit, for conservation purposes, two flora and fauna areas that were unique in Romania. Academics called them "Aquila scientific thorn" and "Aquila scientific Peony". In 2004, Comana Lake was declared natural reservation and area for avifaunistic protection, bringing the two areas of protection together. Even as a protected area, the park surface includes five villages: Comana, Vlad Ţepeş, Budeni, Falaştoaca and Grădiştea. For this reason, a big area of the park is used for grazing and agricultural lands. Villagers are not allowed to cultivate, except legally permitted areas and are very careful where they let their animals graze. Well-known for historic events that took place here, the area has a special charm. Oak and ash forests include some old trees, hundreds of years old. In the reservation area there are many species of plants and animals protected by international conventions.

Right on the brink of the forest, near the protected areas, lies Comana monastery, built in the times of Radu Şerban the Voivod and rebuilt by Şerban Cantacuzino. It is said that this monastery was built on the ruins of the one built by Vlad Ţepeş, over 500 years ago. Legends say that he was killed near the walnut fountain, after being released by Matei Corvin.

Porţile de Fier – Iron Gates Natural Park protected area established by Law no.5/2000 on the approbation of the Plan for National Territory Arrangement - Section III – Protected areas, as a territory where the remarkable beauty of landscapes and biological diversity can be harnessed, by keeping traditions unspoiled and life of the human communities would be the result of economic activities that are harmonized with nature.

Porţile de Fier Natural Park belongs to category V of IUCN: "Protected area: protected area administered mainly for landscape conservation and recreation". According to G.D. 1284/2007, two areas of special

avifaunistic conservation were declared on the territory of Porţile de Fier Natural Park, as part of the European ecological network NATURA 2000 in Romania, respectively:

- ROSPA0026 Danube Course-Baziaş-Porţile de Fier, area of 10124.4 ha
- ROSPA0080 Almăjului-Locvei Mountains, area of 118141.6 ha.

Also, according to the order of the Minister of Environment and Sustainable Development 1964/2007, ROSCI0206 Porţile de Fier was declared site of community interest, part of the European ecological network NATURA 2000, in area of 124293.0 ha.

Porţile de Fier Natural Park has a remarkable biodiversity, being recognized as a natural protected area both on national and on international level. Climate, pedological, petrographic, geomorphological conditions, as well as the influence of Danube on these, and the social context also have created unique places, which managed to keep the characteristics of unique habitats along centuries. On January 18, 2011 the park was included on the international list of humid areas and declared as a Ramsar site, under no. 1946.

Poiana Stampei Tinov was included in the protected areas network in Romania and declared scientific reservation in 1955 as the largest natural oligotrophic peat reservation in Romania. It was declared a humid area of international importance (RAMSAR site) in 2011. The reservation lies on 400 ha and is surrounded by a spruce forest as buffer zone. It is home to rare species of plants, important for Romanian biodiversity, and the tinov represents the southern limit for a great number of species in the south-east of Europe. There are also communities of algae, zooplankton and insects of scientific and ecological value. It is fed by rainwater and leaks.

The site is a rare humid area and has the characteristics of subarctic tundra in Romania. There are 1,351 ha of active peat bogs with *Sphagnum magellanicum*, out of which 400 ha are included in Poiana Stampei reservation. It is the largest peat bog in Romania, and the dominant species is *Pinus silvestris f.turfosa*, surrounded by a spruce forest. *Pinus silvestris f.turfosa* is an endangered ecotype encountered only in peat bogs, representing an important component of communities with *Sphagnetum magellanici* (Malcuit 1929) Kästner et Flösner 1933. It has a very important role in flood prevention in the spring, when snow is melting or during rainy days in summer when level of Dorna and Dornişoara rivers grows, as it retains the water and allows it to return slowly to its initial state. It acts like a biological filter for water, and the moss absorb carbon dioxide gradually, as it grows. Thus, carbon is sealed in the moss as it turns into peat.

The area is located in Dorna depression and s surrounded by Călimani Mountains to south and east and by Bârgău Mountains to west. To east and west is delimited by Dorna and Dornişoara rivers.

The peat bog is natural and formed in the post-glacier age, when peat started to accumulate on the surface of a pre-existing eutrophic lake. The peat bog appeared through the cogging of a spruce forest, as demonstrated by existent trunks. The thickness of the peat layer exceeds 1 m and is still active. The area is important for plant communities growing there: white birch, downy birch, fern, cranberry, blueberry, small cranberry, bog rosemary, Mexican false heather, bulrush and species of *Sphagnum*. These species are not well represented in Romania due to different clime conditions. Pines, 100 years old, are only 15 cm thick in diameter in the centre of the bog, while the spruce forest in the buffer zone is much more developed.

Biogeographically, Dorna depression is located between two main Palearctic fauna regions: euro Siberian and Ponto-central-Asian. Numerous invertebrate species live in the bog, while vertebrates are few. The peat bog was declared scientific reservation over 50 years ago. Therefore, rare flora and fauna there were protected. Its designation as a scientific reservation raised the interest for scientific research in the area, and now, the reservation is also a Natura 2000 site.

Bistreţ is a mosaic of different habitats including Bistreţ Lake, River Danube, lagoons and fishing complexws, meadows, farmland and forests home to a diversity of flora and fauna, especially birds. Being located along an important migratory route, the site is of particular importance for nesting, resting and feeding for many endangered species such as red breasted goose - *Branta ruficollis* and Dalmatian Pelican - *Pelecanus crispus* . The site is place for agricultural recreational and fishing activities. Lake Bistreţ has a role of water reservoir and influences the level of groundwater. The area surrounding the lake has archaeological importance as one of the most important complexes from the Bronze Age in the Lower Danube. Activities that are constituting threats to the site are fish farms, poaching and solid waste. It is envisaged to be designated as crossborder site, together with Bulgaria.

Iezerul (lake) Călăraşi. Originally covered by the entire lake Iezer, the site currently extends only over a small part of the old lake that was maintained due to works on the Danube embankment . What was kept from the site turned into farmland and ponds forming a mosaic of natural and anthropic ecosystems. The site has a special significance for 271 species of sedentary and migratory waterbirds, and for some species of fish, amphibians, reptiles and mammals, including threatened species at national, European and global level. In winter, high concentrations of the species Greater White-fronted Goose - *Anser albifrons* and Red-breasted Goose - *Branta ruficollis*, are met, who find here nesting conditions, food and living. Human activities include fishing, aquaculture and agriculture, and the site is important for flood control and groundwater recharge. Uncontrolled tourism and overfishing are potential threats to the site. Some conservation measures such as prevention of

burning the reeds, reducing the use of chemicals in agriculture and the possible development of ecotourism, are provided for. In the site there is an information center that provides educational programs. It is envisaged to be designated as crossborder site, together with Bulgaria.

The Danube-Olt confluence is a Natura 2000 site (both SCI and as SPA) and also IBA site. Containing natural sections of the Olt and Danube rivers, alluvial forests and grasslands, riparian mixed forests, sandy islands, temporary lakes, the site provides the ideal habitat for many species of waterbirds. Here one can meet the Dalmation pelican - *Pelecanus crispus* with 33 other bird species of European importance with conditions for refuge, feeding and nesting, such as Pygmy cormoran - *Phalacrocorax pygmeus*. It is also important for various species of fish, amphibians and mammals. The site is used for agriculture, forestry, fishing and recreational activities, and to produce hydropower. Because human activities have not changed the site much, many of the ecological functions of the site remained intact and play an important role in flood protection and sediment capture. Threats to the site are the construction of hydropower plants, solid waste and poaching. It is envisaged to be designated as crossborder site, together with Bulgaria.

Suhaia is located along a major migratory route comprising Suhaia Lake, River Danube, connecting channels, ponds, reed beds, marshes and rice fields . The site includes specific habitats for many threatened bird species that find here conditions for refuge, feeding and breeding, including 21 species of European importance such as Dalmation pelican - *Pelecanus crispus*, a globally vulnerable species. Also some threatened species of invertebrates, fish, amphibians, reptiles and mammals including the globally vulnerable fish species European mudminnow - *Umbra krameri*, can be found here. Lake Suhaia plays an important role in groundwater supply and had an important function of flood control before the Danube was dammed. Human activities at the site include aquaculture, agriculture, forestry and recreational activities . Illegal burning of vegetation, poaching and excess fertilizers threaten the site. It is envisaged to be designated as crossborder site, together with Bulgaria.

5.3.3. NATURAL PROTECTED AREAS OF COMMUNITY INTEREST

As a member state of the European Union, Romania has an obligation to contribute to ensuring the biodiversity on the territory of the EU, through the conservation of natural habitats and of the wild fauna and flora.

To this end, on the territory of the EU, "NATURA 2000" is established, being a coherent European ecological network of special protected areas. This network will ensure the conservation or, if needed, the re-establishment of natural habitat types and habitats for species being in a favourable conservation state, spreading over their natural areas

In 2007, in Romania, **273** areas have been declared sites of community importance through *OM 1964/2007 regarding the setting up of the protected natural area of community importance regime an integrant part of the European ecological network Natura 2000 in Romania* and **108** areas of special avifaunistic protection *through GD 1284/2007 regarding the establishment of special protection avifaunistic areas as an integrant part of the European ecological network Natura 2000 in Romania*.

Following the 2008 infringement procedure for the insufficient designation of special avifaunistic protection areas and, at the request of the European Union, of the bio-geographical seminaries for Romania and Bulgaria, which took place in June 2008 in Sibiu, the Ministry of Environment and Forests initiated in 2009 ***"The Research Project in order to fulfil our country's obligations concerning the application of the community regulations regarding Natura 2000 ecological network"***, aiming to designate new areas of avifaunistic special protection (SPA) to include all The Areas of International Importance (IBA - Important Bird Areas), as well as the designation of new sites of community importance (SCI's).

Thus, at the end of 2011, by the designation of new sites through *Order no. 2387 as of September 29, 2011 for the amendment of the Order of Minister of Environment and Sustainable Development no. 1.964/2007 concerning the designation of natural protected area regime of the sites of community importance, as part of the European ecological network Natura 2000 in Romania* and *Decision no. 971 as of October 5, 2011 for the amendment and supplementation of Government Decree no. 1.284/2007 regarding the designation of areas for special avifaunistic protection as part of the European ecological network Natura 2000 in Romania,* the number of sites of community importance reached 383 and the number of areas of special avifaunistic conservation reached 148.

By the designation of new sites and modification of limit for those designated in 2007, the area covered by Natura 2000 sites increased thus:

- from 12,5% of the country area SPAs, in 2007 to 15,5%
- from 13,8% of the country area SCIs, in 2007 to 17,4%

Compared to current 17,84% of the country area representing Natura 2000 sited designated in 2007, at the end of 2011, after designation of new sites, the area of the country included in the Natura 2000 network increased to 23,38%.

Fig. 5.3.3.1. Sites of Community Importance in Romania in 2013

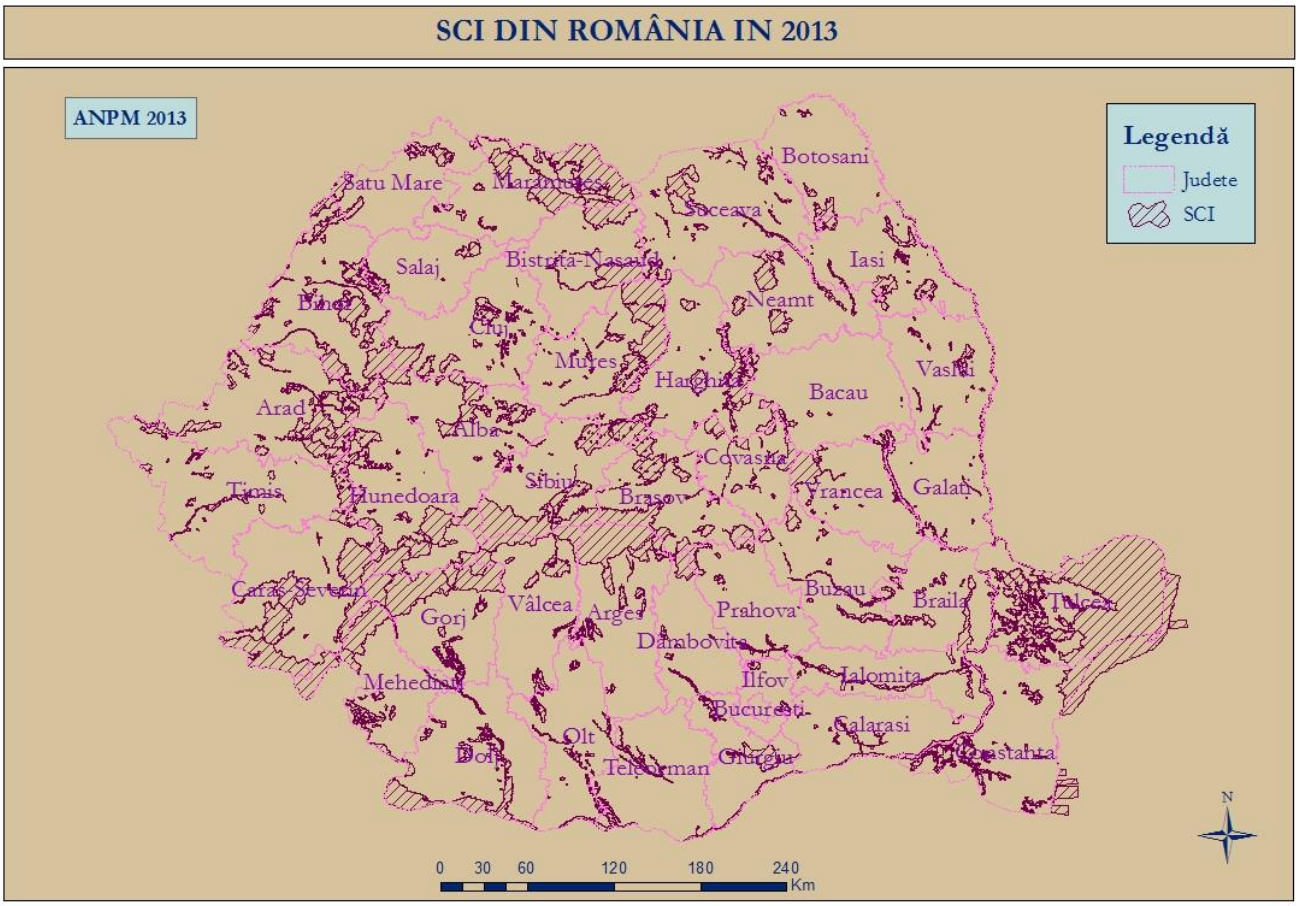
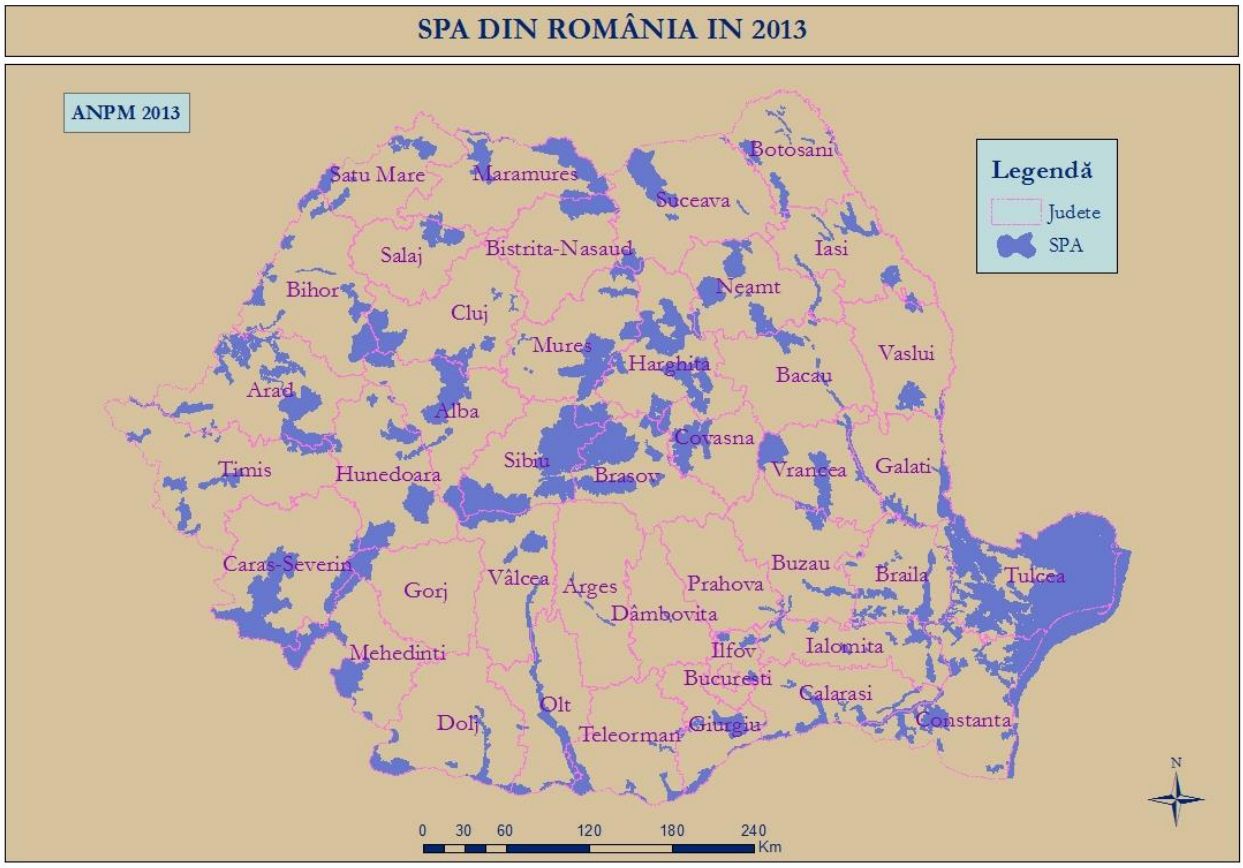


Fig. 5.3.3.2. Sites of avifauna special protection in Romania in 2013



The Technical Assistance Project 2007.19343.04.03 *„Establishment of the Integrated National Register of the species of flora, wild fauna and of natural habitats of community interest from Romania"* set in practice by NEPA, which resulted in an online application known under the name RNI-IBIS available at www.ibis.anpm.ro, also features a module which responds to the reporting obligation to the European Commission in accordance with art. 17 of the Habitats Directive. Another section of the RNI-IBIS application is dedicated to Natura 2000 sites. There is a 4th module as well – BIMS, with the purpose of managing the information regarding the distribution species and habitats of community and national interest.

As previously specified in section 5.1. - Natural areas of national interest, in 2013 NEPA started to implement *Integrated Informatics Environmental System (SIM)* project, within which the Conservation of Nature subsystem is created, further developing the *Natura 2000 Sites (Special conservation areas and Areas of special avifaunistic conservation)* module created in RNI-IBIS application. Following the changes on European Commission level, within the Standard Form of Natura 2000 sites, the concerned modifications will be implemented by SIM, so that the module can respond to new reporting necessities to the Commission. Romania re-submitted in November 2012 the Natura 2000 database in the new format. The limits o Natura 2000 sites re-submitted to the Commission suffered minor changes, having been correlated with Romania's improved administrative limits, thus a better precision of these having been achieved.

5.3.4. MANAGEMENT OF PROTECTED NATURAL AREAS IN ROMANIA

The management of protected natural areas in Romania is carried on in accordance with the provisions of G*ED no. 57/2007 regarding the status of protected natural areas, the conservation of natural habitats, flora and wild fauna approved through Law 49/2011*, with *HG no. 1000/2012 on the reorganization and functioning of the National Environmental Protection Agency and public institutions subordinated to it and MO no. 1470/2013 approving the Methodology for awarding custody and administration of protected natural areas.*

At the end of 2013, there was a number of 10 management plans approved, respectively for Natural Park Grădiștea Muncelului Cioclovina, Macin Mountains National Park, National Park Piatra Craiului, Iron Gates

Natural Park, National Park Călimani, Natural Park Bucegi, Natural Park Balta Mica of Braila, a protected natural area of B1national interest. Lesser mole-rat from Apahida Reservation, Natura 2000 site, Buhuşi Bacau-Bereşti reservoirs and Plopeni Natura 2000 site. Also, were passed normative acts in order to approve the regulations and scientific and advisory councils of natural and national parks.

Within the ***Integrated Informatics Environmental System (SIM)*** project, subsystem Conservation of Nature was created, with a module dedicated to the Administration of the Natural Protected Areas Network in Romania.

The database shall contain the following elements that are necessary for the administration the natural protected areas network: category of natural protected area and its management; spread of the natural protected area and ownership of lands and assets included in its perimeter; identification data for administrator/curator, data concerning administration agreements/custody conventions, normative act of NPA (natural protected area) designation, management plan/npa regulation/ minimum measures for conservation, accomplishment stage of the management plan/ regulation/ minimum measures for conservation, administrator/curator agreement for plans/projects/activities developed in the NPA, projects financed from community funds, developed for the NPA management.

Also, in 2013, NEPA started to implement the project POS Environment Priority Axis 4 *"Integrated Management and Awareness System in Romania of Natura 2000 network" – SINCRON* that had as a specific goal to improve efficiency in management of Natura 2000 sites by implementing a national registry for the implementation of management plans that would allow the increase of transparency regarding decision making for natural, cultural and historic patrimony protection, adopted by the managers of natural protected areas.

In 2013 began the implementation of the project ***Elaboration of spatial data sets according to INSPIRE technical specifications for natural protected areas, including Natura 2000 sites, taking into account the optimization of their management facilities***, financed by the SOP Priority Axis 4, whose beneficiary is the Ministry of Environment and Climate Change. The overall objective of the project is to enhance the protection of biodiversity and natural heritage of Romania by elaborating data sets according to INSPIRE technical specifications for natural protected areas in accordance with the Community legislation, including Natura 2000 sites, in order to optimize the management of natural protected areas and the exposure of spatial data sets related to natural protected areas, after an INSPIRE format, as required by the legislation in force.

5.4. MARINE AND COASTAL ENVIRONMENT

Introduction

The Romanian coastal area has a length of 244 km, representing 7,65% of the national border and it is divided in terms of economic and social characteristics into two main areas. The northern area (about 164 km length), from Musura Gulf up to Midia Cape and the southern area (80km) from Midia Cape up to Vama Veche.

The northern area consists in a protected region of delta, including the Danube Delta, on the territory of which the Danube Delta Biosphere Reservation was established. The national and international legislation imposes that the economic activities in the area to be in accordance with the status of natural reservation so as to maintain an ecological balance.

The southern area is considered a developed area, where the economic activities are concentrated and closely related to the position near the sea.

On the background of a restructuring of the economic activities, the increase of demands in terms of environmental policies implementation, the establishment of protected marine areas (more than 71% of the length of the shore) as well as the new regulations regarding the exploitation of the marine resources, have determined a process of recovery of the marine ecosystem, in the last years.

At the same time the biological indicators showed improvements as well, although sometimes asymmetrical at structural, functional and productivity level, and trends appear towards new states of equilibrium at the level of biodiversity and living marine resources.

The sustainable development of the coastal area requires the cooperation of all the riparian countries to the Black Sea. Thus, The Strategic Plan of Action for the Rehabilitation and Protection of the Black Sea was elaborated. Its general objectives aim for the ensuring of a healthy environment for the population around the Black Sea, both in the urban areas as well as in the rural ones, obtaining a diverse marine ecosystem from a biological perspective, which contains diverse and viable populations of superior organisms, including marine mammals and sturgeons, which should be able to support the means of living resulting from a sustainable activity, such as fishing, aquiculture and tourism in all the countries of the Black Sea.

The natural process for recovering of the state of health of the sea depends on the continuity and firmness of implementing the measures for the conservation, protection and sustainable development of the marine environment, at national and international level.

5.4.1. STATE OF MARINE PROTECTED AREAS

In accordance with the provisions of *EGO no. 57/2007* ***regarding the status of the protected natural areas, conservation of natural habitats, of the wild flora and fauna approved through Law 49/2011****,* as well as of the Birds Directive (79/409/CEE) Habitats Directive (92/43/CEE), in the Romanian marine area the following natural protected areas are established:

- *ROSPA0076 Black Sea*: site of community importance, in accordance with the requirements of the Birds Directive 79/409/EEC, assigned directly as special protected area - SPA through GD no. 1284/2007 regarding the establishment of avifaunistic protection areas as an integrant part of the European ecological network Natura 2000 in Romania - 147 242,9 ha (Conservator - SC EURO LEVEL);
- *ROSCI0269 - Vama Veche - 2 Mai*: site of community importance, in accordance with the requirements of the Habitats Directive 92/43/EEC, adopted through Decision 2009/92/CE, which is superposed on the Marine Reservation 2 Mai-Vama Veche, protected natural area of national importance – 5,272 ha (Conservator - INCDM);
- *ROSCI0094 – Mangalia sulphurous underwater springs from*: site of community importance, in accordance with the requirements of the Habitats Directive 92/43/EEC, adopted through Decision 2009/92/CE - 362 ha (Conservator INCD GEOECOMAR);
- *ROSCI0197 – Eforie Nord - Eforie Sud Submerse beach*: site of community importance, in accordance with the requirements of the Habitats Directive 92/43/EEC, adopted through Decision 2009/92/CE - 141 ha (Conservator SC EURO LEVEL);
- *ROSCI0273 - Cape Tuzla marine area*: site of community importance, in accordance with the requirements of the Habitats Directive 92/43/EEC, adopted through Decision 2009/92/CE – 1,738 ha (Conservator INCD GEOECOMAR);
- *ROSCI0237 - Sfantu Gheorghe methanogen submerged structures*: site of community importance, in accordance with the requirements of the Habitats Directive 92/43/EEC, adopted through Decision 2009/92/CE - 6.122 ha (Conservator INCD GEOECOMAR);
- *ROSCI0066 - The Danube Delta Biosphere Reservation – marine part*: site of community importance, in accordance with the requirements of the Habitats Directive 92/43/EEC, adopted through Decision 2009/92/CE, which is superposed on the marine area of The Danube Delta Biosphere Reservation- natural protected area of national and international importance – 121,697 ha (Conservator ARBDD).
- *ROSCI0281 Cap Aurora*: Site of Community Importance in accordance with the requirements of the Habitats Directive 92/43 / EEC, appointed by the Minister of Environment and Forests Order no. 2387/2011;
- *RO0293 Costinești - 23 August*: Site of Community Importance in accordance with the requirements of the Habitats Directive 92/43 / EEC, appointed by the Minister of Environment and Forests Order no. 2387/2011.

Monitoring of marine habitats in 2013 was carried out under the contract *"Monitoring Services for the conservation status of marine species and coastal and marine habitats of Community interest in Romania"*, in accordance with European Commission requirements for reporting under Article 17 of the Habitats Directive.

5.4.2. STATE OF THE ECOSYSTEMS AND LIVING MARINE RESOURCES

5.4.2.1. Coastal Processes

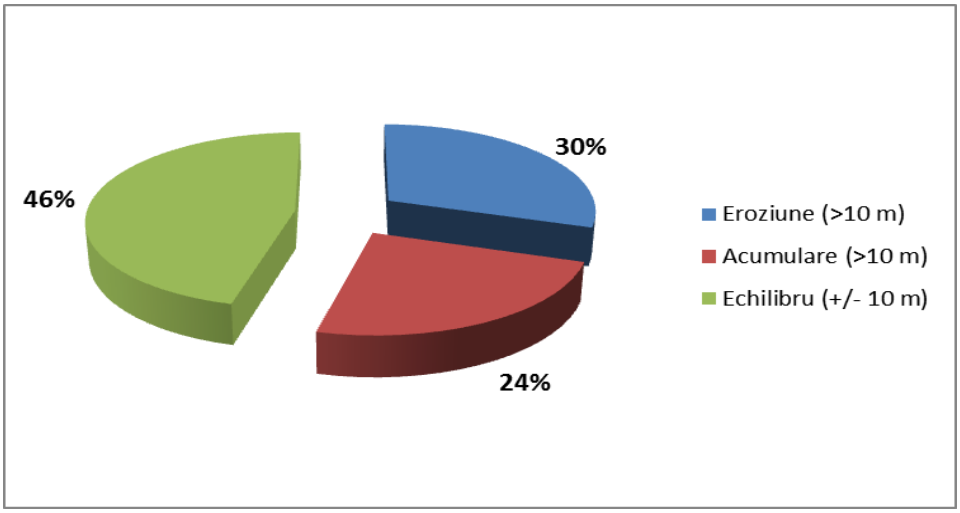
In the delta and lagoon shoreline the following were found:

- Sulina beach area - the advancement of shoreline up to 38 m in the north pier area and ~ 7 m in the military unit area;
- Gârla Împuțită - Râsla Vădanei - withdrawals of shoreline of 5-10m, up to 25m in the Sonda channel area, where there was a rupture of the shoreline;
- Sf. Gheorghe Arm outlet- withdrawal areas interspersed with short storage areas where the shoreline has advanced with up to 10 -15 m;
- Sakhalin - retreat of the shoreline of 20-45 m in the northern part of Sakhalin Peninsula; in the central area, during the cld season 2012-2013, there was a break with a width of ~ 3 km and greater depth than 1.5 - 2 m, basically the southern peninsula remaining isolated from the rest of it; in the southern part continued the process of arching and stretching to the northern extremity

- Ciotica-Zătoane area - was characterized by a withdrawal of the shoreline with 10-30 m
- Perişor - Gura Portiţei - has remained relatively steady, with the withdrawal of the shoreline up to 10 to 13 m in the Perişor-Periteaşca area, advancing of the shoreline to 15 m in the Periteaşca area and balance in the Periteaşca-Gura Portiţei area
- Portiţa - Vadu – the sector has remained steady, erosion areas alternating with balances ones (where the shoreline has not varied more than 10 m); the biggest withdrawls of s the horeline were recorded in the Portiţa Lighthouse and Edighiol, sectors that were flooded during the cold season
- Vadu-Corbu sector was characterized by an advancement of the shoreline with 10-20 m in the north and center, and up to 30-50 m in the Midia Cape.

For the northern sector of the shoreline, the accumulation areas represented ~ 91 ha, and the erosion ones ~ 120 ha. Advances of the shoreline on distances longer than 10 m, were recorded on ~ 24% of the total length, withdrawal of the shoreline with more than 10 m on ~30%, the rest of the shoreline being in dynamic balance – the shoreline withdrew less than +/- 10 m (Fig. 5.4.2.1.-1).

Fig. 5.4.2.1.-1. Ratio of coastal processes
(erosion/relative stability/accretion) on the Sulina shore section - Cap Midia, 2010-2011



Source: National Institute of Research and Development – GRIGORE ANTIPA

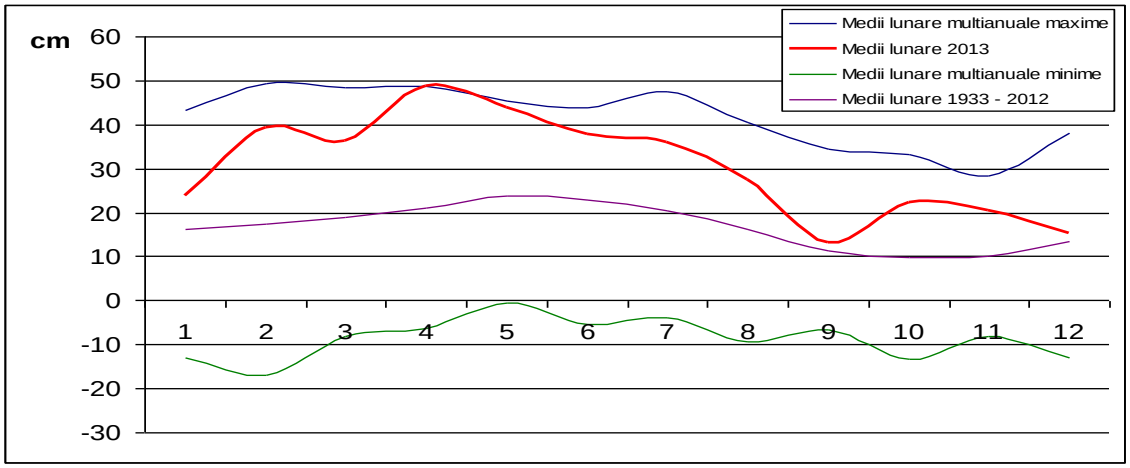
Between September 30 to October 2, 2013, there was an intensification of the hydro-meteorological conditions, when the wind blew with over 10 m / s and was recorded a maximum up to 30 m / s, especially in the N, E and NW. Under these conditions, the southern Romanian coast was affected, therefore on the cliff-side, were landslides, collapses, torrents, etc. and at the base of the cliff were accumulated deposits of algae, garbage (especially PETs) and dead animals.

Following this situation was made an inspection of the coastline with cliffs in the Agigea - Vama Veche are, 14-16 October, when there were found the following slides, collapses, washing processes of the slope of the cliff (the most affected sector was on 2 Mai).

5.4.2.2. Sea level

The Sea level, as one of the state indicators of the coastal area, in 2013 was characterized by the existence of high levels, over the annual average in 1933 - 2012. The annual average, 30.4 cm, is almost double compared to the annual average, 16.8 cm. As an annual average, is the third largest in the entire observation period 1933 - 2012. The annual amplitude, calculated on monthly averages, was 35.8 cm (Fig. 5.4.2.2.-1).

Fig. 5.4.2.2.-1. *Oscillation of the sea level of the Black Sea on the Romanian Shoreline in 2013*



Sursa: National Institute of Research and Development – GRIGORE ANTIPA

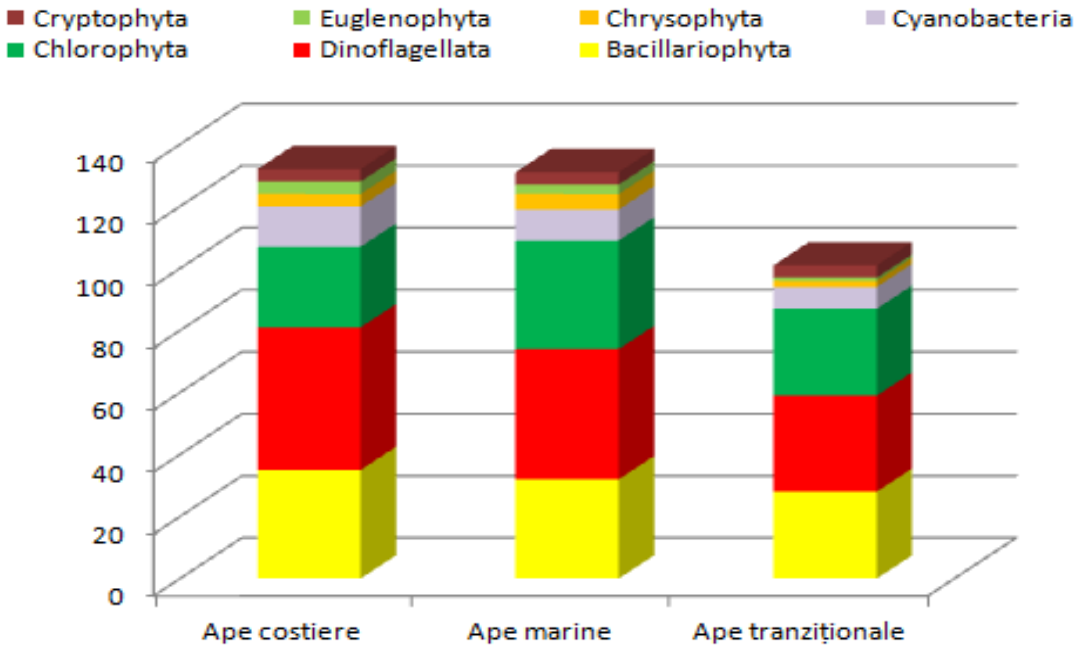
5.4.2.3. State of the maritime ecosystem. State of the shoreline and coastal area

Phytoplankton

The identification of the qualitative and quantitative structure of the phytoplankton structure, as an indicator of the eutrophication state, was performed after the analysis of the samples collected in May and August 2013, on the profiles of Sulina, Mila 9, Sf. Gheorghe, Portița, Gura Buhaz, Cazino, Constanţa, Eforie Sud, Costineşti, Mangalia and Vama Veche, on the entire sea coast, on 5m, 20m and 30m isobaths, as well as on the ones collected twice a week in Casino-Mamaia station.

In the composition of phytoplankton 205 species, varieties and forms belonging to 7 taxonomic groups *(Bacillariophyta, Dinoflagellata, Chlorophyta, Cyanobacteria, Chrysophyta, Euglenophyta and Cryptophyta)*, were identified. The greatest diversity was found in transitional and coastal waters where *dinoflagellates* were dominant (42, and respectively 48 species) (Figure 5.4.2.3.-1), followed by diatoms. In marine waters, with *dinoflagellates* and diatoms (30%, respectively 28%), the proportion of other groups put together exceeded that of the *dinoflagellates* (30%), standing out *the chlorophytes* (28%) and *cyanobacteria* (7%).

Fig. 5.4.2.3.-1. Taxonomic composition of the phytoplankton
from the Romanian sector of the Black Sea in 2013



Source: National Institute of Research and Development – GRIGORE ANTIPA

In coastal waters, at the stations located close to Constanta, there is observed a development of phytoplankton at between $755 \cdot 10^3$ and $4{,}6 \cdot 10^6$ cel·l^{-1}. To the south, the development of phytoplankton was reduced in coastal waters, reaching a minimum value at Mangalia station, on a 5 m isobath ($365 \cdot 10^3$ cel·l^{-1}).

Regarding the quantitative structure of phytoplankton in May 2013, diatoms were the net dominant both as density and biomass (over 70%) in coastal and marine waters. In August 2013, transitional waters were dominated by *nondiatomides*, of these, the dinoflagellates reaching approx. 60% of the biomass, and other groups, particularly clorofites, *cyanobacteria*, *crisofites* and

The year 2013 was characterized by a weak development of the phytoplankton community, the annual average quantities of phytoplankton on the surface ($39{,}67 \cdot 10^3$ cel·l^{-1} şi 0,37 g·m^{-3}) is even lower than the average values recorded in 2012 ($82{,}84 \cdot 10^3$ cel·l^{-1} şi 0,40 g·m^{-3}).

The algal bloom

In 2013, 5 species have developed more than 1 million cells per litre, more than in 2012(3 species), but decreasing compared to the 8 species in 2010.

Of these, *Skeletonema costatum* specie recorded a maximum density in shallow waters in Mamaia ($4 \cdot 10^6$ cel·l^{-1}), in February.

Other species with higher densities ($1\text{-}3 \cdot 10^6$ cel·l^{-1}) were: among diatom, *Cyclotella caspia*, *Pseudo-nitzschia delicatissima, Chaetoceros subtilis* and the species of cyanobacteria *Pseudanabaena limnetica* (maximum density - $1{,}3 \cdot 10^6$ cel·l^{-1}).

Zooplankton

În anul 2013 zooplanctonul este caracterizat în baza unui set de probe colectate în luna august. The zooplankton was dominated by the trophic component, wich recorded average density and biomass values higher than those in the last years.

In terms of qualitative composition, in summer, the dominant organisms were copepods, mainly represented by *Acartia clausi, Centropages ponticus, Oithona davisae* and *Oithona similis*, followed by cladocerans group, represented mainly by *Penilia avirostris, Pseudevadne tergestina* and *Evadne spinifera*. In the qualitative structure of zooplankton were identified 18 taxa, belonging to 11 taxa groups.

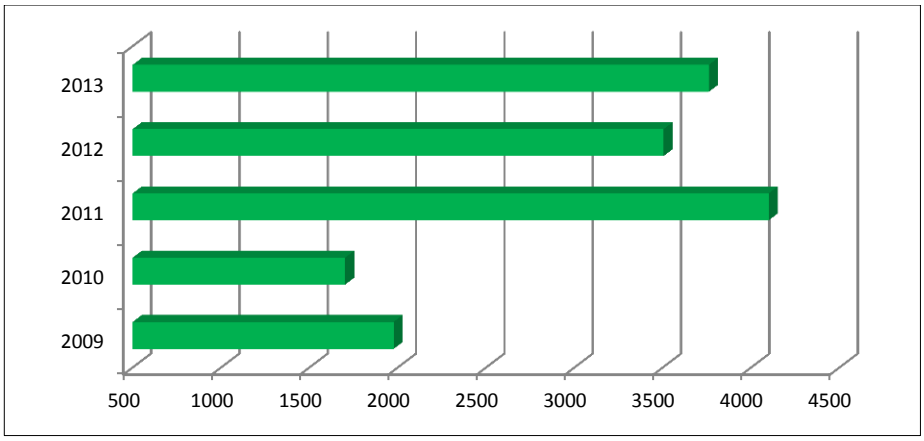
Copepods *Acartia clausi*, *Oithona davisae*, *Oithona similis* and *Centropages ponticus*, cladocerans *Penilia avirostris, Pseudevadne tergestina* and *Evadne spinifera* and, appendiceal *Oikopleura dioica* and *Parasagitta setosa* were constantly present in the analyzed samples. Among the non-indigenous species were reported *Mnemiopsis leidyi, Beroe ovata* and *Oithona davisae* copepod.

Phytobentos

Monitoring of algal flora for 2013 was carried out within the expeditions undertaken during summer, samples being taken from profiles and stations regarded representative as regards the algal flora and which follow the seacoast line Năvodari - Vama Veche: Năvodari, Fishery, Constanţa Casino, Agigea, Eforie Nord, Eforie Sud, Tuzla, Costineşti, Mangalia, 2 Mai and Vama Veche. Profiles analyzed were between 0-3 m, rocky and sandy natural substrate (in order to observe marine phanerogams communities). In the qualitative assessment of the summer of 2013, there were identified 23 taxa, as follows: 10 Chlorophyta, 1 Phaeophyta *(Cystoseira barbata)*, 9 Rhodophyta and 3 Tracheophyta *(Zostera Nolte, Zannichelia palustris, Stuckenia pectinata).*

Regarding marine higher plants, on the Romanian seaside are found: monospecific association *Zostera noltei* (north - Năvodari and in south - Mangalia), the association *Zostera noltei - Stuckenia pectinata* (Năvodari) and areas covered with *Zannichelia palustris* (species observed in summer 2013 in the extreme south, Vama Veche). Fresh biomass for *Zostera noltei* in Mangalia, on the existing lawn between 1-3 m, was similar to the previous year (Fig. 5.4.2.3.-2) - regeneration of the species is maintained and qualitative analysis of specimens showed some indicative features in this regard: long leaves, fresh looking, deep green, little epiphytes (*Colaconema thuretii* - dominant epiphytic), rhizomes and long rizoid system (for good anchorage in the substrate). On the three profiles analyzed, the biomass was consistent and high (1.500 g / m2), a situation that has occurred also in Năvodari (1.700 g / m2 approx. 1 m depth).

Fig. 5.4.2.3.-2*. Average fresh biomass for Zostera noltei between 2009-2013 (summer seasons)*

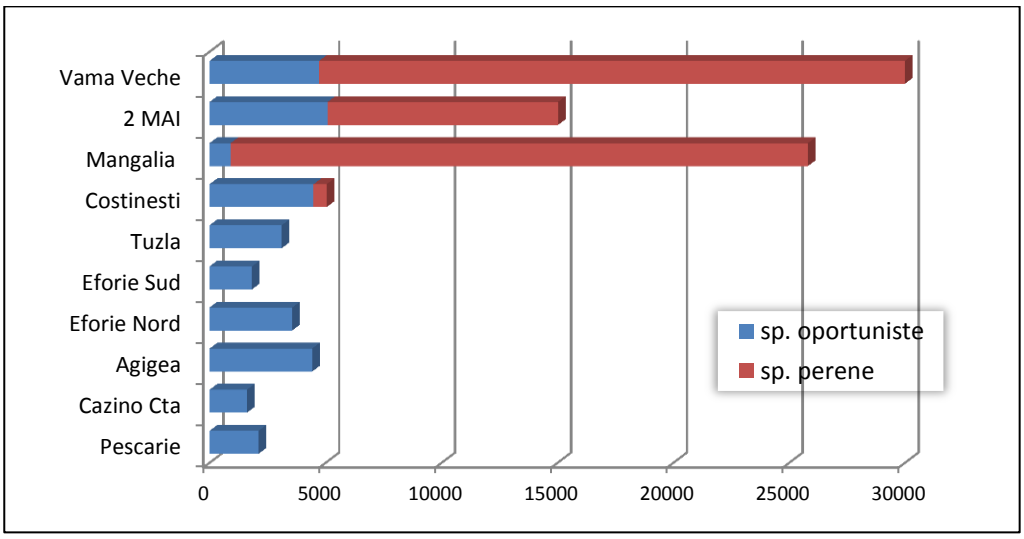


Source: National Institute of Research and Development – GRIGORE ANTIPA

In South, in Mangalia and within the Marine Reservation Vama Veche - May 2, the *Cystoseira barbata* fields are located 1-3 m deep, on hard, natural substrate, which is a fundamental factor in the development of this species, together with a high water transparency, and are maintained in the regeneration process observed in recent years (tall specimens, high fresh biomass, especially in deeper horizons of 2-3 m, but the species remains particularly sensitive to human activities (eg. setting cliffs, construction of embankments, excavations in the port area). *Cystoseira barbata* presented as epiphytes during the summer season the species *Ulva intestinalis*, *Ceramium diaphanum*, *C. virgatum* and *Cladophora* species, and as basifyes - *Ulva rigida* (dominant forming the *Cystoseira barbata - Ulva rigida association*) and *Ceramium virgatum*.

Following the quantitative analysis of samples collected from the Romanian seaside in the summer of 2013, there is a clear dominance of perennial, sensitive species, indicating areas of high ecological quality with a higher specific diversity in the south of the coastline (Fig. 5.4.2.3.-3).

Fig. 5.4.2.3.-3 *The biomass proportion of phytobentic species on the Romanian seaside in summer 2013*



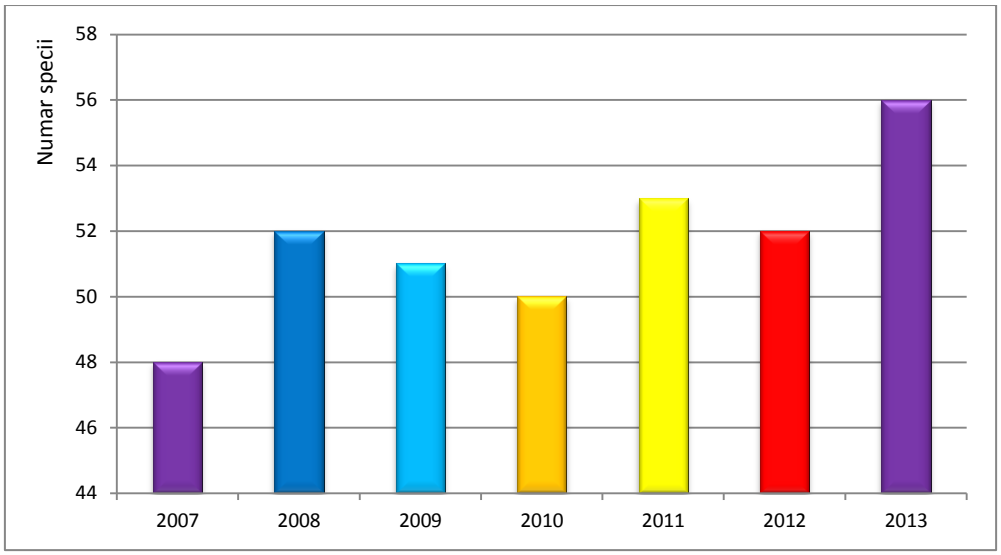
Source: National Institute of Research and Development – GRIGORE ANTIPA

Zoobenthos

Zoobenthos, an eutrophication state indicator, which continues to show a constant evolution concerning the diversity of species. The qualitative analysis performed over the group of monitored areas (Sulina – Vama Veche) led to the identification of 56 species of the macrozoobenthos, the fauna panel keeping its characteristics from the previous years.

In 2013, a higher specific diversity was recorded in coastal waters, where 26, respectively 35 species of macrozoobenthos were identified compared to 2012. From the multi-annual evolution of the number of species identified in the Romanian sector of the Black Sea waters shown a slight but continuous balancing qualitative trend (Fig. 5.4.2.3.-4).

Fig. 5.4.2.3.-4 *Evolution of macrozoobenthos species in the Romanian Black Sea waters sector (Sulina - Mangalia, Constanța East)*



Source: National Institute of Research and Development – GRIGORE ANTIPA

In 2013, the numerical abundance of macrozoobenthos species was 1.3 times higher compared to 2012. The bivalve molluscs *Mya arenaria* and *Abra prismatica*, present in better structured populations in terms of quantity in deeper waters (30 m), contributed to the increase of the biomass values approximately 2 times over compared with the previous year.

In coastal waters, the average values of numerical abundance obtained in Casino Mamaia were over 5 times higher (12.118 ind/m^2), and respectively 2 times higher (1987 ind/m^2) in the south coast (Costineşti -

The results of average values obtained for water bodies investigated in 2013 characterized a state of moderate quality status, with slight tendency towards good status in southern coastal areas less affected by eutrophication.

In order to recover the benthic communities it is necessary a longer period of improved environmental conditions, taking into account the fact that species with low tolerance recover more difficult when the natural / or anthropogenic pressures are high.

5.4.3. STATE OF THE MARINE FISHERIES STOCK

5.4.3.1. Indicators for living marine resources

In 2013, within the Romanian marine area, the commercial fishing activity was carried out in two different ways: fishing with active tools, with the coastal trawler vessels at depths over 20 m and fishing with fixed fishing tools along the seaside, in 20 fishing areas, located between Sulina and Vama Veche, at smaller depths of 3-11 m / stake net, and also at 20 - 60 m depths/seine and lines.

The following trends were signalled (for 2013):

➢ **Evolution *of state indicators***

• **biomass of stocks** for the main species of fish (Tabel 5.4.3.1.-1) indicates:

- ***Sprat*** biomass population was estimated as in the past five years, at about 56,429 tons, showing a natural fluctuation, almost normal;
- ***Whiting*** biomass population was estimated at 19,797 tons, triple from last year and almost equal to the estimates of 2010-2011, when oscillated between 20,000 and 21,000 tons;
- The secrease in the ***turbot*** population biomass in recent years was also found in 2013, being estimated at 554 tons, a lower value with 13.35% compared to the previous year and 107.58% compared with the 2010-2011period;
- ***Shark*** biomass population was estimated at 4483 tons, three times higher than the previous year, but less with about 50% than those estimated in 2010-2011.

Table 5.4.3.1.-1. *Value of the reserves (tons) for the main species of fish from the Romanian sector of the Black Sea*

Specia	2007	2008	2009	2010	2011	2012	2013
Sprat	60.000	61.916	60.059	59.643	60.000	68.887	56.429
Whiting	6.000	8.659	11.846	20.948	21.000	5.650	19.797
Anchovy	20.000	20.000	-	-	-	-	-
Gudgeons	600	500	-	500	500	450	300
Turbot	1.300	2.356	1.500	1.149	1.147	628	554
Shark	4.300	1.450	2.500	13.051	10.000	1.550	4.483

Source: National Institute of Research and Development – GRIGORE ANTIPA

● **the structure of the population** indicates, as it did in previous years, the presence in the captures of a higher number of species (over 20), the most important being the small size species (sprat, anchovy, whiting, mackerel, gudgeons) as well as the bigger species (brill and Danube mackerel). The reduced percent of shark, scad, garfish, grey mullet, blue fish is to be noted as well as the isolated re-emergence of the blue mackerel and pelamid.

➢ **The evolution of the pressure indicators:**

- **the fishing effort** continues the reduction trend noticed ever since 2000. Thus, in 2013, in the active fishing were involved only 2 ships (2 pelagic trawlers, 300 turbot gillnets) and in the stationary fishing were involved a total of 112 boats (43.43% less compared with the previous year) and 15 boats (less than 6 m), 91 boats (6-12 m) and 4 vessels (12-18 m).
- **total levelsof captures:** after a reduction trend signalled in the 2002-2010 period, years when they fell from over 2.000 tons in 2002 to 1390-1940 tons in 2003-2006, and under 500 tons, from 2007 to 2009, reaching a minimum in 2010/258 tons, in the last two years, the catches had an increasing trend, respectively 568 tons in 2011, 835 tons in 2012 and 1.711 tons in 2013 (100% higher than in the previous year).
- **total accepted capture** (TAC), for the main species of fish (available for fishing), between 2008 and 2012, was maintained at the same level.

➢ **Evolution of impact indicators:**

- **the percent of the species whose reserves are outside the safety limits** was close to that of the previous years being nearly 90%; Exceeding the limits of safety is not only due to the exploitation of Romanian marine sector, most fish species having a cross-border distribution, which requires regional management.
- **the percent of the complementary species from the Romanian captures** continues to be maintained at a level similar with the one in the previous years, of 20%.
- **changes of the structure of size classes (age, length)**, compared with the period 2009-2013, excepting the sprat, for there is a tendency noticed of the hordes to get younger, due to a very good supplementation; for the other species from the captures the biological parameters were maintained almost at the same values.
- **CPUE** (catch per fishing effort), resulted with regard to fishing in the Romanian beach area:

5.4.3.2. Measures for solving critical problems

► **on national level**: the harmonising of the sustainable development strategies in the area of Romanian marine fishery with those of environment protection, by implementing the concept of fishing management based on an ecosystem approach and of the Code of Conduct for responsible fishing by: avoiding to set up an excessive fishing capacity; practicing a responsible fishing; conservation of the biological diversity of the marine ecosystems and the protection of the endangered species; setting up and using selective fishing methods – non-destructive, profitable, which show respect for the environment and protect the living marine resources; development of the mariculture and the diversification of the mariculture products; development of an integrated plan for the restructuring of the fleet in relation to human resources, appropriate materials with the available live resources;

► **on regional level**: the harmonising at regional level of the institutional legal framework and the regulations for the sustainable use of living resources; the improvement of the management of the exploitation of the fish reserves through evaluation methodologies agreed at regional level; programmes / projects development for the evaluation of fish reserves and for monitoring the environmental conditions and the biological factors which influence them; establishment of partnerships between the institutions of research, administration and the producers organisations for the elaboration of a joint research programmes; establishing a regional fishing database; starting a very rigorous action for fighting against illegal fishing.

5.4.4. MARITIME SPATIAL PLANNING (MSP)

The field of Maritime Spatial Planning (MSP) is considered part of the Integrated Coastal Zone Management (ICZM) and sustainable development tool . In March 2011, the ICZM Protocol on integrated coastal zone management entered into force. The Protocol was implemented particularly in neighboring Member States of the Mediterranean Sea. The FP7- PEGASO project carried out a survey for protocol implementation and dissemination. As a member partner of this project, Romania (by INCDM and INCDDD) actively contributed to this objective, including by its periodic reports and collaboration with the Black Sea Commission

On the Romanian Black Sea coast, marine activities and uses are not separated from the coast, but are continuous, overlap, having a simultaneous, mutual influence. Land pressures are high, affecting the shore and, therefore, it is necessary to integrate these in common measures at regional level. This approach is supported by the results obtained by INCDM during the marine environment monitoring. Therefore, there is not only a strong influence in both directions, from shore to sea, and from sea to shore.

In 2013, thw PSM activity was carried aut in some projects, in relation with the informational support and specific authority in the field. These can be specified as follows:

1. **The main opportunities conferred by the new regulations, standards and European legislation**, among which the EU Framework Directive for Maritime Spatial Planning and Integrated Coastal Zone Management, the EU Marine Strategy Framework Directive (MSFD - 2008/56 / EC), the Declaration of Limassol (08/10/2012) for the Integrated Maritime Policy of the EU member states. The new Framework Directive proposed for ICZM and PSM (EC - COM (2013) 133 final) aims at implementing similar instruments and practical approaches in the coastline and maritime space, useful for a sustainable development and good management of the Romanian coastal zone. In this regard, the main results achieved so far, corresponding to the articles of PSM and ICZM Directive are embodied as follows:

- Marine area landscaping plans and possible contributions to the development of the strategy on the integrated coastal zone management in Romania *(Art. 4,5,6,7,8);*
- Projects specific to ICZM and PSM field (Interreg-CADSES-PlanCoast, FP7PEGASO, PN NATIONAL PROGRAM) dedicated to the marine area landscaping and to the coastal zone integrated management strategies *(Art. 9);*
- Marine data and information collected to support the process of drafting of landscaping plans for coastal and marine area through projects and permanent updates of data *(Art. 10);*
- Assessment of coastal and marine activities, including landscaping/ planning of the maritime area *(Art. 11);*
- Bilateral and multilateral cooperation between institutions of the Member States and of those located in the Black Sea basin area *(Art. 12).*

2. **Existing and newly established bodies for Integrated Coastal Zone Management** (coordinated by MMSC), Maritime Surveillance and Integrated Maritime Policy (Ministry of Transport), able to contribute to the implementation of European Directives in Romania.

In the field of Integrated Coastal Zone Management, attached to the Romanian legislation on ICZM the Romanian National Committee of Coastal Zone (NCCZ) legally continued its activity in order to support coastal development in a rational way.

For the Maritime Spatial Planning in Romania, the only expert working Group which operated until now was the inter-ministerial Group for the implementation of the CISE roadmap (*Common Information Sharing Environment* / 2010), which created, until 2013, the sharing of information at national level, established at the initiative of the Inter-ministerial Committee regarding the Integrated Maritime Policy, which INCDM was representative for PSM areas, marine pollution, database and GIS.

In 2013, was established the Commission for Integrated Maritime Policy, under the same coordination of the Ministry of Transport, Bucharest (the inter-ministerial committee).

3. **Technically** speaking it demonstrates that **knowledge / PSM information** belongs to the interministerial committee for the Integrated Maritime Policy, thanks to the data collected and stored by its members and of their own experience, applicable in the marine space areas.

In this regard, the Ministry of Regional Development and Public Administration leads spatial planning, with the possibility of extending the marine space; Ministry of Environment and Climate Change monitors the environmental quality of coastal and marine areas; Ministry of Transport coordinates and manages the navigation routes; other ministries cover all marine activities, water use and security of the Romanian Black Sea (MoD, MFA, MT, MEC). Ministry of Environment and Climate Change is involved in and supports the implementation of the EU and coordinates the National Committee of the Coastal Zone (CNZC).

4. The main significant **INCDM projects** in the PSM and ICZM fields, in 2013: PEGASO / FP7, CBC-JO / SRCSSMBSF and SYMNET, PN II - ECOMAGIS, PERSEUS / FP7, COCONET / FP7, MISIS, for their contribution to risk assessment, vulnerabilities assessment, and the main environmental variables, the impact of

pressures, natural resources including marine fisheries, maritime activities and uses, land and sea connections and influences.

INCDM achieved, within the project CBC-JOP Program - SRCSSMBSF, in collaboration with partners in the Black Sea (Bulgaria, Turkey and Ukraine):

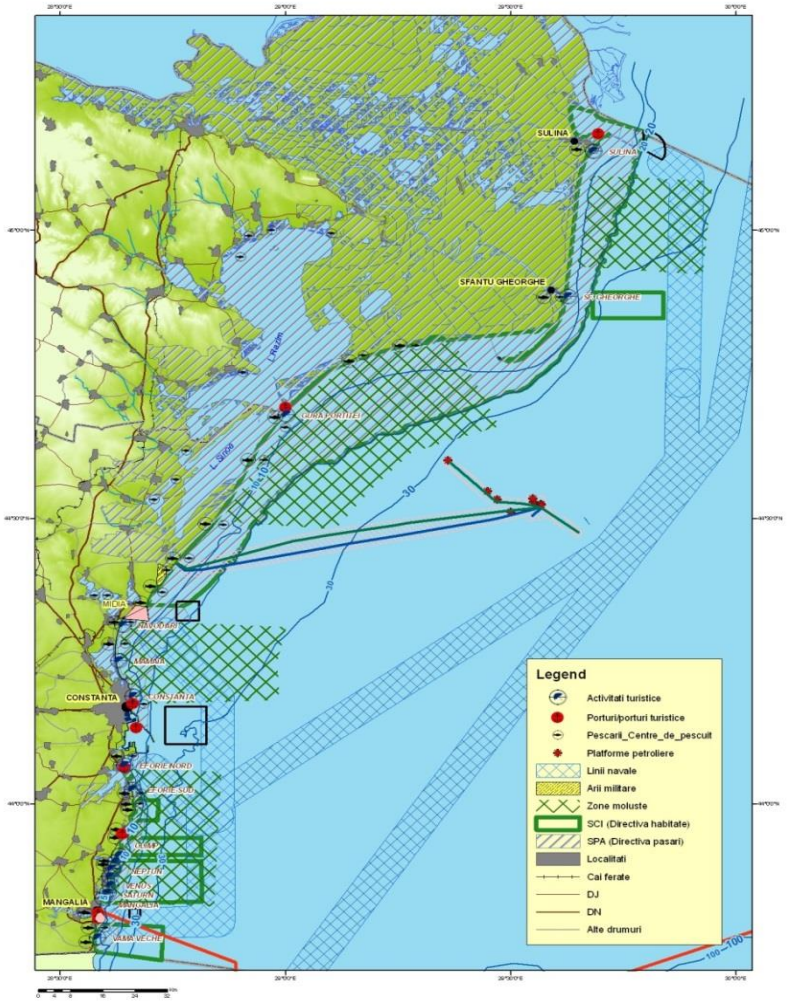
- Report on the Status of fishery resources in the Black Sea, which includes distribution maps of key species;
- List of national focal points, skilled researchers, NGOs involved in marine fisheries in the Black Sea;
- Fisheries Management Plan of the Black Sea..

Through the PEGASO project, coordinated by the National Research and Development Institute "Danube Delta" Tulcea, have been experienced significant initiatives to disseminate the results obtained at the Romanian seaside, supported by MECC, Bucharest, nationally, and the Black Sea Commission, the Black Sea (MECC representative interview, as the end user of the results of the project by *Plan Bleu pour l'Environnement et le Développement en Méditerranée)*. To this end, the proposals made for the future are:

- Development at cross-border level with the Bulgarian side, as to extend the PSM process at the southern border of Romania, between the two Member States;
- Sharing experience in their entire Black Sea basin, common to countries outside the EU, for a better overview of common ICZM and PSM issues, at regional level, knowledge and information sharing and standardization of methods in order to have a coordinated approach, similar to the field;
- Initiate a "coastal virtual information center" informative, to be developed with the support of the National Committee of the Coastal Zone, the Technical Secretariat and working groups for delimitation of the coastal area and county planning.

Besides these, INCDM continued the development of thematic and integrated maps in the coastal and marine area, regarding inland waters, transitional, marine, coastal and marine habitats, marine protected areas, evaluation and use of natural resources, pressures, activities of maritime areas, tourism, resource extraction, waterways and transport etc. (Fig. 5.4.4.-1).

Fig. 5.4.4.-1. *Map of key maritime activities and uses*
(Source: National Institute of Research and Development – GRIGORE ANTIPA)



5.4.5. ANTHROPIC PRESSURES

The main anthropogenic pressures identified as significant in 2013 within the Romanian coastal area come from the pronounced development of various socio-economic activities in the natural space of the coastal area: *marine fishing, agriculture and food industry, petrochemical industry, mining / sand industry for artificial silting of beaches, tourism industry, maritime transport / ports and waterways / navigation, military and defense activities, housing construction and urban expansion in areas immediately adjacent to the shoreline.*

Environmental issues identified in the Romanian coastal area induced by anthropogenic factors identified as significant in 2013 were as follows*: coastal erosion / sediment dynamics, water / air pollution, population growth in residential areas near the shore, uncontrolled development of tourism and recreation activities over the capacity of the environment, changes in the height regime of the buildings located on the beach, changing the regime of non-permanent use constructions to permanent use constructions located in the beach area, maritime transport, natural resource / sand beach extraction, overexploitation of fish stocks, loss of marine and coastal habitats, maintaining the list of endangered species.*

In 2013, environmental monitoring conducted at the Romanian seaside showed slightly higher concentrations of pollutants in the marine area under the influence of the Danube, and also in the southern sector in certain areas subject to different anthropogenic pressures (ports, wastewater discharges).

Thus, we can say that, in the year 2013, the main anthropogenic pressures identified in the Romanian coastal area come from increased development of different socio-economic activities in the coastal area: constructions / holiday houses districts in tourist areas, expansion and modernization of existing tourist ports etc.

Also, **urban expansion/coverage of beach areas with constructions and vertical expansion/ elevation of the level of the old historical building/terraces on the beach by building multiple stories on top of them** (Mamaia area), the uncontrolled development of provisional tourism constructions and tourism activities, recreation and leisure over the support capacity of the coastal environment, are additional pressures exerted by tourism on the environment, in the conditions of population doubling during the summer season, significant pressures, also related to the increase/doubling of the domestic wastewater that requires treatment, increase/doubling of car traffic and leisure navigation, with higher emissions and noise.

In terms of the impact on biodiversity, namely the reduction of nesting habitats, the reduction of the surface of the island due to a decrease in the solid flow by redistributing liquid flows between Chilia arm, Stambulul Vechi and Bâstroe Channel and by removing the source of sediment, the induced changes have an impact on avifauna / high risk, aquatic fauna / medium risk.

Measures must be taken to stop the erosion of beach areas by off-road vehicles and reduce the environmental impact of camping activities / damage to emersed beach biocenosis, particularly on psamofile vegetation. The situation of the management development of beaches and coastal bathing waters requires the implementation of protection solutions with minimal impact on the related ecosystem. Addressing the complexity of the interdependence of different anthropogenic pressures requires also an assessment of the estimated costs of the measures that contribute to the restoration and prevention against degradation of the marine environment in relation to pressure and activities that generate these pressures, and this approach must also define a state of reference, a variability interval considered normal for different parameters / status indicators associated with coastal processes. All these measures for which it was possible to assess the amount / degree of impact can be analyzed in relation to the pressures involved.

To reduce and control the problems that arise in the Romanian coastal area, we propose to optimize the coastal management activities and to conduct related studies, on the risks and hazards in existing conditions respectively, the reconsideration of emergency situations management: accidental oil pollution, earthquakes, flood management, coastal ecosystem response to toxic waste spills, the impact of insecticides, biotechnological risk with impact on the community, chemical hazard on the community in times of drought, desertification, land degradation, climate change, risk assessment in case of landslides / slides of the slope of the cliff, intense storms, marine waterspouts etc.

5.5. ACCIDENTAL POLLUTION OF THE MARINE AND COASTAL ENVIRONMENT

In 2013 the following accidental pollutions were recorded, however, without major environmental incidents, the information being presented in table 5.5.1 below:

Table 5.5.1. *Accidental pollutions of the marine and coastal environment*

Pollution event					Applied measures
Location	**Date**	**Polluter**	**Pollutant substance**	**Cause**	
Neptun Lake	18.01.2013, 17:30 hours	unknown	There were recorded iridescent oil marks on the water surface	Discharge of rainwater with oil load.	Measures were imposed against the Mangalia City Hall to decontaminate the affected area within a specific deadline.
Cernavoda Lock (pollution was recorded on the Danube-Black Sea Canal, in the locality of Cernavoda).	03.02.2013, 16:05 hours	unknown	There were recorded iridescent oil marks in the area of reeds and under the mobile bridge viaduct.	Possible bilge leak from a ship that transited the Lock	The environmental factor affected was the water of the channel over a length of 200 m and width of approx. 1m along the bank of the reeds. Measures were imposed against CN ACN SA to decontaminate the affected area.
Tomis Constanța Recreation seaport, aquatorium pier B	30.05.2013, 19:17 hours	Recreational boat EOL 777, Romanian flag	Diesel fuel	The fuel leaked due to cracks in the engine compartment, through the sternpost of the boat (approx. 5l), spewing out in the form of iridescent oil, the environmental factor (water) being affected on an area of about 50 square meters.	In the aquatorium were placed floating dams and biodegradable absorbent materials. On 04/06/2013 have been completed the decontamination operations and the area has been cleaned up.
Vama Veche	17.08.2013, 22:30 hours		There was recorded an overflow of sewage wastewater in the Black Sea	ENEL electrical network failure which stopped the pumps in the pumping station which serves the town. The environmental factors affected were water and soil. The sewage went through a stretch of beach, open channel of a width of 20-30 cm over a distance of about 50 m.	Has been redressed the problem of the failure of the ENEL electricity network
Mamaia Resort	28.08.2013, ora 16.00	unknown	Degraded oil product	Thin belt of algae where appears from place to place degraded oil product (residue) in the form of spherical cakes. The storm might have been a possible cause for the pollution, favouring the degraded oil product to be carried in from offshore. The environmental factors affected were the water and the beach. This phenomenon occurred over a length of approx. 200 m from the river.	ABA DL Constanta intervened during the night to manually collect and the area was cleaned up by mechanical equipment
Mamaia Resort	-	unknown	Spherical degraded oil product	Thin belt of shells where appears from place to place degraded oil product (residue) in the form of spherical cakes.	ABA DL Constanta intervened during the night to collect
Marine platform PFSSU / Pescarus, located about 80 nautical miles offshore	28.09.2013	unknown	Oil product (cca 200 l)	Emergence of an iridescence close to the platform, in the direction of hydrocarbon pipelines PFSSU-PFCP	The production of oil and gas was stopped, the pipelines dowry was replaced with seawater. For the identification of the pollution source, a Shark diving team, equipped with ROV equipment traveled to the area on a GSP King ship. Was monitored the pollutant front

Pollution event					Applied measures
Location	**Date**	**Polluter**	**Pollutant substance**	**Cause**	
					evolution. It has been tested the pipeline installation. There was identified no pressure loss and no pipe leakage. Tests run for a week on equipment and piping that could have lead to the iridescence notified on 28.09.2013, revealed no leaks, therefore production was resumed.
CDMN Km 50+300, at 15m from the shore	03.11.2013	CNFR Navrom Galaţi	Pollution with oil product	Mercury pusher 207, belonging to NSRF Navrom Galati sank as a result of damage (cracks) in the engine room.	The polluter was sanctioned according to GEO 195/2005 alin1 article 96, point 1.
Berth 69 A, Port of Constanta	08.12.2013	Niagara ship, Cook Islands flag, Aries Shipping agent, shipowner Volgo-don Shipping	Oil product	Emergence on the water surface (1-2 square meters) of an iridescence of oil product, leaked from the deck of the ship, while loading gasoline, inside the anti-pollution floating dam surrounding the ship	Oil Terminal intervened with decontamination solutions. A fire truck supervised the scene. At 20:00 the decontamination action was completed. The Niagara vessel commander was sanctioned under GD 876/2007, article 4, paragraph a, with the amount of 8000 RON

Addressing complexity of interdependence of different anthropogenic pressures requires, at the same time, estimated costs of measures that contribute to restoration, prevention of degradation on marine environment in relation to the pressure and the activities that generate such pressures, and in this approach, defining a reference state, of a variability range considered normal for different parameters/indicators of status associated to coastal processes, must intervene. All these measures for which evaluation of the amount/degree of impaction has been possible, can be analyzed in relation to related pressures.

To reduce and control the problems in the Romanian coastal zone, it is proposed to optimize the coastal management activities and conducting related studies, on the risks and hazards in existing conditions, respectively, the reconsideration of emergency situations management: accidental oil pollution, earthquakes, flood management, coastal ecosystem response to toxic waste spill, the impact of insecticides, biotech risk with impact on the community, chemical hazard on the community in times of drought, desertification, land degradation, climate change, landslide/slope of the cliff risk assessment, intense storms, marine waterspouts etc.

5.6. TRENDS

Biodiversity is the world's natural capital, is integral to sustainable development by providing vital goods and services, such as food, carbon absorption and water redistribution, underlying economic prosperity, social welfare and quality of life. Along with climate change, the loss of biodiversity is the most serious threat to the global environment and entails substantial losses to the economy and quality of life.

Destruction, fragmentation and degradation of habitats due to: land use change, overexploitation, aggressive practices on the environment, invasive species, pollution and, increasingly more, climate change constitute the most intense pressures on biodiversity.

Natural protected areas are established to protect the natural values and to reduce human intervention in natural and semi-natural ecological systems.

They are models for the conservation of natural areas, where human intervention is reduced, and of the areas in which man has intervened, as is the case of modified landscapes that have a special landscaping and cultural importance. In the process of preserving the integrity and diversity of nature must be ensured that any use of natural resources is equitable and sustainable.

6. WASTE MANAGEMENT

6.1 CONSUMPTION AND ENVIRONMENT

Growth and development of modern technologies in recent decades have brought new levels of comfort in our lives. This has led to a greater demand for goods and services and thus a growing demand for energy and resources. The way we produce and consume contributes to many of today's environmental problems such as global warming, pollution, depletion of natural resources and biodiversity loss. Many of the products we buy and use every day have a significant environmental impact of the materials used in their manufacture to the energy required for their use and waste resulting from their removal from service.

In 2008, the European Commission adopted the *"Action Plan on Sustainable Consumption and Production and Sustainable Industrial Policy "* (SCP / SIP Plan), which includes a number of proposals in order to help improve the environmental performance of products and increase demand for products and sustainable production technologies. The central element of the action plan is to create a dynamic framework to improve the energy and environmental performance of products and encourage their uptake by consumers. In this framework, several initiatives have resulted, but more ambitious plans to counteract the negative effects of consumption on the environment and for consumers to switch to a fuel-efficient in terms of resources must be developed.

In order for the modern society to become sustainable in the long term, the products with the lowest negative effect on the environment must become the accepted standard. The most important step is phasing out products that use energy and natural resources in excess of or containing dangerous substances, or release harmful emissions. The next step is to promote efficient products in terms of energy and resources and good environmental performance. This means you have to start from the planning phase. It is estimated that 80% of all product-related environmental impacts are determined during this phase. An Eco-design requirement for products is an important tool to achieve the policy objectives set by the EU strategic documents concerning the sustainable production and consumption.

Consumers play an important role in protecting the environment through the choices made when buying products. A number of labelling schemes help consumers by providing details on the environmental performance of some products.

Despite growing environmental awareness, most people have difficulties in reporting personal consumption habits to existing global problems such as need to preserve resources. This is also because market prices do not yet fully reflect the environmental costs of production and consumption over the life cycle of a product, including its management when it becomes waste (eg cost generated from climate impacts associated with emissions of greenhouse gas emissions, biodiversity loss as a result of uncontrolled urban development, reduction of natural resources due to excessive use, health problems caused by pollution, etc.).

Most times, consumers choose products with better performance in terms of life cycle because initial costs are often very high and, in some cases, due to the lack of information on the effects and benefits of their future. Low levels of demand do not encourage businesses to invest in a product design that reduce the environmental impacts associated with the production, use and disposal of products. The challenge is to turn this vicious circle into a virtuous one. To this end, the overall environmental performance of products throughout their life cycle must be improved, the demand for better products and technologies must be promoted and stimulated and the labelling system should be made simpler and more consistent to help consumers make better choices.

The European Commission has launched a series of actions and programs of education and awareness about the difference it can make in people's lives, behaviour of efficient resource usage and the benefits of environmental consumption.

6.2 MATERIAL RESOURCES AND WASTE

Population growth and improved living standards result in demand and price increases and put pressure on natural resources we rely on, such as metals, minerals and food.

To address this issue, the European Commission has made the efficient use of resources one of its major political concerns. This means we will have to produce more with lower consumption, to use resources sustainably and to manage them more effectively throughout its lifecycle. To this end, we need innovation, changes in modes of production and consumption and the establishment of appropriate incentives and price signals.

The emblematic initiative "*An efficient Europe in terms of resource use*" of the Europe 2020 strategy aims to support the transition to an economy that is efficient in the use of all resources, to separate the absolute economic growth consumption resources and energy and its environmental impacts, reduce greenhouse gas emissions, to increase competition through efficiency and innovation and to promote greater energy security. The Guiding line towards an energy efficient Europe and Guiding line for moving to a competitive economy with low carbon dioxide are essential elements of the initiative, which determine the framework for future actions for achieving these goals.

Waste prevention through the use of modern and innovative technologies and turning waste into a resource, as required by the Guiding line on resource efficient use requires full implementation of EU waste legislation across the EU, based on the strict application of the waste hierarchy aimed at different types of waste. This includes applying the waste hierarchy and the effective use of market-based instruments and measures to ensure the gradual elimination of landfills, limiting energy recovery from recyclable material, the use of recycled waste as a major and reliable source of raw materials for the EU, managing in safe conditions the hazardous wastes and reduce their generation, eradicate the illegal waste shipments and removing barriers on the internal market that prevent ecological recycling activities.

According to statistics, EU economy uses 16 tons of material each year per capita, of which 6 tonnes becomes waste, half of them going to disposal. If these wastes cannot be avoided, the Commission urges those involved to reuse them, recycle them and to recover those that can be a valuable resource. Landfill taxation and the introduction of payment depending on the waste generated ("pay as you throw") can help achieve this goal. Some Member States have already achieved recycling rates of over 80 % and virtually they no longer use landfills for disposal. Others still have a long way to go in this respect.

There are already rules on specific issues such as electrical and electronic equipment waste, packaging, batteries and accumulators or out of use vehicles, which contribute to the efficient use of resources.

6.3 WASTE MANAGEMENT

The EU approach towards waste management is based on three principles:

- ***Waste prevention*** - factor considered to be extremely important in any waste management strategy directly linked both to improvement of production methods and determination of how consumers change their demand for products (orientation towards green products) and to address a way of life, resulting in reduced amounts of waste;
- ***Recycling and reuse*** - encouraging a high level of components material recovery, preferably by material recycling. In this respect several waste streams for which material recycling material is priority, were identified: packaging waste, end of life vehicles, batteries waste, electrical and electronic equipment waste;
- ***Final disposal of waste*** - where waste cannot be recovered, it must be disposed of safely to the environment and human health, with a strict monitoring.

In 2010, the European Commission launched the *Europe 2020 - A strategy for smart, sustainable and favourable to inclusion* Strategy, in order to guide the economic development of the EU in the next decade. The new strategy has the overall objective of transforming the EU into a smart, sustainable and favourable to inclusion economy, to provide a high level of employment, productivity and ensure economic, social and territorial cohesion of the Union.

In 2013, the Romanian Government adopted the National Waste Management Strategy 2014-2020 which aims at the following directions for action:

- Prioritize efforts in waste management in line with the waste hierarchy;
- Development of measures to encourage waste prevention and reuse, promoting the sustainable use of resources;
- Increasing the recycling rate and improve the quality of recycled materials, working closely with businesses and establishments and undertakings which recover waste;

- Promote recovery of packaging waste;
- Reducing the carbon impact generated by waste;
- Encourage production of energy from waste for wastes that cannot be recycled;
- Organize the national database and efficient monitoring process;
- Implementing the concept of "life cycle analysis" in waste management/policy.

It is also wanted the improvement of services for the public and business sector by:

- Encouraging green investments;
- Supporting initiatives that recognize and reward people who reduce, reuse and recycle waste from households;
- Collaborating with local government authorities to increase efficiency and quality of collected waste, making them easier to recycle;
- Collaborating with local government authorities and the business sector to improve waste collection systems.

6.4 IMPACT

EU policies on waste management aims to reduce the impact of waste on the environment and human health and to improve energy efficiency in the EU. To be effective, this impact should be reduced at each stage from the exploitation life of the resource. Applying the instruments established by existing Community legislation, such as the dissemination of best available techniques or ecological design of products, is therefore an important factor in achieving this goal.

The long term goal of these policies is to reduce the amount of waste generated and where waste generation cannot be avoided, to promote their use as a resource and obtain higher levels regarding their safe recycling and disposal.

Waste Framework Directive (2008/98/EC) has already opened the way to new thinking in terms of waste management. It sets an extended responsibility of the manufacturer and describes powerful and innovating factors to stimulate a sustainable production, taking into account the entire life cycle of products. Member States are encouraged to adopt legislative and non-legislative measures to enhance reuse and prevention, recycling and other waste recovery operations. Manufacturers should be encouraged to get involved in creating points of acceptance of products scrapped. They may engage in waste management and to assume financial responsibility for this activity. They will make available to the public information on reusability or recycling of the product. Appropriate measures to encourage the design of products that have less impact on the environment and generate less waste during production and subsequent use, will be taken. Such measures may encourage the development, manufacturing and marketing of products with multiple uses that are technically durable and allow for an environmental management at the end of their lives.

Waste Framework Directive requires Member States to carry out programs to prevent waste production. These include specific prevention programs to be implemented at the appropriate level and which must be made public.

6.5 PRESSURES

Some environmental impacts caused by our consumption levels and patterns are not visible at first. Producing power for charging mobile phones and freezing of our food causes carbon dioxide emissions into the atmosphere, contributing to climate change. Transport and industrial means release pollutants into the atmosphere, such as sulfur oxides and nitrogen oxides, which harm human health.

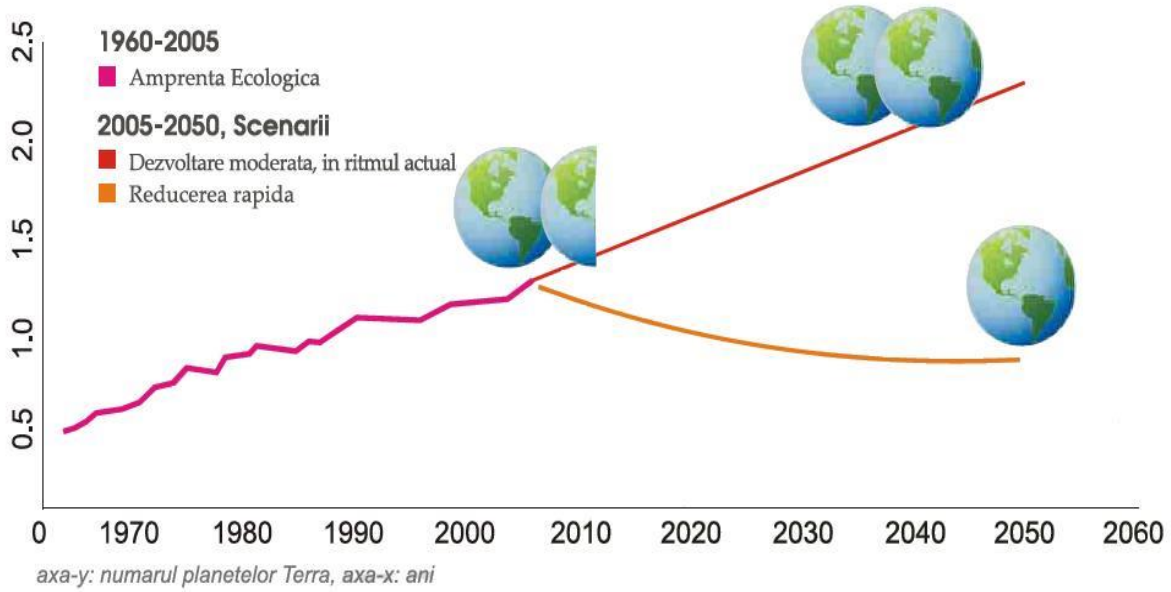
In everyday life, when we choose certain goods and services which we buy, we do not often think of "fingerprint " which they leave on the environment. Shelf prices almost never reflect their true cost.

Ecological Footprint is an objective indicator that synthetically expresses the pressure the mankind exerts on the biosphere, depending on the productive area (land and water surface) and of planet required for providing natural resources it consumes and to neutralize the waste inhabitants of the planet generate. Ecological footprint of a country includes the areas of cultivated land, pastures, forests and fisheries needed for the production of fibers, wood and food and areas occupied to neutralize the waste generated.

Ecological Footprint is calculated by dividing human consumption of natural resources to the earth's capacity to regenerate them and is expressed in *global hectares (hag)*. The time dynamics of the ecological footprint expresses the exploitation by people of all categories of natural resources, within the general attempt to cater to an increasing level the requirements of development. Currently available in the world are 1.8 hag / person. Every European uses 4.9 hag, and a North American two times more than an European. This is possible, but only by reducing the availability of consumption of the inhabitants on other continents.

Global ecological footprint concept was used first time in 1992 by Canadian ecologist William Rees of the University of British Columbia.

Ecological Footprint can refer to both global consumption and the impact that local communities or even individuals have on local ecosystems and the biosphere in general. This impact is expressed in terms such as : carbon footprint, type of food footprint, housing footprint, footprint of goods and services. The end result of a research on the ecological footprint typically expresses the number of Earths needed to sustain the population at the consumption level derived from this study.



Today humanity uses the equivalent of 1.3 planets to provide the resources we need and to absorb the waste we produce. This means that now the Earth needs one year and four months to regenerate what we use in a year. Moderate UN scenarios show that if we keep the same rate of consumption and population growth, by 2035 we will need two planets to meet our requirements!

6.6 TYPES OF WASTE

For the collection, validation and processing of data and information regarding the generation and management of waste, the National Agency and the County Agencies for Environment Protection carries out every year a collection of data regarding the generation and management of waste from certain types of economical operators, based on 5 types of questionnaires, namely:

- PRODDES – data provided by waste generators
- MUN – data provided by sanitation operators
- TRAT – data provided by the operators of waste treatment installations
- COLLECTION/TREATMENT – data provided by economical operators with CAEN Code rev. 1 5157, 3710 and 3720
- SLUDGE – data provided by operators of town and industrial wastewater treatment plant.

The questionnaires are drafted in such a way that they contain all the parameters required to ensure both the monitoring of implementation of legislation in the field of waste and the elaboration of reports that need to be sent to EC/EUROSTAT.

6.6.1 MUNICIPAL WASTE

➢ **Municipal waste generation**

Municipal waste represents the total amount of waste generated in the urban and rural areas from households, institutions, commercial units, economical units (household and assimilated waste), street waste collected from public spaces, streets, parks, green areas, waste from constructions-demolitions collected from waste management operators.

Collection of municipal waste is the responsibility of municipalities, directly (through specialized services within Local Councils) or indirectly (by giving this responsibility on a contract basis to companies specialized in sanitation).

In 2011[1], the amount of municipal waste collected by its own specialized services of municipalities or sanitation was 5.085 million tons. Compared to the amount of municipal waste generated in 2010, in 2011 it decreased by approximately 12.6%. Amid the economic crisis, the lower consumption, has led to the generation of less waste, both from population and economic sector.

From the total amount of municipal waste collected, 76.6% is the domestic and assimilated waste.

Table 6.6.1.1 *Total waste collected by the municipalities in 2011*

Collected waste	Collected quantity millions of tons	Percent %
Household waste	3893,66	76,60%
Waste from municipal services	659,64	12,95%
Constructions/demolitions waste	531,78	10,45%
TOTAL	5085,08	**100%**

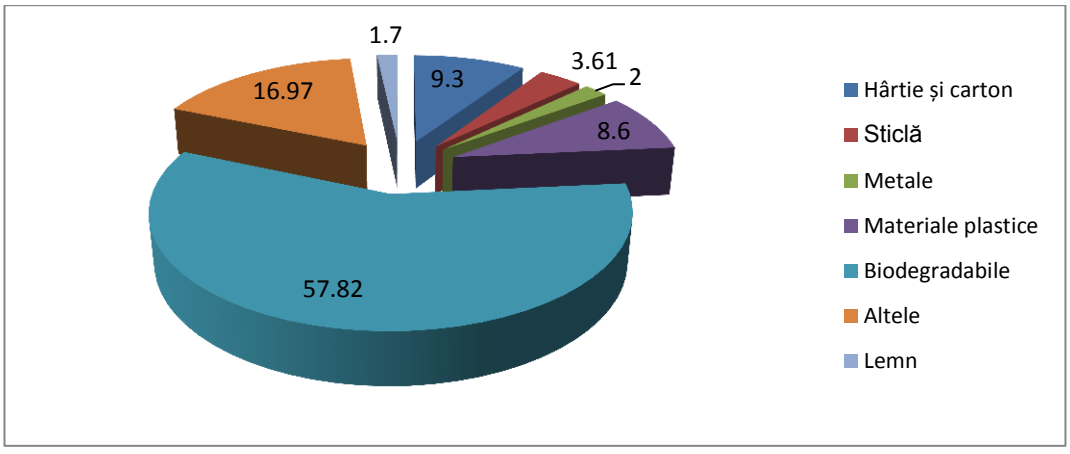
Source: The National Environmental Protection Agency

Table 6.6.1.2 *Percent composition, on material type, of domestic waste collected in 2011*

MATERIAL	PERCENT
Paper and cardboard	9,3
Glass	3,61
Metals	2,0
Plastic	8,6
Biodegradable	57,82
Other	16,97
Wood	1,7
Total	100%

Source: The National Environmental Protection Agency

Figure 6.6.1.3 *Percent composition of domestic and biodegradable waste collected in 2011*



Source: The National Environmental Protection Agency

Tabel 6.6.1.4 *Municipal waste collected, on main categories of waste, according to development regions, in 2011 (- thousand tons -)*

Development Regions	Total	Domestic and biodegradable waste	Municipal service waste	Construction-demolition waste
North-East	613,25	483,30	43,95	86
South-East	852,43	692,90	127,03	32,5
South-Muntenia	645,45	490,83	64,27	90,35
South-West Oltenia	286,82	251,22	24,00	11,6
West	565,28	428,28	69,05	67,95
North-West	567,75	424,20	105,70	37,85
Centre	634,80	499,48	80,47	54,85
Bucharest-Ilfov	919,30	623,45	145,16	150,69
Total	**5085,08**	**3893,66**	**659,64**	**531,78**

Source: National Environmental Protection Agency

We should mention that in Romania, municipal waste collection is not a general practice, on country level. The table below presents the evolution of the connection degree for the sanitation service during 2006-2011.

În tabelul de mai jos se prezintă evoluţia gradului de conectare la serviciul de salubritate în perioada 2006-2011.

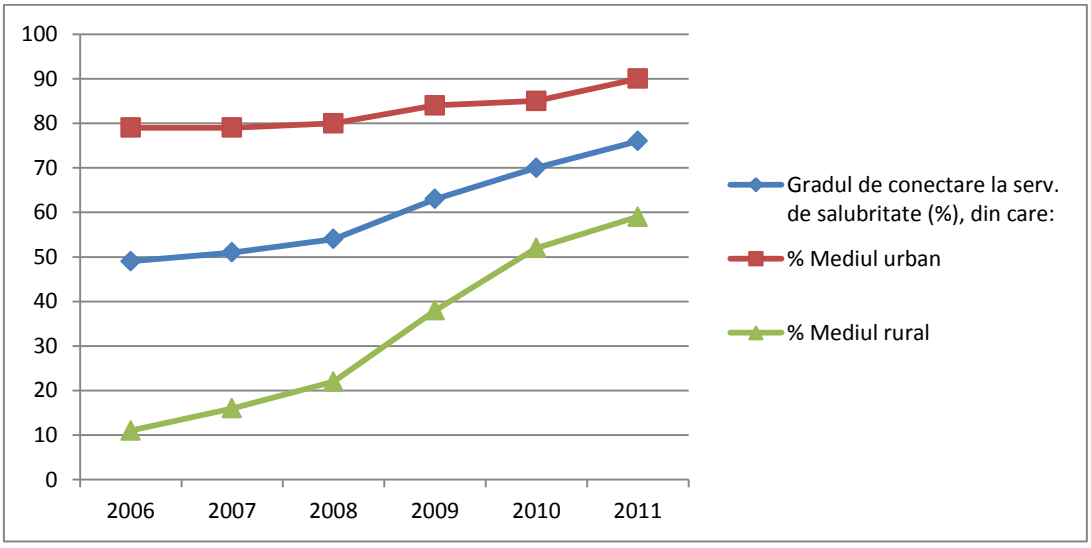
Table 6.6.1.5 5 *Evolution of the connection degree to sanitation services during 2006-2011*

	2006	2007	2008	2009	2010	2011
Connection to sanitation services (%),of which:	49	51	54	63	70	76
% Urban environment	79	79	80	84	85	90
% Rural environment	11	16	22	38	52	59

Sursa: Agenţia Naţională pentru Protecţia Mediului

The table shows a gradual increase, from one year to another, of the connection to sanitation services, especially in the rural environment.

Figure 6.6.1.6 *Evolution of the connection degree to sanitation services during 2006-2011*

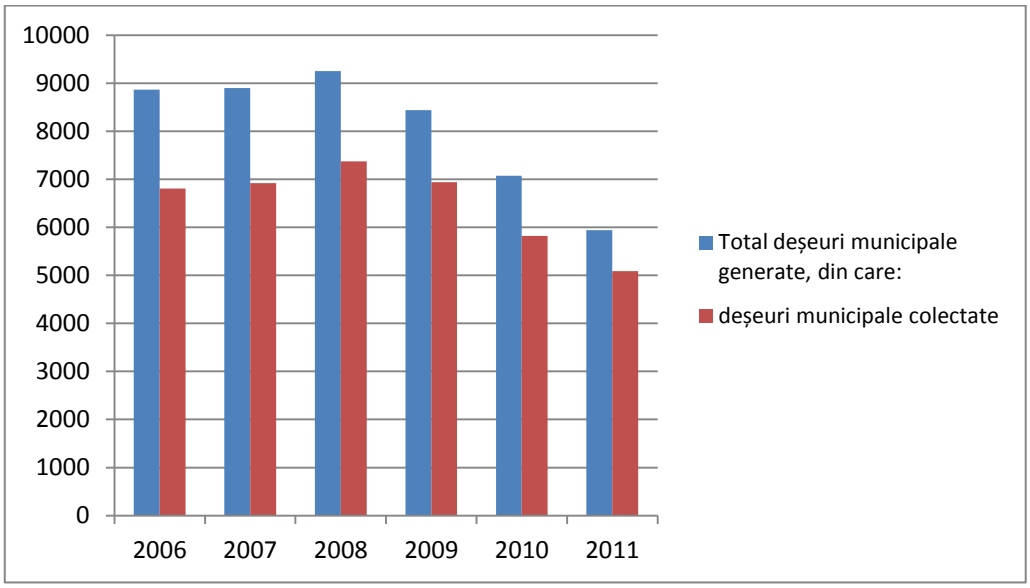


Source: National Environmental Protection Agency

Thus, an amount of 0.858 million tons of domestic waste generated by the population which does not benefit from sanitation services, was estimated, the total amount of municipal waste generated in 2011 being 5.95 million tons.

The following production indicators were used to calculate these amounts of generated waste that remained uncollected: 0,9 kilos/location/day in the urban environment and 0,4 kilos/location/day in the rural environment.

Figure 6.6.1.7 *Evolution of the municipal waste generated and collected during 2006-2011*



Source: National Environmental Protection Agency

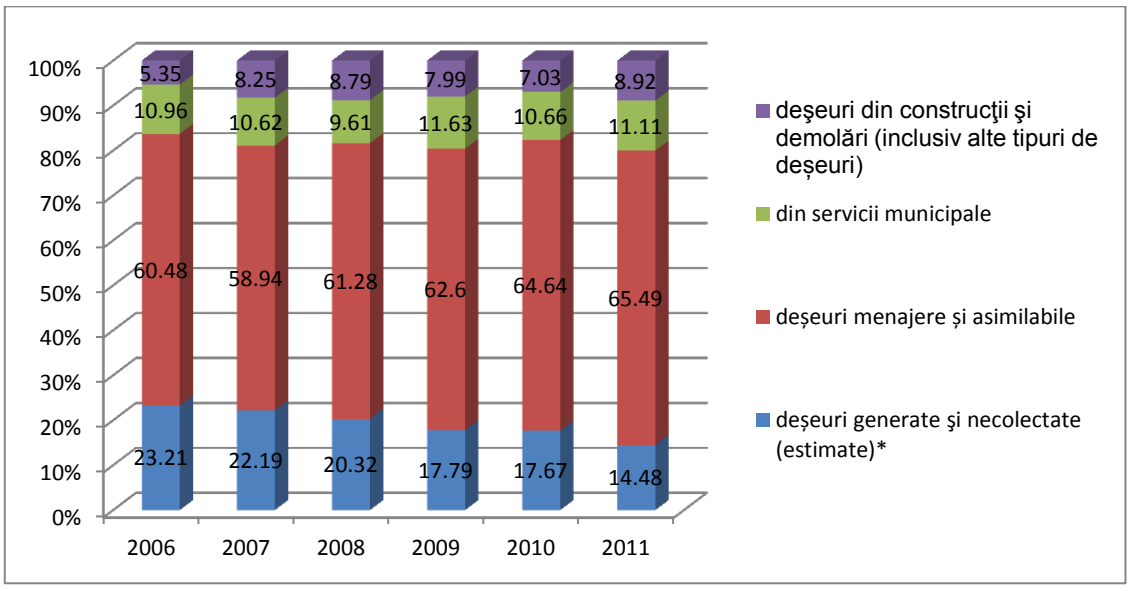
Table 6.6.1.8 *Evolution of the amount of municipal waste generated during 2006-2011 (-thousand tons-)*

	2006	2007	2008	2009	2010	2011
Total deseuri municipale generate, din care:	8866,42	8895,19	9251,00	8440,00	7073,42	5942,73
Total municipal waste generated, out of which:	2057,58	1973,53	1879,83	1501,29	1250,10	857,65
1. waste generated and uncollected (estimated)*	6808,84	6921,66	7371,17	6938,71	5823,31	5085,08
2. municipal waste collected, out of which:	5362,44	5243,18	5669,12	5283,35	4572,06	3893,66
- Domestic and biodegradable waste	972,05	944,76	889,23	981,42	753,75	659,64
- From municipal services	474,35	733,72	812,82	673,94	497,51	531,78

Source: National Environmental Protection Agency

** The amount of waste generated and uncollected (generated by population that is not serviced by sanitation services) adds to the amount of municipal waste collected, as estimated in the table above.*

Figure 6.6.1.9 *Structure of municipal waste generated during 2006-2011*



Source: National Environmental Protection Agency

Tabelle 6.6.1.10. *Evolution of municipal waste production*

Year	***Municipal waste*** *(kg/capita/year)*
2006	410
2007	412
2008	430
2009	393
2010	**330**
2011	**312**
Average value	**381**

Source: National Environmental Protection Agency

- **Municipal waste management**

Municipal waste management requires the collection, transportation, exploitation and disposal of waste, as well as monitoring of waste dumps after closing down.

In Romania, the responsibility for the municipal waste management is of the local public administrations, which, directly or after having licensed the sanitation service towards an authorised economic operator, have to provide collection (including selective collection), transportation, treatment, recycling and final disposal of this waste.

In 2011, about 93% of the municipal waste collected (excluding construction and demolition waste), collected by waste management operators was disposed of in landfills, recycling and recovery rates of these types of waste are still very low. In 2011, from 4553.3 thousand tons of municipal waste collected by waste operators (excluding construction and demolition waste), 198.5 thousand tons were recovered, by material recycling or energy recovery. Energy recovery is mostly done in cement fabrication plants authorized to co-incinerate municipal waste that are improper for material recycling.

Municipal waste disposal is done exclusively by storage. So far, facilities for municipal waste incineration have not been put into service in Romania.

In 2011, municipal waste was disposed both on compliant landfills (31), and non-compliant landfills (106) which cease activity as approved by EU transition periods (provided by GD no. 349/2005 on waste disposal).

Commissioning of new landfills continued in 2012 and 2013, so that at the end of 2013 there were 33 authorized landfills for municipal waste.

Tabel 6.6.1.11 *List with compliant municipal landfills authorized at the end of 2013*

No.	Region	County	Landfill	Landfill operator
1	**I North-East**	**Neamţ**	Piatra Neamţ	ASOCIEREA SC ROSSAL SRL - SC SALUBRITATE SA
2	**I North-East**	**Bacău**	Bacău	Bacău City Hall
3	**I North-East**	**Iaşi**	Tutora	SC SALUBRIS SA Iaşi
4	**II South-East**	**Brăila**	Brăila - loc. Muchea	SC TRACON SRL
5	**II South-East**	**Buzău**	Buzău - Gălbinaşi	SC RER SERVICII ECOLOGICE SRL
6	**II South-East**	**Constanta**	Ovidiu	SC TRACON SRL
7	**II South-East**	**Constanţa**	Costineşti	SC IRIDEX GROUP IMPORT EXPORT BUCURESTI FILIALA COSTINESTI SRL
8	**II South-East**	**Constanţa**	Mangalia - Albeşti	S.C. ECO GOLD INVEST S.A.
9	**II South-East**	**Constanţa**	Incinta Port	SC IRIDEX GROUP IMPORT EXPORT BUCURESTI FILIALA COSTINESTI SRL
10	**II South-East**	**Tulcea**	Vărărie	SC ECOREC SA
11	**III South**	**Ialomiţa**	Slobozia	S.C. VIVANI SALUBRITATEA S.A
12	**III South**	**Prahova**	Ploieşti - Boldeşti	SC VITALIA SERVICII PENTRU MEDIU-TRATAREA DESEURILOR SRL
13	**III South**	**Prahova**	Vălenii de Munte	SC TERMOELECTRICA SA
14	**III South**	**Dâmboviţa**	Aninoasa	SC EUROGAS PRESCOM SRL FIENI
15	**III South**	**Dâmboviţa**	Titu	SC EUROGAS PRESCOM SRL FIENI
16	**III South**	**Teleorman**	Mavrodin	CONSILIUL JUDEŢEAN TELEORMAN
17	**III South**	**Argeş**	Albota	Arges County Council
18	**IV South-West**	**Dolj**	Mofleni-Craiova	SC ECOSUD SRL BUCURESTI
19	**IV South-West**	**Gorj**	Depozit Tg. Jiu	SC POLARIS MEDIU SRL

No.	Region	County	Landfill	Landfill operator
20	**IV South-West**	**Mehedinţi**	Halânga	SC BRATNER Servicii Ecologice SA
21	**IV South-West**	**Vâlcea**	Feţeni	ADMINISTRAŢIA DOMENIULUI PUBLIC/PRIMARIA MUN.RM.VALCEA
22	**V West**	**Arad**	Arad	S.C. ASA ARAD SERVICII ECOLOGICE SRL
23	**V West**	**Timiş**	Ghizela	Consiliul Judeţean Timiş
24	**VI North- West**	**Bihor**	Oradea	S.C. ECOBIHOR S.R.L.
25	**VI North- West**	**Satu Mare**	Doba	Primăria Municipiului Satu Mare
26	**VI North- West**	**Bistriţa-Năsăud**	Tarpiu	S.C. VITALIA S.R.L.
27	**VII Center**	**Braşov**	Braşov	S.C. FIN-ECO S.A. BRASOV
28	**VII Center**	**Mureş**	Sighişoara	S.C. SCHUSTER ECOSAL S.R.L
29	**VII Center**	**Sibiu**	Sibiu-Cristian	S.C. TRACON S.R.L BRAILA
30	**VII Center**	**Harghita**	CeKend- Odorhei	SC AVE HARGHITA SALUBRITATE SRL
31	**VIII Bucharest – Ilfov**	**Bucharest**	Chiajna	SC IRIDEX GROUP IMPORT EXPORT BUCUREŞTI
32	**VIII Bucharest – Ilfov**	**Ilfov**	Glina	SC ECOREC SA
33	**VIII Bucharest – Ilfov**	**Ilfov**	Vidra	SC ECO SUD SRL

Source: National Environmental Protection Agency

Together with the commissioning of new deposits, continued the cessation of work at non-compliant landfills, on the terms provided by GD 349/2005 on waste disposal, so that at the end of 2013 were functional 46 non-compliant municipal waste landfills, which gradually cease activity until 16 July 2017.

In parallel, were built transfer and sorting stations. At the end of 2013 there were operating 119 sorting / sorting and transfer plants and another 6 plants were pending authorization.

- **State of the projects of integrated municipal waste systems**

At the end of 2013 were being implemented 29 projects approved by the European Commission and the AM SOP Environment, namely:

- Vrancea, Giurgiu, Bistriţa-Năsăud (approved in 2009);
- Arad, Sibiu, Mureş, Covasna, Sălaj, Botoşani (approved in 2010);
- Neamţ, Suceava, Cluj, Bacău, Vaslui, Călăraşi, Olt, Argeş, Timiş (approved in 2011);
- Caraş-Severin, Alba (approved in 2012);
- Prahova, Iaşi, Mehedinţi, Harghita, Brăila, Vâlcea, Constanţa, Maramureş, Tulcea (approved in 2013),

- **Biodegradable waste**

Of the total amount of municipal waste, most part is represented by domestic and biodegradable waste (around 72%), and approximately 45% of it is represented by biodegradable waste. These come both from households and from economic agents, commercial areas, offices, public institutions, hospitals, as well as from public areas (parks, public gardens, markets, streets).

In documents submitted during negotiations of Chapter 22 - Environment, respectively the Plan of Implementing Directive 1999/31/EC on the landfill of waste, reducing the amount of biodegradable waste disposed, and in response to European Commission's letter no. JDdC / amp Ares.env.C.2 (2010) 711 845 of 21st of October 2010, Romania has stated the following:

- The first two goals of the art. 5 paragraph (2) letters a and b of the Directive, relating to reducing the amount of biodegradable municipal waste disposed, cannot be achieved within the deadlines set by the Directive (16th of July 2006, reduce by **25%** of the total quantity of biodegradable municipal waste, expressed as gravimetric produced in 1995 or the latest year before 1995 for which standardized EUROSTAT data are available and 16th of July 2009, reduce by **50%**);
- Given that, in 1995, the total amount of municipal waste was disposed of in landfills, in accordance with paragraph 3 of art 5 paragraph (2) of the Directive, Romania has opted for four-year derogation relating to the objectives set out in art. 5 paragraph (2) letters a) and b) of Directive 1999/31/EC, respectively until 16th of July 2010, and until 16th of July 2013.

Table 6.6.1.12 presents the data on amounts of municipal waste generated (including amounts of estimated waste generated but uncollected) and amounts of waste collected by means of special services of town halls or sanitation companies in 2011, compared to 20010. The table also shows the data on biodegradable waste generated.

Table 6.6.1.12 *Amounts of waste generated and collected (including biodegradable waste)*

Types of waste	**Amount of waste -** *mil.tons/year* **-**		
	2009	**2010**	**2011**
Total municipal waste generated, out of which:	9,15	7,56	5,95
❖ Biodegradable waste	3,60	3,36	3.00
❖ Municipal waste collected	7,25	6,32	5,08

Source: National Environmental Protection Agency

Analysing data from the table above, we observe a decrease of the amount of biodegradable waste, of about 37%, expressed gravimetrically compared to the amount of municipal biodegradable waste produced in 1995, thus the established objective being observed.

This decrease is due, firstly, on one hand, to the application of provisions of art. 9, let. p) of the Government Emergency Ordinance no. 196/2005 on the Environmental Fund, with subsequent amendments and supplements, according to which, starting July 1, 2010, administrative and territorial units responsible for municipal waste management, must reduce by 15% the amount of municipal and biodegradable waste collected and disposed. In case of non-fulfilment of this annual goal, administrative and territorial units will pay a contribution of 100 RON/ton, to the Environmental Fund, for the difference between the amount corresponding to the annual goal and the amount achieved by specific activities of selective collection and recovery.

On the other hand, the continuation to reduce the amount of biodegradable waste generated is due to selective collection of paper, cardboard and especially packaging waste as well as biodegradable waste from green areas, parka and other areas. Local authorities responsible for municipal waste management, focused particularly on the separate collection of biodegradable waste that can be collected easily and inexpensively treated, especially in rural areas. In this regard information and awareness actions were carried out for of individual rural households composting of vegetable waste, building platforms in rural area for composting of manure and vegetable waste.

Continued the construction of platforms for composting vegetable waste from parks and green spaces in urban areas and the construction of recyclable waste sorting stations and biodegradable waste composting stations, close to the landfills.

Thus, in 2013, nationwide, there were 70 licensed facilities and platforms for composting biodegradable municipal waste and about 50 plants and composting platforms were in various stages of implementation and regulation in terms of environmental protection. These plants are built by Phare CES 2004 Programme and integrated waste management projects at county level (financed by ISPA or SOP Environment). Funding applications for projects of integrated waste management, under development in this period, provide for each county optimal method for managing biodegradable municipal waste (individual composting, centralized composting, mechanical-biological treatment) and treatment capabilities necessary to meet the targets set out in Directive 1999/31/EC.

6.6.2 INDUSTRIAL WASTE

In 2011[1], the amount of waste generated by mining, energy and manufacturing industries was about 213 million tons, most of which (90%) resulted from extraction (mining) activities.

Non-hazardous waste generated by the main economic activity between 2006 - 2011, with the exception of the mining industry, are shown in Table 6.6.2.1.

Table 6.6.2.1. *Non-hazardous waste generated by main economic activity (with the exception of the mining industry) between 2006 – 2011* *- thousand tons –*

Economic activity	2006	2007	2008	2009	2010	2011
Processing industry	8.964,15	18.860,39	10.678,66	7.780,74	7.010,46	7.215,96
Production, transportation and distribution of thermal energy, electricity, gas and water	102.551,84	36.465,59	7.055,92	6.103,45	5.886,2	6547,9
Catchment, treatment and distribution of water	220,82	10,96	20,58	12,85	17,62	28,11
Other	483,92	1.494,34	506,52	739,25	514,9	912,97
TOTAL	**112.220,73**	**56.831,28**	**18.261,68**	**14.636,29**	**13.429,18**	**14704,94**

Source: National Environmental Protection Agency

The 419,300 tons of hazardous waste generated in 2011 represented about 0,2% of the total amount of waste generated (including waste from mining).

Quantities of hazardous waste generated by the main industrial activities between 2006 - 2011 are presented in the following table.

Table 6.6.2.1. *Hazardous waste generated by main economic activity between 2006 – 2011*

- thousand tons -

Economic activity	2006	2007	2008	2009	2010	2011
Mining	497,59	11,24	31,11	87,79	146,27	110,39
Crude Oil Processing Industry, Coal Coking	226,35	37,89	114,53	125,91	157,51	145,16
Chemicals and Chemical Products Manufacturing	47,11	53,33	54,02	24,55	22,01	8,9
Metallurgy Industry	168,76	121,62	150,78	99,64	71,53	64,01
Machinery and Equipment Industry	33,05	26,67	28,58	25,36	24,63	18,62
Transport Industry	26,19	31,06	13,33	12,11	9,59	16,74
Other	53,76	137,28	42,59	63,22	82,77	55,48
TOTAL	**1.052,81**	**419,08**	**434,94**	**438,58**	**514,32**	**419,30**

Source: National Environmental Protection Agency

The responsibility to manage the industrial waste lies with the operators that generate such waste. They ensured waste management according to regulatory documents in their possession, through recovery (recycling and co-incineration) or removal (storage and incineration).

6.6.3 WASTE GENERATED FROM MEDICAL ACTIVITIES [1]

Every year, the Ministry of Health, through the National Institute of Public Health Bucharest, issues a National overview called "Monitoring and inspection of the management system for waste generated from medical activities" and updates the national database on waste generated from medical activities. This is part of the National program II for monitoring determining factors in life and work environments, respectively area - Protecting health and preventing diseases associated with environmental risk factors, activity - Monitoring and inspection of the waste management system of medical activity in accordance with the M.H. Order no. 422/2013 Technical Norms for achieving national health programs for 2013 and 2014

The database is achieved through a system of quarterly reporting data collected by health facilities with beds, under the coordination of local public health departments, based on the methodology of data collection. Its main objectives are: regular assessment of the waste management procedures used in medical facilities fitted with beds, qualitative and quantitative assessment of waste produced in said facilities, identification of risks that may result from this type of waste, minimize the amount of medical waste generated by the health care units, and proposal of measures aiming to improve the management of waste generated by said facilities

[1] *Information in this section are provided by the Ministry of Health.*

At the end of 2012 was approved, issued and published in the Official Gazette, the MH Order no. 1226/2012 approving the Technical regulations on the management of medical waste and methodology of data collection for a national database of medical waste.

The year 2013 is basically the first year of implementation of the new legislation on medical waste management, namely technical standards and methodology for data collection at healthcare units level in the country. Collecting and reporting data to the national database of waste generated from medical activity was based on the Methodology of data collection, represented by the Annex 2 to the Minister of Health Order no. 1226/2012. Data collection methodology is applied monthly at the level of public and private healthcare units with beds and also monthly is done the reporting to the county public health departments. National Institute of Public Health through CNMRMC developed electronic reporting and data processing models on waste management generated by medical activity for healthcare facilities, public health departments and regional public health centres. The Regional County Public Health Departments, following the centralization of data, every three months report to the regional public health centres. Regional Public Health Departments process data reported by the county public health departments and submit the situation to the National Centre for Monitoring the situation of the Community Environmental Risks (CNMRMC) within the National Institute of Public Health (INSP). Annually, CNMRMC processes data at national level, develops the synthesis report and submits it to the Ministry of Health.

For 2013 data were reported to the National Institute of Public Health by 42 county public health departments and Bucharest Municipality. Data submitted are types and quantities of waste arising from medical activity (according to GD no. 856/2002 - Class 18 01), as well as the evaluation of the management way of this category of waste in the public and private healthcare units with beds. For 2013 reported data on average 553 public and private healthcare units with beds (including health units belonging to ministries with own health care network). From Bucharest, on average, have reported 45 public and private healthcare units with beds. These data were reported in accordance with the methodology of data collection for the national database, approved by M.H. Order No. 1226/2012. We specify that the data have been reported by healthcare units with day beds or dialysis centres, oncology centres, medical and social assistance units.

All public and private reporting healthcare units carry out the separation and collection of generated waste by category. Medical units collect waste from medical activities in suitable containers in a proportion of 100%. 88% of healthcare units investigated use a yellow bag for collecting medical waste. 84% of medical units use cardboard box with yellow bag inside to collect infectious waste, anatomio-pathological waste and anatomical parts. Rigid plastic containers resistant to mechanical actions, with temporary and definitive closure are used by health units in a proportion of 98% for stinging-cutting waste collection. 87% of units use black or transparent plastic bags for collecting non-hazardous waste, which are not subject to special measures concerning the prevention of infections. Other packages are used for the other categories of medical waste or hazardous chemical waste, expired drugs, hazardous chemical waste. For amalgam waste from dental care are used special containers provided by the company that collects them. 17% of the units investigated use other types of containers.

Medical hazardous waste transport is performed on a separate circuit from that of the patients and visitors, in proportion of 64%, and in some cases this is conditioned by a certain time frame. The rest of the health care units did not specify this. 84% of public and private health units reported that they possess and use mobile containers in the temporary storage space of waste, and 30% use trolleys for the transport of waste.

Medical units mentioned that hold temporary storage spaces for the generated waste.

Following the analysis of data on the treatment and final disposal of hazardous waste from medical activity, revealed the following:

- 58% of health units investigated contract specialized companies to eliminate hazardous generated waste by incineration;
- 14% of health units treat hazardous medical waste by low temperature thermal decontamination (signed contract with specialized companies and / or their equipment in health units), and incinerate hazardous waste, under contract in incinerators in the area;
- 11% of health units treat hazardous medical waste only by low temperature thermal decontamination (including mechanical processing of such waste).
- 17% of health units have not completed the questionnaire.

Elimination of non-hazardous waste similar to household waste is carried out under contract with specialized sanitation companies, waste being transported to municipal landfills.

6.6.4 WASTE STREAM

- **Packaging Waste**

Data on packaging and packaging waste managed in 2011[2] was reported according to the *Ministry of Environment and Water Management Order no. 927/2005 on the procedure for reporting data on packaging and packaging waste.*

Data analysis and their interpretation was carried out by N.E.P.A. Further on, the results obtained are presented below.

Total amount of packaging entering the market in 2011 was 992510 tons.

Table 6.6.4.1. *Structure of packaging introduced on the market in 2011*

Material	Total amount of packaging entering the market in 2010 (t)	%
Glass	139730	14,08
Plastic	278810	28,09
Paper and Cardboard	293100	29,53
Metal - Aluminium	20050	2,02
Metal - Steel	35180	3,55
Metal - Total	55230	5,57
Wood	225540	22,72
Other	100	0,01
TOTAL	**992510**	**100**

Source: National Environmental Protection Agency

In 2011, 539860 tons of packaging waste was recovered, of which 496,040 tons were recycled.

Of the total amount of packaging placed on the market in 2011, the overall recovery percentage was 54.39% and the recycling percentage was 49.98%.

Table 6.6.4.2. *Structure of packaging waste recovered and recycled by type of material – 2011*

Material	Amount of recycled waste (t)	%	Amount of recovered waste (t)	%
Glass	83790	59,97	83790	59,97
Plastic	112460	40,34	120370	43,17
Paper and Cardboard	191990	65,5	199340	68,01
Metal - Aluminium	7310	36,46	7310	36,46
Metal - Steel	27100	77,03	27100	77,03
Metal - Total	34410	62,30	34410	62,3
Wood	73390	32,54	101950	45,2
Other	0	0	0	0
TOTAL GENERAL	**496040**	**49,98**	**539860**	**54,39**

Source: National Environmental Protection Agency

- **Out of Use Vehicles (OUV)**

Economic operators involved in the implementation of Directive *2000/53/EC* transposed into national law by *Government Decision no. 2406/2004 regarding management of end of life vehicles,* with changes and additions are: manufacturers, dealers, collectors, insurance companies and operators having as object the activity of treatment, recovery, recycling of end of life vehicles, including parts and materials.

[2] *Data for 2012 are under validation and processing. Reporting for the reference year 2012 was done according to MO 794 of 6 February 2012 on the procedure for reporting data on packaging and packaging waste which repealed MO 927/2005.*

Since January 1, 2007, economic operators must ensure the following objectives, taking into account the average empty weight:

- reuse and recovery of at least 75% of the average per vehicle and year, of vehicles manufactured before January 1, 1980;
- reuse and recovery of at least 85% of the average per vehicle and year, of vehicles manufactured before January 1, 1980;
- reuse and recovery of at least 70% of the average per vehicle and year, of vehicles manufactured before January 1, 1980;
- reuse and recovery of at least 80% of the average per vehicle and year, of vehicles manufactured before January 1, 1980;

Since January 1, 2015, operators must ensure the following objectives, taking into account the average empty weight:

- reuse and recovery of at least 95% of the average per vehicle and year for all of life vehicles;
- reuse and recovery of at least 85% of the average per vehicle and year for all of life vehicles;

In order to monitor the objectives set out above, operators carrying out operations of collection and treatment of VOU, are required to submit forms to local government environmental protection agencies for National Environmental Protection filled in for the previous year, until 15th of March of the current year

NEPA requests from economical operators, through EPAs, the following data on an anual basis:

- number of destruction certificate issued for each out of use vehicle collected;
- number of vehicles collected depending on categories M1 and N1;
- mass of vehicle registration documents for each out of use vehicle and chassis series;
- manufacturing year for each out of use vehicle;
- reception for each out of use vehicle;
- quantities of materials resulting from the cleaning and dismantling of VOUs, materials from shredding obsolete vehicles in Romania, the total mass of obsolete vehicles and exported, by country, and the total weight of parts scrapped vehicles in Romania and exported for treatment
- quantities are reported only for treated OUV;
- the amounts reported by each operator, from: operating records, notes, scales and accounting documents.

Operators must have operating records containing:

- copies of certificates of destruction;
- inventories and locations, by types and quantities of all substances, materials and components resulting from operations of pre-treatment and treatment of out of use vehicles;
- records of all waste recycled or disposed of, and information on the components reused;
- information on waste streams from other areas of activity of the unit, which will be removed along with waste streams resulting from the management of out of use vehicles;
- operating problems, causes and measures taken to address them.

The total number of out of use vehicles collected and for which destruction certificates were issued in 2011[3], was of 124,299 units. In 2011, 128,839 units were treated. These data come from authorized operators for collecting and treatment of OUVs. The difference between the number of scrapped vehicles collected and the number of vehicles scrapped treated is due to the fact that not all out of use vehicles collected in previous years were treated, some were left on stock either at collectors or economic operators authorized for treatment. The average empty weight for OUV's treated was 110,035 tons, of which 5,196 tons were reused, 85,995 tons were recycled and 4,290 tons were energy recovered.

The objectives achieved in the year 2011, for the OUVs entered into the treatment process were:

- reuse and recovery: 86.80%;
- reuse and recycling: 82,90%.

At the end of 2012, 445 authorized economic operators for collecting OUVs, were performing their activity, with a total of 528 working stations.

The vehicle manufacturers and importers, 31 in number, created OUV's collection networks, evenly spread in the territory.

List of operators authorized to collect and/or treat OUV's is regularly updated and published on the website of NEPA.

[3] *Data for 2012 are under validation and processing.*

- **Sludge from city wastewater treatment**

Council Directive no. 86/278/EEC on the protection of the environment and particularly the soil when sewage sludge is used in agriculture, is implemented *by Common Order 344/708/2004* of the Environment and Water Administration and of the Minister of Agriculture, Forests and Rural Development regarding the approving of the technical norms for environmental protection, in particular of the soil, when sewage sludge is used in agriculture. Waste management legislation aims at reducing the quantities of biodegradable waste disposed of in landfills. Thus there will be be removed stabilized sewage sludge on landfills. These sludge from wastewater can be used in agriculture, if they don't not threaten soil quality and agricultural products resulted.

Information on the quantities of sludge for 2011[4]:

- there is a number of 202 municipal wastewater treatment plants and 80 industrial wastewater treatment plants;
- the amount of sludge generated by municipal wastewater treatment plants in 2011, is 123,460 tons s.u.;
- In 2011, one permit was issued for sludge application in agriculture

Since urban areas have sewer systems unit, industrial wastewater being discharged after pre-treatment in municipal treatment plants, sludge is unsuitable for composting and reuse for land fertilization.

According to the regulations on sewage sludge, wastewater treatment plants holders are required to update the sewage plants, to improve the quality of sludge, provide treatment for stabilization and find its use in agriculture and other areas. If the sludge composition prevents its spread on land, disposal by incineration or co-incineration will be ensured.

- **Construction and Demolition waste (C&D)**

Construction and demolition waste is waste resulting from activities such as construction of buildings and civil infrastructure, demolition of buildings and civil infrastructure, upgrading and maintenance of roads, etc.

There is no strict record son them, because, on one hand, there is no legislation specific to this waste flow, and on the other hand, in many circumstances, the owners of such waste are hard to be identified by the environment protection authorities (since they are economic operators whose field of work does not require obtaining an environment permit).

Sanitation operators report annually, from the total of municipal waste collected, the C&D waste amounts collected from the population. The respective data from the 2006-2011[5] period is presented in the table below.

Table 6.6.4.3. *Evolution of the quantities of waste generated and capitalized R & D in 2006-2011*

- thousand tons –

	2006	2007	2008	2009	2010	2011
Total construction and demolition waste collected, of which:	474,35	733,72	812,82	673,94	497,51	531,78
- capitalized	0	6,82	23,15	84,15	145,9	253,55

C&D in recent years began to show interest for construction, so operators have purchased equipment for processing and recovery of such waste. Currently authorized at the national level for reuse of C&D are the following operators, table 6.6.4.4.:

Table 6.6.4.4. *List of economical operators authorized for capitalization of C&D*

County	Localization	Holder/Operator
Bacău	Bacău	CJ Bacău
	Bacău	SC Eco Sort Recycling SRL
	Bacău	SC Miralex SRL
Neamț	Piatra Neamț	CL Piatra Neamț
Cluj	Dej	CL Dej
Sibiu	Mediaș	SC Ecosal
Argeș	Pitești	SC Salubritate 2000SA
	Pitești	SC GROUP CONSTRUCT SRL
	Oarja	SC GOLD MEDALION SRL

[4] *Data for 2012 are under validation and processing.*
[5] *Data for 2012 are under validation and processing.*

County	Localization	Holder/Operator
Prahova	Blejoi	SC Star&TD SRL
Botoşani	Botoşani	SC Europa Group SRL
Iaşi	Iaşi	SC Generali Zmontagi
Dâmboviţa	Găeşti	SC IGO SA
	Fieni	SC Eurogas Prescom Fieni
Braşov	Braşov	SC Fin-Eco Braşov
Constanta	Ovidiu	SC OVI PREST CON SRL – inert waste storage
Vrancea	Panciu	CL Panciu
Ilfov	Popeşti-Leordeni	SC Ecorecycling SRL
	Chitila	SC Ecorecycling SRL
Hunedoara	Hunedoara	Authorized mobile facilities
Mureş	Tg. Mureş	Authorized mobile facilities

A large part of the amount of construction and demolition waste generated by businesses, was used to fill holes or taught businesses in the construction industry for recovery.

- **Used oils**

According to *G.D no. 235/2007 on the management of used oil*, oil producers and importers are obliged to ensure the holding of used oil management system, the quantities and types of oils on the market. This obligation can be done individually or through third parties indicated by the central government for environmental protection by those responsible.

In order to establish a coherent system of management of used oils, those responsible may enter into voluntary agreements with central and/or local government authorities.

In 2011[6], reporting on national used oil management involved a total of 3823 economic operators, of which according to type of activity we have:

- 187 operators to introduce new oil on the market;
- 1716 operators of used oil generators;
- 1139 authorized service stations to exchange supplies (oil change and oil filter) generators of used oils;
- 96 operators authorized to collect used oils;
- 612 stations distribution of petroleum oils collected from individuals;
- 7 operators of recovery by incineration of used oils in cement kilns equipped with waste incineration;
- 21 operators oils used by other recovery operations,
- 38 operators of recovery of used oil combustion in heating systems approved in accordance with Annex 1 to Government no. 128/2002 on waste incineration with subsequent amendments, and Order nr.462/1993;
- 7 operators authorized to remove used oil by incineration.

The total quantity of new oils introduced on the market during 2011 at a national level, was of aproximately 60,733.75 tons.

The total quantity of used oil that was collected, capitalized and eliminated, during 2011, was of aproximately 20,587.9364 tons.

The capitalization/elimination methods were the following:

- reuse: 245.9172 tons;
- capitalization through co-incineration: 421.458 tons;
- capitalization through methods other than co-incineration or regeneration (i.e. obtaining a CLU fuel): 16480.778 tons;
- capitalization through burning in heating plants: 281.037 tons;
- elimination through incineration: 119.515 tons;
- in stock at the end of year 2011: 3039.2314 tons.

[6] *Data for 2012 are under validation and processing.*

- **Electrical And Electronic Equipment Waste (EEEW)**

The main objectives of *Directive no. 1037/2010 on waste electrical and electronic equipment (EEEW)* are as follows:

- the prevention of electrical and electronic equipment waste, and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste;
- improving the environmental performance of all operators involved in the life cycle of electrical and electronic equipment (EEE), (producers, distributors and consumers) and in particular those operators directly involved in the treatment of waste electrical and electronic equipment.

Government Decision no. 1037/2010 on EEEW shall apply to electrical and electronic equipment falling under the categories set out in *Table 6.6.4.1.*, provided they are not part of another type of equipment that does not fall within the scope of this Directive.

Table 6..6.4.5. *Electrical and Electronic Equipment Categories (EEE)*

Category 1	Large Household Appliances
Category 2	Small Household Appliances
Category 3	IT and Telecommunications Equipment
Category 4	Consumer Equipment
Category 5	Lighting Equipment
Category 6	Electrical and Electronic Tools
Category 7	Toys, Leisure and Sports Equipment
Category 8	Medical Devices (with the exception of all implanted and infected products)
Category 9	Monitoring and Control Instruments
Category 10	Automatic Dispensers

Only registered producers in the Register of EEE Producers and Importers, established at NEPA, are allowed to distribute electrical and electronic equipment.

In early 2006, the procedure of registration of EEE producers into the Register of EEE Producers and Importers kicked off, in accordance with the requirements of the legislation in force. By the end of 2013, 1.980 producers of electrical and electronic equipment (EEE) were authorized.

In 2011[7], an amount of about 128,008 tons of EEE was placed on the market. (estimates)

Their distribution by category for 2006-2011 is presented in the table below.

Table. 6.6.4.6. *Distribution by categories of EEE marketed*

Category	**EEE Quantity(tons)**					
	2006	**2007**	**2008**	**2009**	**2010**	**2011 (estimates)**
1 - Large Household Appliances	72016.48	99876.09	161964.55	68265.88	74328.96	69314.97
2 - Small Household Appliances	3872.43	8605.78	18080.61	8812.54	17484.70	14420.78
3 - IT and Telecommunications Equipment	25198.93	31746.24	19715.01	11139.41	31944.22	14039.23
4 - Consumer Equipment	20661.89	38133.71	22659.92	11605.67	12908.06	13346.75
5 - Lighting Equipment	6233.31	2203.04	3926.90	3609.1575	4594.26	5747.06
6 - Electrical and Electronic Tools	10535.48	5085.37	9918.45	6517.07	7669.82	6726.74
7 - Toys, Leisure and Sports Equipment	353.46	1159.75	466.23	627.54	953.61	744.09
8 - Medical Devices (with the exception of	58.09	94.55	5605.49	6952.94	275.92	470.48

[7] *Data for 2012 are under validation and processing.*

Category	EEE Quantity(tons)					
	2006	2007	2008	2009	2010	2011 (estimates)
all implanted and infected products)						
9 - Monitoring and Control Instruments	1711.26	546.33	934.14	6040.86	769.82	2980.65
10 - Automatic Dispensers	207.92	502.08	457.48	249.48	387.30	217.60
TOTAL	**140849.24**	**187952.95**	**243728.78**	**123820.54**	**151316.67**	**128008.36**

Source: National Environmental Protection Agency

EEEW Management

In order to achieve the annual objectives of EEEW collection, reuse, recycling and recovery, producers can act:

- individually, by using their own resources;
- by transferring these responsabilities, under contract, to an authorized economic operator to do so;

The following associations have obtained permits to take over responsibility on achieving the annual objectives of EEEW collection, reuse, recycling and recovery:

- ECO TIC Association
- Romanian Recycling Association RoRec
- RECOLAMP Association
- ENVIRON Association
- CCR LOGISTICS SYSTEMS RO S.R.L.
- ECOPOINT Association
- ECOMOLD Association
- ECO LIGHTING COLLECT Association

Permits and contact details of these Associations are available on the NEPA website: ***http://www.anpm.ro/articole/deşeuri_de_echipamente_electrice_si_electronice-28.***

Collected WEEE

Since 2008, the EEEW collection target is at least 4 kg waste / capita / year. Despite efforts by authorities and responsible economic operators, the aforementioned annual collection target hasn't been achieved.

Between 2006 – 2011[8], an amount of 112486 tons of EEE was collected. Its distribution by years and category is presented in the table below.

Table.6.6.4.7. *Distribution by categories of EEEW collected*

Category	EEE Quantity (tons)					
	2006	2007	2008	2009	2010	2011 (estimates)
1 - Large Household Appliances	517.68	1625.54	8923.68	21385.59	14119.93	9987.33
2 - Small Household Appliances	51.85	107.19	735.82	1489.54	913.64	673.18
3 - IT and Telecommunications Equipment	274.24	1164.32	6252.69	9103.73	6459.84	5446.30
4 - Consumer Equipment	47.04	599.57	5175.38	5061.14	3567.23	3199.49
5 - Lighting Equipment	7.88	8.30	206.20	177.41	182.660	228.84
6 - Electrical and Electronic Tools	166.27	113.19	321.83	674.57	625.81	743.07
7 - Toys, Leisure and Sports Equipment	1.30	2.68	32.80	111.78	62.73	94.56
8 - Medical Devices (with the	0.01	22.22	16.49	41.78	19.86	20.52

[8] *Data for 2012 are under validation and processing.*

exception of all implanted and infected products)						
9 – Supervision and control instrumenst	65.31	39.58	39.66	594.99	215.41	464.16
10 – Automatic Dispensers	0.00	2.20	13.85	118.97	79.50	87.69
TOTAL	**1131.58**	**3684.78**	**21718.40**	**38759.50**	**26246.61**	**20945.16**

Source: National Environmental Protection Agency

EEEW Treatment

Collected EEEW are treated both in Romania and in other EU member states. The difference between collected and treated EEEW during a year is kept in stock at waste collecting/treating operators as follows:

- In 2007, out of EEEW collected 19.7% were treated;
- In 2008, out of EEEW collected 36,43% were treated;
- In 2009, out of EEEW collected 94,39% were treated;
- In 2010, all EEEW collected were treated, as well as part of EEEW in stock at the beginning of the year.
- In 2011, all EEEW collected were treated, as well as part of EEEW in stock at the beginning of the year (estimates).

➢ Battery and Accumulator Waste (B&A)

The main objectives of *Directive no. 1132/2008 on batteries and accumulators and waste batteries and accumulators are:*

- establish requirements regarding the placing on the market of batteries and accumulators, and specific rules for the collection, treatment, recycling and disposal of waste batteries and accumulators to supplement the harmonised national legislation on waste and to promote a high level of collection and recycling of waste batteries and accumulators as well as regulations prohibiting the placing on the market of batteries and accumulators containing hazardous substances
- improve the environmental performance of batteries and accumulators and the activities of all economic operators involved in the life cycle of batteries and accumulators, e.g. producers, distributors and end-users and, in particular, those operators directly involved in the treatment and recycling of waste batteries and accumulators.

Government Decision no. 1.132/2008 on batteries and accumulators and waste batteries and accumulators shall apply to all types of batteries and accumulators, *(Tablel 6.6.4.7.)*, regardless of their shape, volume, weight, material composition or use; it shall apply without prejudice to the harmonised national legislation defined by Directive *2000/53/EC of the European Parliament and of the Council of September 18, 2000 on out of use vehicles and Directive 2002/96/EC of the European Parliament and of the Council of January 27, 2003 on electrical and electronic equipment waste (EEEW).*

Table 6.6.4.8. *Types of Batteries and Accumulators*

Portable batteries (categories 1 and 2)	1a Alkalines
	1b Lithium
	1c Carbon Zinc
	1d Zinc-Air
	1e Mercuric Oxide (HgO)
	1f Silver Oxide (Ag_2O)
	1g Battery Pack
	1h Other
Portable batteries (categories 1 and 2)	2a Nickel-Cadmium (NiCd)
	2b Lead
	2c Nickel-Metal Hydride (NiMH)
	2d Lithium-Ion
	2e Lithium Polymer
	2f Other
Car batteries (category 3)	3a Lead-Acid
	3b Nickel-Cadmium (NiCd)
Industrial Batteries (category 4)	4a Lead-Acid
	4b Nickel-Cadmium (NiCd)
	4c Other

Only registered producers in the Register of Battery and Accumulator Producers and Importers, established at NEPA, are allowed to distribute batteries and accumulators.

Starting with 2009, registration of producers of batteries and accumulators into the Directive kicked off, in accordance with the requirements of the legislation in force. By the end of 2013, 587 producers of batteries and accumulators were authorized.

The quantities of batteries and accumulators entering the market between 2009 – 2012[9] *and their distribution by type is presented in the table below.*

Table 6.6.4.9 *Category structure for B&A, entering the market in 2009-2012*

Type of B&A	**Quantity** (tons)			
	2009	**2010**	**2011**	**2012**
1a	937,47	868,96	970,61	1456,31
1b	35,53	11,51	15,92	171,79
1c	822,55	1364,55	1384,03	463,94
1d	1,47	1,81	15,05	0,32
1e	0,00	1,82	0,00	0,01
1f	0,56	1,12	2,14	0,04
1g	18,19	4,33	4,31	5,62
1h	0,69	3,66	6,24	4,09
2a	49,90	133,05	56,89	22,37
2b	64,58	119,67	19,75	24,63
2c	93,51	48,19	62,62	400,11
2d	51,64	693,25	153,18	168,57
2e	2,89	192,11	3,48	9,18
2f	0,12	3,33	2,19	12,58
3a	21584,75	29839,22	27717,44	5703,20
3b	0,02	3,57	0,00	0,00
3c	6,51	5,06	0,21	0,00
4a	679,41	2549,62	3900,84	2036,40
4b	13,37	27,68	16,25	13,97
4c	0,57	35,02	60.12	72,68

Source: National Environmental Protection Agency

Waste Battery and Accumulator Management

In order to achieve the annual objectives of collection, reuse, recycling and recovery of waste batteries and accumulators, producers can act:

- individually, by using their own resources;
- by transferring these responsabilities, under contract, to an authorized economic operator to do so;

The following associations have obtained permits to take over responsibility on achieving the annual objectives:

- RECOBAT PLUS Association
- ECOTIC BAT S.R.L.
- THE NATIONAL BATTERY RECYCLING SYSTEM Asociația
- CCR REBAT RO S.R.L

Permits and contact details of licensed economic operators are available on the NEPA website: http://www.anpm.ro/articole/deșeuri_de_baterii_si_acumulatori-29.

[9] *Data for 2012 are under validation and processing.*

B&A collected

According to art. 7 (1) H.G. No. 1.132/2008, since 2012, producers of portable batteries and accumulators must achieve a minimum collection rate of 25%.

In 2012[10], a collection rate of the B & A portable of 11% (46% for type of portable acid lead B&A, 6% for nickel-cadmium type and 10% for other types of portable B&A), was achieved.

In the period 2009 – 2012, an amount of 249,862.85 tons of B & A was collected. Distribution on years and categories is indicated in the table below:

Table 6.6.4.10. *Quantities of B&A collected*

Types of batteries and accumulators waste*	Quantity collected **2009**(tons)	Quantity collected **2010**(tons)	Quantity collected **2011**(tons)	Quantity collected **2012**(tons)
Portable 1 and 2	12,45	34,84	159,20	312,08
auto 3	37134,43	73200,85	77505,21	58860,35
industrial 4	62,14	1898,04	188,92	494,35

Source: National Environmental Protection Agency

B&A waste treatment

In accordance with legal provisions, the treatment of B & A collected waste must be carried out by applying the best available techniques.

Since 2012, operators performing tasks of recycling the batteries and accumulators of any kind shall ensure that recycling processes achieve the following minimum recycling efficiencies:

- recycling of 65 % of the average weight of lead-acid batteries and accumulators, including recycling of the lead content to the highest degree that is technically feasible while avoiding excessive costs;
- recycling of 75 % of the average weight of nickel-cadmium batteries and accumulators, including recycling of the cadmium content to the highest degree that is technically feasible while avoiding excessive costs, and
- recycling of 50 % of the average weight of other batteries and accumulators waste
- Operators in Romania who treated B&A lead waste achieved in 2012, a level of recycling efficiencies of about 81 %

6.6.5. SELECTIVE COLLECTION AND RECYCLING

Selective waste collection is one of the conditions necessary to achieve an adequate level of recycling and recovery.

The implementation of selective collection was forecasted to be approached in three stages, as follows:

- 2004-2006: experimental (pilot projects), awareness of the population;
- 2007-2017: extending the selective collection at a national level;
- 2017-2022: implementing the selective collection in more difficult areas (collective homes, dispersed rural environment, mountain areas).

During the period 2004 – 2006, in Romania, the separated municipal waste collection for exploiting the recyclable materials originated from the household waste (paper, cardboard, glass, metal, plastic materials) was practiced only locally, to a small extent, being initiated by the sanitation companies and by the town halls, in collaboration with the economical operators which place packages and packaged products onto the market.

Since 2007, separate collection began to expand at settlements level. Thus, in 2007, separate collection was implemented in 183 villages, reaching in 2010 to 698 localities. It is expected that the selective waste collection will grow much faster, once the implementation of integrated waste management is done and also considering the new laws concerning the collection and use of municipal waste.

[10] *Data for 2013 are under validation and processing.*

6.7. PLANNING (response)

Waste management planning is an important tool for the implementation of policies and regulations related to waste. Planning may reveal incentives to divert waste from storage to recycling and exploitation of waste resources content. The most important elements in waste management planning are:

- involvement of stakeholders and, in general, the general public in the waste management planning;
- setting specific targets sectors, specific flows of waste and waste treatment;
- improvement of statistics relating to the generation, transport and waste treatment in economic sectors and relevant waste streams;
- planning and allocation of responsibilities to ensure sufficient treatment capacity;
- defining responsibilities and its inclusion in the plan, together with a description of ways and means of implementation.

Waste management planning is obligatory in the EU (according to the Waste Framework Directive) and is already used with good results: in many of the EU-25 countries, national taxes were introduced on waste and waste disposal, to help finance waste management and thus increase interest in recovering the waste, rather than simply dispose of it.

As required by EU legislation, national policy documents for waste management include two main components namely:

- National Waste Management Strategy - is the framework setting Romania's objectives about waste management;
- National Waste Management Plan - is the strategy and implementation plan containing details about the actions to be taken for achieving the strategy, the pattern of such actions, including deadlines and responsibilities.

6.8 PERSPECTIVES

The 2014-2020National Waste Management Strategy, approved by GO 870/2013, proposes the measures to ensure the transition from the current model of development based on production and consumption to a model based on waste prevention and use of industrial recovered materials, thus ensuring the preservation of national natural resources and creating the premises of reconciliation of economic and environmental imperatives.

The main objectives of the new strategy are:

- Improving the quality of the environment and health;
- Support research / development in waste management;
- Encourage green investments (projects, activities and jobs dedicated to environment protection);
- Increasing resource efficiency;
- Sustainable waste management;
- Correlation of waste management policies with climate change;
- Development of responsible behavior on preventing waste generation and management;
- Strengthening institutional capacity.

Target selection was based also on the need to ensure the continuity of the processes initiated by SNGD 2004-2012 and consistency of prioritizing the investments.

7. CLIMATE CHANGES

7.1. UNFCCC, KYOTO PROTOCOL, EU POLICY REGARDING CLIMATE CHANGES

The scientific researches confirm the fact that global warming is a direct or indirect result of the human activities (fossil fuel burn, change of land use, etc.), which causes the change of the global atmosphere composition and adds to the natural variability of the clime, observed in a comparable period of time.

The greenhouse gas appears due to the selective absorption by the greenhouse gas molecules of the thermal radiation emitted by the Earth and its isotropic reemission both in the space outside the atmosphere and to the Earth.

By the increase of gas concentration in the atmosphere, the greenhouse effect intensifies and the energy and humidity transfer in the system is disturbed causing unbalance at the level of the clime system.

Greenhouse gasses: carbon dioxide (CO_2), methane(CH_4), nitrous oxide (N_2O), hydroflourocarbon (HFC), perflourocarbon (PFC), Sulphur hexafluoride (SF6).

The impact of the climate changes is reflected in: the increase of the average temperature with significant variations at regional level, the diminishing of the water resources for the population, the reducing of the volume of ice caps and the raise of the oceans' level, changes in the hydrologic cycles, widening of the arid areas, changes in the seasons cycle, increase in frequency of the extreme phenomenon, reduction of biodiversity etc.

Given that climate change phenomenon is a process of a global nature humanity is facing in this century in terms of environmental protection , the Ministry of Environment and Climate Change has developed National Strategy on Climate Change 2013-2020 , approved by Government Decision no. 529/2013.

National Strategy on Climate Change (NSCC) 2013-2020 addresses the issue of climate change in two different ways: (1) the reduction of emissions of greenhouse gases in order to achieve national goals assumed, and (2) adapting to climate change taking into account the European Union's policy on climate change and documents developed at European level and the experience and knowledge acquired within collaborative actions with foreign partners and prestigious international institutions.

Nationally, the limitation and reduction will be achieved by applying the Scheme of trading certificates of greenhouse gases emissions (EU ETS) (the objective established at the European level being -21% in 2020 , compared with the hypothetical level of emissions from EU ETS sectors in 2005) and the application of Decision No . 406/2009/EC (for Romania, target represents a 19 % increase in emissions by 2020, compared with emissions related to the sectors covered by this decision in 2005).

According to the Decision no. 162/2013 / EC on determining annual emission levels allocated to the Member States for the 2013- 2020 period, under Decision No. 406/2009 /CE of the European Parliament and of the Council, on Annex I, annual emission levels allocated to Member States for the years 2013-2020 are presented, calculated by applying the global warming potential values defined in the Second Assessment Report of the IPCC. For Romania, these values are listed below:

Annual emission allocation (in tonnes of carbon dioxide equivalent)							
2013	2014	2015	2016	2017	2018	2019	2020
79108341	80681687	82255034	83828380	85401727	86975074	88548420	90121767

Annex II of the same decision presents annual emission levels allocated to Member States for the years 2013-2020 calculated by applying the global warming potential values defined in the Fourth Assessment Report of the IPCC. For Romania, these values are listed below:

Annual emission allocation (in tonnes of carbon dioxide equivalent)							
2013	2014	2015	2016	2017	2018	2019	2020
83080513	84765858	86451202	88136547	89821891	91507236	93192581	94877925

The Adaptation to Climate Change component (ASC) 2013-2020 aims to create a general framework for action and mapping guidelines to enable each sector (each responsible institutions at the sector level) to develop its action plan in accordance with the national strategy . Consultations with the public sector revealed that one of the major barriers in implementing the component of adaptation to climate change (ASC) is excessive centralization in the MMSC.

The objective of ASC component is to increase Romania's ability to adapt to actual or potential effects of climate change by establishing national strategic directions that can guide policy development at the sector level, taking action and development of capacity necessary to update them regularly. Actions supported by this component are:

• active monitoring of climate change impacts and associated economic and social vulnerability;

• integration of adaptation measures to climate change into development strategies and policies at the sector level, and harmonization of these measures between them;

• identifying the urgent adaptation measures to climate change in critical socio-economic sectors.

The Report of the European Environment Agency (EEA) *"Climate Change, Impacts and vulnerability in Europe 2012"* (Climate change impacts and vulnerability in Europe 2012-http: //www.eea.europa.eu) reveals that all regions in Europe are affected by climate change, which causes a variety of impacts on society, ecosystems and human health. According to the report, higher average temperatures were observed across Europe, in combination with decreased rainfall in southern regions and increased precipitation in northern Europe. In addition, icecaps and glaciers are melting, the sea level is rising and these trends are expected to continue.

Following discussions at international level regarding climate change mitigation, it was agreed to limit global average temperature increase to 2 ° C above pre-industrial era. On the basis of various emission trajectories, the United Nations Environment Programme has identified differences between current emission reduction commitments and reductions needed to achieve the objective. It is clear that greater efforts are needed to reduce emissions to a greater extent, in order to increase the chances of limiting temperature increase to 2 ° C.

Climate change is an additional pressure on ecosystems, leading to the displacement to the north and higher altitude areas, for many species of plants and animals. They adversely affect agriculture, forestry, electricity, tourism and infrastructure in general.

European regions particularly vulnerable to climate change include:

• Southern Europe and the Mediterranean (due to the increased frequency of heat waves and droughts); • mountainous areas (due to melting in areas of increasingly extensive snow and ice);

• coastal areas, deltas and floodplains (due to rising sea levels and increasing frequency of heavy precipitation, floods and storms);

• the far north of Europe and the Arctic (due to increasing temperatures and melting ice).

Europe will have to face the challenge of ensuring that policies on climate change in the next decade, promote and invest in mutually beneficial scenarios, mutually reinforcing themselves. As agreed at EU level, each Member State shall allocate 20% of future structural funds and EU investment (FESI 2014-2020) climate-relevant projects and actions, be it industrial, agricultural, urban, forestry or transport.

There is a strong political awareness at EU level on the need to develop and implement sound policies for disaster risk management aimed at developing their resilience and reducing the worst effects both within the EU and in its external action.

Internationally, disaster risk reduction has been identified as a key theme in international summits, such as the Rio 2012 sustainable development or G20 initiatives on disaster risk management and development of a methodological framework for assisting governments in development of more effective strategies for disaster risk management and, in particular, financial strategies based on an assessment of risk and enhanced risk financing. The process towards a new international framework for disaster risk reduction (Hyogo Framework for Action post-2015) places particular emphasis on the issues of financing disaster risk management and economic costs of disasters. A disaster management policy should include prevention, resilience and reducing vulnerability and enhancing individual ecosystems. In areas prone to risks, property owners will have to invest more in measures to reduce the risks associated with ownership.

Disaster risk management can help to promote economic development and prosperity undisturbed:

- short-term investments in risk management can be a way to accelerate the actions for growth and job creation (new technologies, research and development, resilient infrastructure and buildings, innovative financial instruments);
- in the medium term, improved disaster assessment and increasing resistance contributes to focus on structural sustainability of public and private capital and improve macroeconomic stability by reducing the negative impact of natural and man provoked disaster on growth and on public and private bugets;
- in long-term perspective, investment in risk management has a high rate of return and contribute to sustainable economic development.

The special report on disaster risk management and extreme events in order to adapt to climate change, published in 2012, serve to frame the challenge of dealing with extreme weather events and climate change as a criterion in decision making under uncertainty, analyzing response in the context of risk management. One of the novelties brought by this report is to integrate, in a special report unique skills and perspectives of disciplines covered by WG.I (*The IPCC Working Group I*), WG.II (*The IPCC Working Group II*) and disaster risk management at Community level. Also the report on adaptation and disaster risk management was emphasized and has established ambitious plan for an outreach effort.

The Fourth IPCC Assessment Report, published in 2007, which is the most rigorous assessment of the current state of climatology, as science, presents the results of scientific researches and comments on global climate change and the predictions made based on the use of climate models. The report describes "*an accelerated transition to a world with a warmer climate, marked by more frequent extreme temperature situations, including heat waves, worsening drought in some regions, heavier precipitation in other regions, melting glaciers and Arctic ice, and overall increase of global sea levels*".

According to this Report (available on: www.ipcc.ch), globally:

- The annual average temperature has increased by about 0.74°C over the last 100 years (1906-2005) compared to 0.6°C during the period 1901-2000, and the tendencies indicate a rise of the global average temperature until 2100 with 1°C, up to 6.3°C, according to the greenhouse gases emission scenario;
- 11 of the last 12 years (1995-2006) were among the hottest of the data recorded after 1850;
- presently, the greenhouse gases concentration in the atmosphere exceeds the values registered in the last 650,000 years, and the forecasts indicate an unprecedented increase ;
- the sea level has increased by 1.8 mm/year during 1961-2003, 3.1 mm/year during 1993-2003 and 0.17 m over the entire 20th century, the scenarios estimating an increase of the planet oceans level by 19 cm up to 58 cm at the level of 2100;
- the thickness of glaciers in the Arctic area and of the area occupied by them (40% in the last 30 years) decreased, with the possibility of their complete disappearance, by 2100;
- reduction of the glaciers in the mountains area (Alps, Himalaya, Andes Mountains) and the possibility of disappearance of more than 70% of the continental glaciers;
- increased frequency of extreme meteorological phenomenon (heavy rain, heat waves, storms, tornadoes, hurricanes, etc), the climate models indicating also a gradual increase in the next years;
- Europe's weather got warmer by about 1°C in the last century, quicker than the global average. A warmer atmosphere contains more water vapours, however the new precipitations regime differ a lot from one region to the other. The amount of precipitations increased considerably in northern Europe, while the southern part of the continent is experiencing ever more often drought periods;
- the development of some mutations at the biospheres level: early blossoming of some species of plants, disappearance of some amphibians species etc;
- if reduction measurements are not taken, the level of the greenhouse gases emissions up to 2030 will have a value higher with 25-90% than the present level, the most important increases coming from the transportation industry;
- at least two thirds of the increase of emissions at global level will come from the developing countries, the emissions per head in 2030 will be significantly higher in the developed countries that in the developing countries.

Up to 2030, the scenarios concerning the emissions reduction may be accomplished with a cost representing only 3% of the global GDP, the costs being higher after 2030.

The last warmest 15 years, at global level, were registered in the last two decades, 1998 and 2005 being representatives.

The report recommends that for the limitation of the average global warming to 2°C over the pre-industrial value, is necessary a reduction of the greenhouse gases emissions of at least 50% of the present level until 2050.

The Fifth Global Evaluation Report (AR5) published by IPCC shall provide updated information on the scientific, technical and socio-economical aspects of the climatic changes. The report shall consist of three reports issued by the Working Group and one Synthesis Report (SYR), to be adopted and approved by the end of October 2014, the translation and distribution to be completed by March 2015.

Here are some of the latest works prepared by the Intergovernmental Panel on Climatic Changes (IPCC): *Special Report on the management of catastrophes and extreme events risk, in the meaning of adapting to the climatic changes, and Renewable energy sources and diminishing the climatic changes*.

According to the latest IPCC report on renewable energy sources (2011), each society needs energy services to meet basic human needs (ex. Lighting, cooking, comfort, mobility, communication, etc.) and to serve process production. For economic development to be sustainable, energy services must be safe and with a low environmental impact. Sustainable social and economic development requires ensuring access to energy resources at reasonable prices. This may mean applying different strategies in different stages of economic development. To be beneficial in terms of environmental, energy services must have a low environmental impact

and a low level of greenhouse gases (GHG) emission. However, 85% of primary energy used in the states economy, at woldwide level, comes from burning fossil fuels, fossil fuel consumption reprezenting 56.6% of total anthropogenic GHG emissions.

Renewable energy sources play an important role in providing energy services in a sustainable manner and, in particular, climate change mitigation. This special report explores current and potential contribution of renewable energy sources to provide energy services for sustainable social and economic development. The report includes assessments of available renewable resources, technologies, costs and benefits, future scenarios and policy options.

GHG emissions associated with energy services are a major cause of climate change. Reviewed long-term basic scenarios show that the expected decrease in energy consumption will not be able to offset the effects of GDP growth globally. Consequently, most scenarios show a strong increase in primary energy supply in this century. In the absence of any policy on climate change, most basic scenarios show considerably higher emissions in 2100 compared to 2000, implying increased levels of CO2 and thus intensifying global warming.

Depending on the socio-economic scenarios and considering additional uncertainty towards the end of this century, an increaseof the average global temperature is expected, over the period 1980-1999 with an average value of between 1.1 ° C and 6.4 ° C. To avoid the negative effects of such changes on water resources, ecosystems, food security, human health and coastal settlements potentially irreversible climate system, the Cancun Agreements call for limiting global average temperature increase to 2 ° C maximum compared to pre-industrial values, the participating States agreeing to consider limiting the increase to 1.5 ° C.

There are several ways to reduce GHG emissions in the energy system, while providing energy services desired. Technologies for energy production from renewable sources are diverse and serve the full range of needs for energy services.

The contribution of renewable energy depends heavily on economic competition between technologies that exploit these sources, taking into account the social and security issues. Even without the impetus for reducing climate change, scenarios that are examined in this report indicate that the growing demand for energy services is expected to lead renewable energy at levels that exceed today's energy consumption.

Globally, it is estimated that renewable energy represents 12.9% of total primary energy supplied. The largest contribution to the amount of energy from these sources was biomass (10.2%), mostly (60%) being represented by fuel (biomass) used in traditional equipment for cooking and heating in developing countries, registering at the same time, a rapid growth of modern biomass sources. The contribution of renewables to primary energy production varies significantly by country and region. Scenarios for a future with fewer emissions of greenhouse gases are considering the use of renewable energy, including in combination with nuclear energy, and where using coal and natural gas, together with technologies for capturing and storage of dioxide carbon.

Although the percentage of use of renewable energy in total global energy consumption is still relatively low, their implementation has grown rapidly in recent years. Of the approximately 300 GW of new generation capacity installed worldwide in 2008-2009, 140 GW came from those renewable sources. In sum, in 2009, developing countries hosted 53% of world capacity for producing energy from renewable sources. In most scenarios, increasing the share of renewable sources energy in the total primary energy produced, requires the implementation of policies to stimulate change in the energy system. Government policies, decreasing costs of production technologies for renewable energy, changes in fossil fuel prices and other factors have supported the continued growth of their use. These developments suggest that it is possible for renewables to play a more visible role in the coming decades, both in the developed and in the developing countries.

Some technologies for producing energy from renewable sources can be transferred to the place of use, in rural and urban areas (decentralized type), while others are used in large energy networks (centralized). Although many of these technologies have reached maturity in terms of technical and are widely used, others are still in the early stages of technical maturity and commercial use.

Theoretical potential of energy from renewable sources significantly exceeds the total quantity of energy used by the global economy, literature includes references to a number of weather forecasts, but studies have consistently shown that the potential for this type of energy is significantly higher than today's global energy demand or in the future. Solar energy holds the highest theoretical potential of all renewable energy sources.

Some types of renewable resources such as wind or photovoltaic (solar) are variable and are not always available for use when needed. Currently, the average cost of electricity produced by using renewable technologies is higher than existing energy prices, although in some cases, use of renewable sources is already economically competitive. The margins of the energy cost for a number of existing technologies for renewable sources are quite large, depending on a number of factors including, but not limited to the characteristics of the technology, regional variations in cost and performance, as well as different rates of interest.

Renewable energy sources can provide a range of opportunities and can be used not only for climate change mitigation, but also to support sustainable and equitable economic, energy access, energy supply security and health impact and the local environment.

At EU level, the transport sector remains the sector with the greatest impact on emissions of greenhouse gases, about a fifth of total emissions of carbon dioxide (CO2) emissions come from road transport EU and about 12% of CO2 emissions from all over Europe come from fuel burnt in passenger vehicles.

To help Europe meet its targets for reducing emissions of greenhouse gases in the transport sector, the EU must apply rigorous measures.

Technological innovation can help the transition to a more efficient and sustainable European transport system by improving fuel efficiency using motors, materials and new design methods. To help drivers to choose new cars with the highest fuel economy, European legislation requires Member States to ensure that all customers have all relevant information, including a label indicating the car's fuel consumption and CO2 emissions.

EU legislation imposes limits on emissions from cars and light trucks, who account for some 15% of CO2 emissions in the EU. Therefore, their reduction can make a significant contribution to combating climate change.

New cars, issued in 2007, on average 159 grams of CO2 per kilometer. The EU regulations established clear emission limits that manufacturers must comply so that in 2015, the amount must reach 130 g / km, a reduction of 18% and in 2020 to 95 g / km, a further reduction of 40%. According to data published by the European Environment Agency (EEA) in 2013, CO2 emissions from cars sold in Europe fell by almost 4% to 127gCO2 / km.

Regarding vans, up to 2017, average emissions should fall to 175 g, a reduction of 14% from the level of 203 g / km in 2007 and in 2020, it should reach 147 g, a further reduction of 28%. A typical van sold in European markets, issues 180.3 gCO2 / km, slightly higher than the target of 175 gCO2 / km for new utilities 2017. New vans in the European Union (EU) must become more efficient to meet carbon dioxide targets set for 2017 and 2020 according to data published by the European Environment Agency (EEA).

Also, the EU calls for a reduction, by 2020, up to 10% of "greenhouse gas intensity" generated by fuels for vehicles, that is the amount of fuel gas generated during a life cycle, from the extraction and to distribution.

EU committed to a reduction of total GHG emissions from transport by 20% by 2030 compared to 2008 levels (+ 8% compared to 1990 levels) and at least 60% by 2050 compared to 1990. For greenhouse emissions international maritime bunker, the trend is to reduce emissions by 40% by 2050 compared to 2005 levels, and transport oil consumption is reduced by 70% by 2050 compared to 2008 levels.

An important element in reducing emissions of greenhouse gases in the transport sector is the fuel quality.

In this respect, the Commission intends to introduce a new system of testing fuel efficiency in 2017, fuel efficiency standards in Europe representing the only effective policy to reduce CO2 emissions.

Worldwide, the "Aviation" sector contributes significantly to climate change, transport being the fastest developing sector, trend for the coming years being one of considerable growth.

In the 27 member states of the European Union, EEA report shows that, taking into account the mileage, civil aviation remains the mode of transport with the highest increase 48% between 1997 and 2007.

In the *4th Global Evaluation Report* published by IPCC, the "*civil aviation sector*" is described as the Transportation sector with the most rapid increase at global level. The projections concerning the quantification of the GHG emissions generated in the aviation field and their tendencies and considering the high efficiency of the used fuels, IPCC concludes that the emissions will increase in this case 489.29 million to per year in 2002 to about 1,247.02 million to in 2030. In accordance with the same Intergovernmental Panel, supposing that the fuels efficiency increase in the context of the industries development will remain constant, the emissions in the aviation field will continue to increase but at a lower level compared with the GHG emissions generated by transportation means.

Even though the airplanes technology and operational efficiency have been well-improved and developed in the last years, is not enough to neutralize the impact a high traffic has over the increase of GHG emissions. The dynamic of the airway traffic is mainly influenced by the increase of the request of the population and the population's availability to cover the tickets costs, as well as the increased requests for trips with exclusive tourism purpose.

Under those circumstances, the European Union estimates that the efficiency requirements for the products that use different forms of energy, the inclusion of the aviation activities within the European chart trading the GHG emissions certificates at community level (EU ETS) the strategy concerning the limitation of CO2 emissions coming from cars and the new requirements regarding the quality of the used fuels may significantly contribute to the accomplishment of our objective of reducing the GHG emissions.

According to the data included in the *Report of the European Environment Agency for 2011* (*Greenhouse gasses emissions – tendencies and prognoses in Europe*), the emissions from the aviation sector shall continue to increase because transportation in this field is growing fast. If, in 1992, the carbon dioxide emissions generated by aviation represented 2% of the total carbon dioxide anthropic emissions (approximately 13% of the global CO_2 emissions from transportations), given to the rapid growth of the aviation activities during the past 30 years, the IPCC scenario estimates that the CO_2 emissions resulting from the worldwide aviation activities shall get triple until 2050. The contribution of the aviation activities to the global warming is expected to rise from 3.5% in 1992, to 5% in 2050.

According to route to a Single European Transport Area, one of the main objectives to be achieved by 2050 is using certain types of fuels in aviation activities, which could reduce carbon emissions by 40%.

Based on recent estimations of the European Environment Agency, after an important drop of the GHG emissions in 2009, caused by the economic recession, the total emissions from the EU ETS Trading Scheme went up in 2010 and stagnated at approximately 15.5% below the emissions level of 1990 (approximately 14% of the emissions from the aviation activities are considered). For 2010, the emissions level was 5% below the level of

2008. The prognosis for the member states point out that the total emissions at EU level shall not be significantly reduced in the future, until 2020 respectively. Therefore, following the national measures adopted by each member state, in 2020, the emissions across the European Union shall be 19% below the level of 1990, which is only a minimum diminution objective by 20%. The 1 percentage point gap might be completed and the target might be exceeded by 5% if the member states shall apply the additional measures presently scheduled, în particularly those related to transport and residential sectors.

Such emissions levels were approximately 7% lower than in 2008 and significant emissions reductions were noticed in 2008 and 2009 in all member states, as an effect of the economic crisis and because of renewable energy sources development.

According to the provisions of the member states, based on the existing measures and policies, the emission from the EU ETS Scheme (except for those from the aviation activities) shall moderately decrease as of 2010, in 2016 reaching the level observed in 2009 and obtaining a diminution by 19% of the 1990 level. Assuming that the emissions from the international aviation shall not undertake a significant reduction, it is expected that the 1% is roughly preserved until 2020, if no additional measures for emissions reduction are taken.

Presently, the measures taken at European level with the aim of reducing the effects of the climatic changes mainly concentrate on the GHG emissions limitation and reducing as well as adaptation to the effects of the climate changes. A recent EEA report shows that up to know only 7 of the 32 member states of the Environment European Agency have adopted actual measures based on the reduction of the climatic effects and have started the implementation of the national Strategies of adapting to the climate changes, based on the situation of each country.

At international level, the chiefs of states and governments, representatives of the organizations and intergovernmental and NGO agencies, as well as media representatives reunited at the "*United Nations Conference on the Climate Changes, Warsaw, 2013*" including the 19th "*Conference of the Parties in the Framework Convention of the United Nations on the climate changes (UNFCCC) and the 8th Conference of the Parties in Kyoto Protocol,* which was held in Warsaw, Poland, between November 11th - November 22nd , 2013.

Some of the major objectives of the COP Presidency 19 are:

- adopting necessary elements for the implementation of COP decisions in previous years, especially COP16 / CMP6 (Cancun), COP17 / CMP7 (Durban) and COP18 / CMP9 (Doha), on the second commitment period under the Kyoto Protocol, adaptation to climate change, capacity building, technology transfer and financial mechanisms;
- registration of measurable progress in terms of new international agreement, in particular the elements required to develop a negotiating text for future global agreement before the month of May 2015;
- strengthening confidence in the process conducted under the UNFCCC, which should be a transparent, inclusive, open to both of States Parties and other stakeholders;
- increasing the level of knowledge and understanding of the scientific evidence on the effects of climate change;
- Increasing the level of cooperation on climate change, both at cities level and medium business level;
- operationalization of key institutions and processes needed to promote the implementation of the Convention;
- progress in talks on continuity of adequate financial support provided by developed countries (long-term financing) for implementing the post-2012 commitments in developing countries.

Despite the difficulties encountered during negotiations, the Polish Presidency of the Conference managed to achieve three political targets:

- The roadmap, including the timetable for the next steps to achieve a new global agreement at COP 21 in France in 2015, was approved and adopted;
- The implementation of previous decisions of the COP was significantly advanced and completed many important issues;
- Trust between the parties within the UNFCCC process, which often suffered because of decisions that were taken, was significantly restored.

Due to obvious global climate change in recent years, the question of assessing the effects of climate change in the next period arises, taking into account the policies and measures to reduce emissions of greenhouse gases. Regardless of the implementation of measures to reduce emissions of greenhouse gases, climate change adaptation strategies must be redesigned so that they are based on a systematic analysis of vulnerable/affected regions, sectors and population, to counteract the inevitable impact of change. Thus, adaptation to climate change and water availability issues are to be managed in a much broader context: local, regional, national, European and international.

Romania's climate is transitional temperate-continental, marked by some oceanic, continental, Scandinavian-Baltic, Mediterranean and Black Sea climatic influences. Thus, Banat and Oltenia feel a Mediterranean hue, characterized by mild winters and rich rainfall (especially in autumn). Dobrogea manifests a Ponte hue, with rare rain, but heavy. In regions of the East, the continental character is more pronounced. In the north of the country (Maramures and Bucovina) a Scandinavian-Baltic hue is felt, which causes a wet and cold climate with cold winters. The west manifests more pronounced influences of low pressure systems generated over the Atlantic, causing moderate temperatures and high precipitation. After Köppen classification, Romania is characterized by the following climate:

1. cool temperate continental climate (DFB) without a individualized dry season and thermally moderate summers; hot and cold season are well defined thermally; this type defines most of the country's territory;
2. warm temperate continental climate (CFB), with moderate moisture throughout the year without a overly intens dry seasone and relatively moderate summers; hot and cold season are well defined thermally; this is representative of the western half of the Romanian Plain and the Western Plain.
3. temperate continental climate (Cfa), similar to CFB, but summers that can be excessively hot; this type is specific for Dobrogea Plateau and the eastern half of the Romanian Plain;
4. mountainous climate (H) cool with high moisture throughout the year; this type is found in the Carpathian mountain massifs.

In our country, the changes in the climate regime meets the global context, but with the particularities of the geographical region is located in. Thus, in the 1901-2010 period, analysis of the annual average temperature at the air meteorological stations with consecutive series of observations over 100 years, reveals that the average annual temperature has risen by 0.5°C between 1988 to 2010 (10.2°C) over the whole period analyzed (9.7°C), a value that is very close to the global average of 0.6°C..

Evolution on decades of average annual air temperatures for the period 1961-2010 compared with the reference period of 1961-1990 shows that between 2001-2010, the average annual air temperature Romania increased by 0.4-0.5°C compared to each decade since 1961 and to date, with significant warming recorded especially in summer and winter (over 1 to 3°C) . The increasing trend is highlighted especially since 1981. Also, tropical days are more frequent and winter days are increasingly rare . It is also noticed that the average minimum temperatures recorded higher values in summer, and average of maximum temperatures, especially in the southern and south-eastern areas (up to 2°C) . Snow depth decreased significantly in northeast, central and western Romania, while across the country the annual frequency of phenomena of frost and ice have decreased significantly.

In terms of precipitation regime for the period 1901-2010, the analyzes indicate, especially after 1961, a general decreasing trend of annual amounts of precipitation throughout the country and especially a sharp increase in the deficit of precipitation in areas in southern and eastern Romania.

Global warming has increased the frequency of extreme events, rapid alternation between severe heat / severe drought and heavy rainfall / flooding is becoming more apparent. From 1901 to the present, in Romania every decade has had 1 to 3-4 years of extreme drought or rain, increased frequency of droughts (4-5 years) is however, becoming more evident after 1981 (table 7.1.1).

Tabel 7.1.1. Drought/heavy rain years in Romania, 1901-2010 period

SECOLUL XX		
DECADE	***EXTREME DROUGHT YEARS***	**EXCESSIVE RAIN YEARS**
1901-1910	*1907-1908*	1910
1911-1920	*1917-1918*	1911, 1912, 1915, 1919
1921-1930	*1923-1924, 1927-1928*	1929
1931-1940	*1934-1935*	1937, 1939, 1940
1941-1950	*1945-1946, 1947-1948, 1949-1950*	1941, 1944, 1947
1951-1960	*1952-1953*	1954, 1955, 1957, 1960
1961-1970	*1962-1963, 1964-1965*	1969, 1970
1971-1980	*1973-1974, 1975-1976*	1972, 1974, 1975, 1976
1981-1990	*1982-1983, 1985-1986, 1987-1988*	1981, 1990
1991-2000	*1992-1993, 1997-1998, 1999-2000*	1991, 1997
21ST CENTURY		
2001-2010	*2000-2001, 2001-2002, 2002-2003, 2006-2007, 2008-2009*	2005, 2006, 2010

Global warming implies two major problems for the humankind: on one hand the necessity of drastic reduction of the GHG emissions in order to stabilize the concentration level of those gases in the atmosphere, to hinder the anthropic influence on the climate system and to offer the possibility of the natural ecosystems to adjust in a natural manner, and on the other side the necessity of adjusting to the effects of the climate changes considering the fact that they are already visible and unavoidable due to the inertia of the climate system, no matter the result of the actions for emissions reduction.

Rethinking and the reorganizing the urban structures, promoting a sustainable urban transportation, facilitating a lower energy consumption per head, thermal rehabilitation of the living spaces and offices, turning the cities into "*urban ecosystems*", using "*eco-friendly*" technologies based on the reduction of the GHG emissions, changing the population's behavior in terms of creating and protecting the green areas are just a few viable and concrete solutions that may be set into practice in order to reduce the effects of the climate changes and to improve the quality of life.

In Romania, the climate changes impact was estimated in a study of the Romanian Academy where they selected a different Models of General Circulation of the atmosphere, which best reflects our country's conditions.

The National Institute of Hydrology and Waters Management has started in 2011 the project on: „*The impact of the climate changes and of the framework directive on costs and water resources in southeast of Romania"*, to be developed until 2014.

The project proposes the unitary spatial identification of the surface and underground water bodies in the southern Romania, so that to provide sufficient concrete data to be used when making managerial decisions, having the following main objectives:

- evaluation of fresh water consumption from agricultural exploitations in various scenarios related to the modification of the regional climatic conditions;
- simulation of consumption restrictions in various scenarios related to the modification of the regional climatic conditions;
- evaluating the fresh water consumption costs depending on the source under the conditions provided by various scenarios related to the modification of the regional climatic conditions.

The project shall include four stages, namely:

- Stage 1 – Documentation and Overview;
- Stage 2 - Complex documentation on the aquifer structures and water bodies in the southern Romania, highlighting the parameters of average and minimum river flows in this area;
- Stage 3 – Outlining the spatial extension of the aquifer structures and underground water bodies in the investigated area and identifying the evolution trends of the surface water resources in the context of global heating phenomena, highlighting the agricultural exploitations consumptions;
- Stage 4 – Preparing a geo-referential database concerning the potential underground and above ground water offer for the future and the conceptual and numeric model of the aquifer structures. The additional water costs in the context of implementing the Water Framework Directive.

During Stage I, from 15.11.2011 to 15.12.2011, a documentary study was made based on the data provided by the specialized literature, concerning the underground and aboveground water sources, the existing policies and regulations in the water field. Based on the documentary study prepared, the following stage conclusions might be drawn:

- the consumption of worldwide water resources increased no less than 6 times, while in our country it sensitively decreased following the falling of the economic activities;
- in 2020 – 2025, the water crisis shall be more acute worldwide;
- in order to counterattack the effects of global heating, global measures are being taken, such as: establishing floodable zones under controlled and consolidating the dams; hydro-technical works for protection against flooding of some urban storage systems in case of abundant precipitations;
- in the Danube River, there has been found an rising tendency of the maximum flows measured starting with the 1840s, correlated with an rising tendency of the Black Sea level, according to the measurements done in Constanța and Sulina starting with the 1860;
- according to the Water Framework Directive (Art. 5 and 9) the water economic mechanism must be promoted, which requires an economic analysis and evaluation for each hydrographical basin;
- The implementation of the Water Framework Directive, through the general flowcharts prepared for each hydrographical basin, in order to reach the level of 2015 of the "*good water condition*", shall lead to an increase of the water price, for agricultural exploitations inclusively;
- Regulation CE 1698/2005 stipulates compensations for farmers to cover the additional costs resulting from the implementation of the Water Framework Directive and creating a network of protected natural areas "*Natura 2000*";
- Promoting the economic mechanism for water in conformity with the provisions of Water Framework Directive (integral recovery of the costs related to the supplied water services), might lead to contradictions with the provisions of the Common Agricultural Policy (CAP), which for the period 2014-2020 estimates to make compensatory payments as "*decoupled payments*". Decoupled payments mean compensations granted to farmers for various losses suffered by agriculturists, so that not to favour certain agricultural crops to the detriment of others. Choosing one type or another of culture should be determined by the market demand and supply.

In Romania, the climate variability will have direct effects on industries such as agriculture, forestry, water management, residential and infrastructure sector; it will lead to the change of the vegetation periods and the movement of the limits between the forests and meadows; will increase the frequency and intensity of extreme

weather phenomenon (storms, floods, drought) The climate changes from Romania are within the global limits, considering the regional conditions: the temperature increase will be more obvious during summer while in the north-west of the Europe the most important increase will be during winter.

Thus, in Romania it is expected an increase of the average annual temperature compared with the period 1980-1990 similar to Europe's, existing smaller differences between the pattern's results in what concerns the first decades of XXI century, and greater for the end of the century:

- between 0.5°C and 1.5°C, for the period 2020-2029;
- between 2.0°C and 5.0°C, for 2090-2099, depending on the scenario (example: between 2.0°C and 2.5°C in the case of the scenario with the lowest increase of the average global temperature and between 4.0°C and 5.0°C in case of the one with the highest increase of temperature).

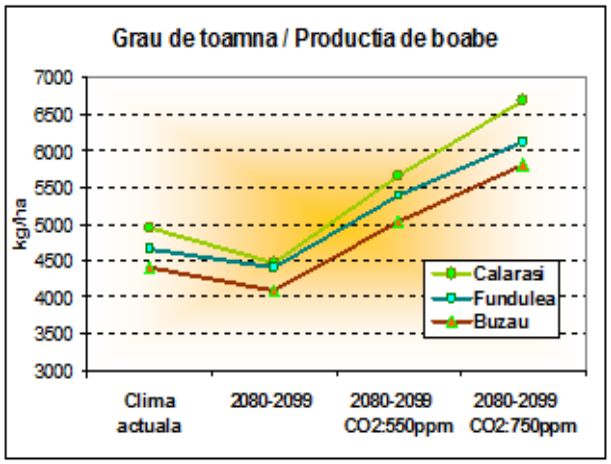
In terms of pluviometric data, more than 90% of the climate patterns forecast for the period 2090-2099 severe droughts during summer, in the area of Romania, especially in south and south-east (with negative deviations compared with the period 1980-1990, more than 20%). In what concerns the precipitations during winter, the deviations are smaller and the uncertainty higher.

Effects on agriculture

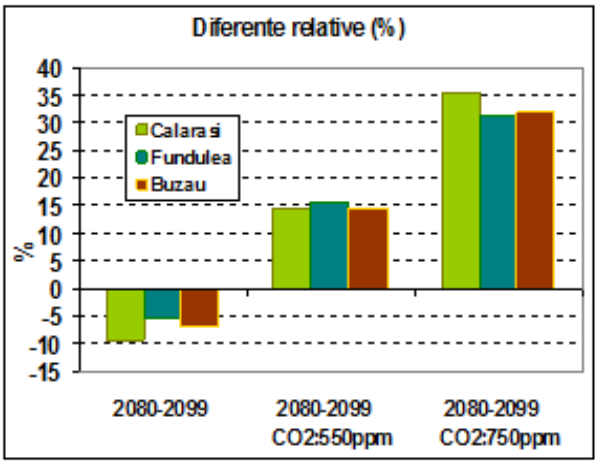
The agriculture represents the most vulnerable field, the studies showing the following aspects:

- In the case of wheat crop , the analysis of simulated results under two regional climate scenarios (2020-2050 and 2080-2099) shows an increase in grain production (on average by 10.3 % to 34.8 % from current levels according to the modification of the genetic coefficient factor on vernalization and photoperiod) and more rapid development of culture , ie 8 days to 21 days earlier, compared to the current period and agricultural region , the increases occurring in the southern and south-eastern areas where thermal values growth trend is more obvious and as a result , forcing vegetative processe is more intense. The simulated results for the agricultural area in southern Romania indicates that wheat varieties with average requirements for vernalization and low to reduced photoperiod requirements are the best combination to ensure the best use of future climate resources , allowing constant yields and a reduced annual variability. Increased wheat production under climate change is due to the positive effect of increased atmospheric CO_2 levels on photosynthesis , which counteracts the negative effect of shortening the growing season due to rising air temperature (graphs 7.1.1 , 7.1.2 , 7.1. 3 , 7.1.4).

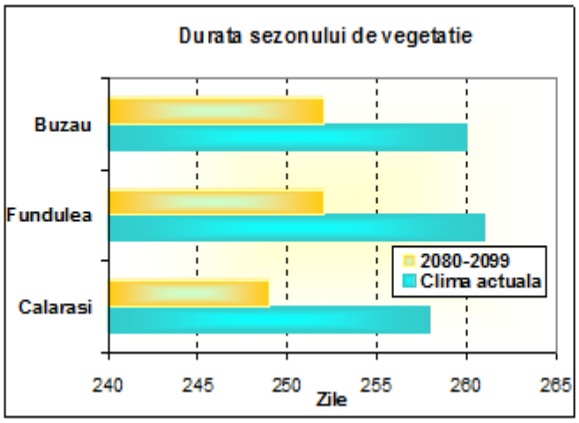
Grafic 7.1.1



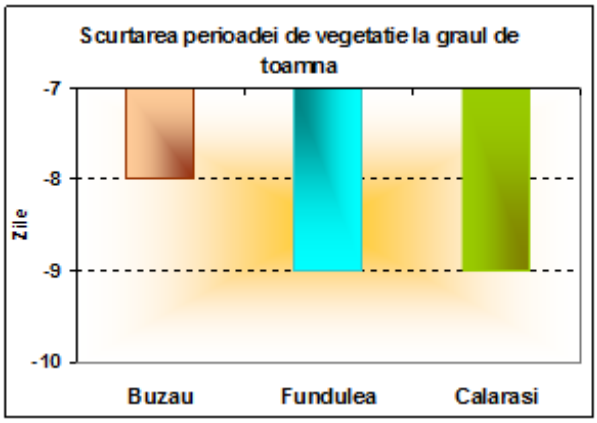
Grafic 7.1.2



Grafic 7.1.3

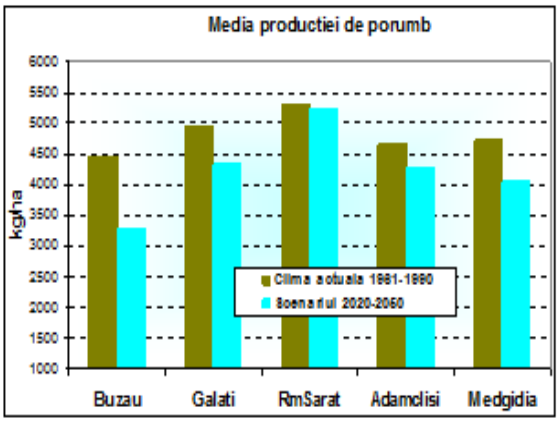


Grafic 7.1.4

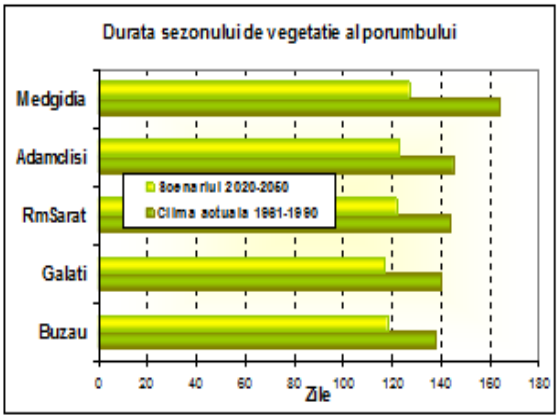


➢ in the case of corn crops, in the southern-eastern part of Romania, according to climate projections for 2020-250 period, shortening of the growing season by average with 20 to 37 days can be produced, due to rising air temperature and thus decrease of production by 14% until 2020 and 21% by 2050, as a result of increased soil water deficits, especially in the grain filling phase (July-August). Corn, since is a C4 plant, benefits less from the effect of increased CO_2 concentration on photosynthesis (graphs 7.1.5, 7.16).

Grafic 7.1.5

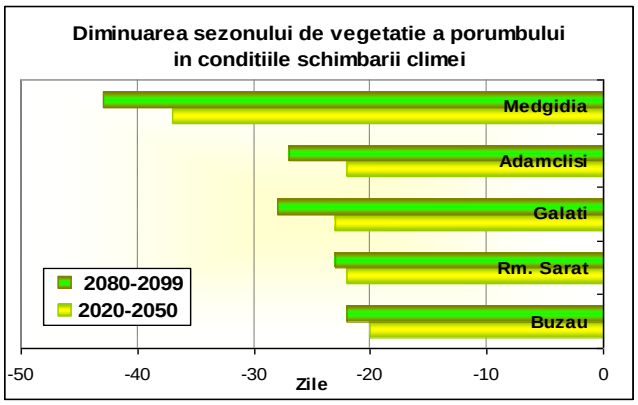


Grafic 7.1.6



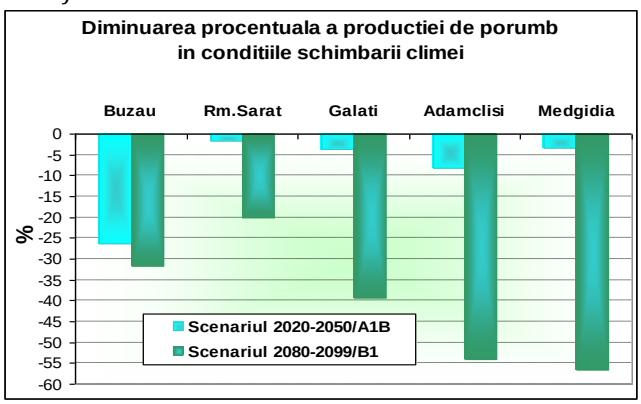
With RegCM/2080-2099SRES B1/518 ppm scenario the results show that the average corn production is significantly reduced in south-eastern Romania with approx. 20% up to 57% compared to 1961-1990 period. Length of growing season under current climate varies between 138 days and 164 days, and under this scenario the vegetation period will decrease by 22 days to 43 days (Graphs 7.1.7, 7.1.8).

Grafic 7.1.7



1961-1990 /138 – 164 zile
2020-2050 / 117 – 127 zile / - 20...- 37 zile
2080-2099 / 112 – 121 zile / -20...- 43 zile

Grafic 7.1.8

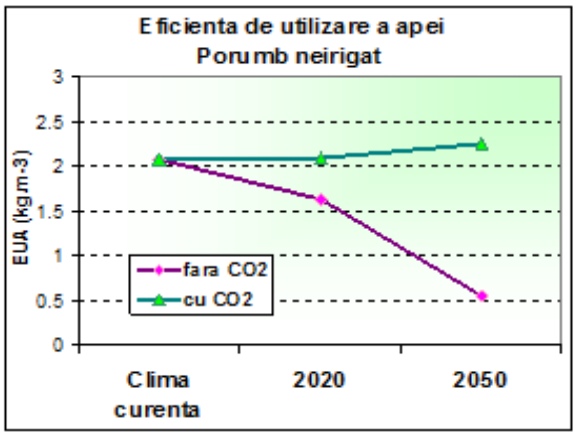


1961-1990 / 4463-5314 kg/ha
2020-2050 /3290-5224 kg/ha / -1,7...- 26,3%
2080-2099 /2045-4253 kg/ha / -20,0...- 56,6%

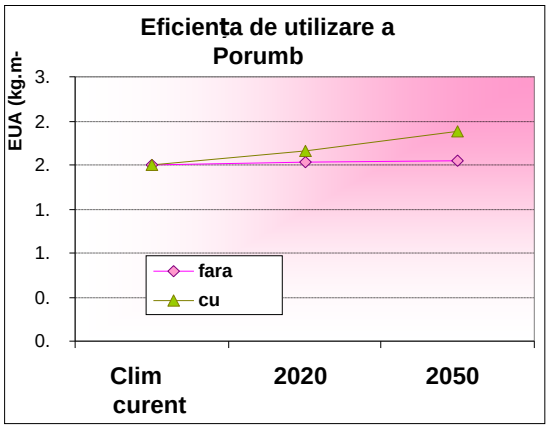
Building and development of agricultural management options on adaptation and reducing the possible negative effects of climate change on crop may recommend specific technological measures: changing the date of sowing, use of genotypes with resistance to high temperatures and drought, changing practices of land work, changing crop rotation and last but not least, the application of irrigation. The results show that, in the non-irrigated maize, water use efficiency (UAE) is reduced significantly by 22% in 2020 to 74% in the decade of

2050. By the application of irrigation, water efficiency increases for the two scenarios as follows: 1.5 - 2.5% (without CO_2) to 8-19% (CO_2) as compared with the current climate (7.1.9 graphics, 7.1.10).

Grafic 7.1.9.



Grafic 7.1.10.



It is noted that, in our country climate change clearly reflects in changes in the temperature and precipitation regime , especially starting from 1961 to the present , the effects on growth and development of agricultural plants being significant . In this context, lack of water and pedological droughts in southern and eastern areas of Romania may cause severe reduction in production , particularly in the excessively dry agricultural years and temperature values higher / lower than optimum reflects the metabolic reactions of plants, causing thermic stress especially during summer and winter , when the changes of their minimum trends can easily increase the dangers of frost for sensitive species. Therefore , the adaptation of cultivated species to climate change will be based on experience gathered from extreme climate reactions, on implementing the adaptation and management plans of climate change risks and on the new research in the field regarding the regional and local effects of the reaction of cultivated genotypes to current and foreseeable climate change . Essentially, solutions and recommendations for the development of measures and procedures for the prevention and mitigation of climate risk in agriculture must include the entire complex of fully known measures (agro-technical , cultural, irrigation , etc. .) and concrete actions for locating and limiting the expansion of extreme weather events in order to avoid bigger consequences.

Effects on forestry

Out of the total surface, 28,3% represents the area covered by forests; they are unevenly distributed on our country's territory (51.9% in the mountain area, 37.2% in the hills area and 10.9% in the plane area) The area of the national forest fund is of 6580 thousands ha, of which, about 6,300 thousands ha are covered by forests and the rest of the area is dedicated to the cultivation of forests, production and management. In the areas covered by woods, in the plane and hill regions, an important decrease of the forests' productivity after 2040 due to the increase of temperatures and decrease of the precipitations' volume, is forecasted.

Effects on waters' management

The hydrological consequences of the CO_2 concentration increase in the atmosphere are significant. The shaping of the effects caused by this phenomenon was realised highlighting the main hydrographical basins. The shaping results show the possible effects of the changes in volume of the precipitations and evapotranspiration.

Increasing temperatures and reducing rainfall could lead to decreased water inventories and increased demand for water, these phenomena causing deterioration of freshwater bodies, increasing pressure on the already fragile balance existing in many parts of the country between the stocks of water and water requirements. In areas where rainfall may increase, there is no certainty that they will be produced in the favourable season of the year to be used; additionally, in these circumstances the probability of flooding increases.

Effects on human establishments

The main impact of the climate changes on the urban areas, infrastructure and buildings is related, mainly, by the effects of the extreme weather events such as heat waves, heavy snows, storms, floods, increase of the instability of the slopes.

Therefore, the urban planning and the designing of a proper infrastructure play an important role the minimisation of the impact of the climate changes and the reduction of the risk of the human environment.

The industrial, commercial, residential and infrastructure industries (including energy and water supplies, transportations and storage of wastes) are vulnerable to climate change.

The territorial planning may offer an integrated framework that allows connections between the vulnerability, risk evaluation and adjustment, being possible to lead to the identification of the most efficient options of action.

Those areas are directly affected by the temperature change and the precipitations' regime or indirectly through the general impact on the environment, natural resources and the agricultural production. Areas such as buildings, transportations, oil and gases exploitations, tourisms and industries in the coastal area, are affected by the climate changes. Other industries, such as the food industry, wood processing, textile industry, production of biomass and energy from renewable sources, are areas potentially affected.

United Nations Framework Convention on climate changes (UNFCCC) and Kyoto Protocol

Romania has ratified *The United Nations Framework on the climate changes* (UNFCCC) through *Law no. 24/1994*, committing to act: for the "stabilisation of the GHG concentrations in the atmosphere at a level which will prevent the dangerous human disturbance of the climate system, level which should be reached in a proper period of time which allows the ecosystems to adjust naturally to the climate changes so as the food production not to be threatened, and the economical development to be carried on in a sustainable manner".

Romania ratified the Kyoto Protocol through Law no. 3/2001, taking the commitment regarding the establishment of measures, targets and certain periods of GHG emissions reduction with effect from 2008 - 2012, with 8% compared with 1989.

In 2013, a series of actions have been implemented with the purpose: improvement of the national inventory of the GHG emissions and Romania's reporting capacity under Kyoto Protocol and UNFCCC, the implementation of the trading scheme of the GHG certificates, the operation of the National Register of GHGs, improvement of the legislation regarding the adjustment to climate changes and the setting of the regulating framework for Romania's participation to the Kyoto Protocol mechanisms namely the International Emissions Trading. Also, public awareness activities were identified related to the impact and the adjustment to climate change.

Romania has, starting with 2008, a national System for the estimation of the level of anthropic GHG emissions from sources or the retention through sequestration (capitation) of the carbon dioxide (SNEEGHG), regulated through H.G nr.1570/2007. This law regulates the attributions and the way of cooperation between the institutions responsible for supplying the necessary information for the emissions estimation, reports, the stages of the procedure regarding the estimation of the anthropic emissions, reporting, archiving and recording of the information in order to ensure transparency, consistence, comparability, and accuracy of the National Inventory of the GHG emissions (NIGHGE), under the circumstances of following the obligations under Kyoto Protocol and/ or European legislation.

The first Romanian Guide regarding the adjustment to the effects of climate changes (OM no. 1170/2008) illustrates the impact of the climate changes and includes adapting measures for each affected field.

During 2013, the representatives of the Ministry of Environment and Forestry and the National Environmental Protection Agency have attended different activities of awareness and changes of experience on the theme of "Adaptation to the effects of the climate change" carried on as conferences, seminars and symposiums.

Also, during the period 2009-2010, Romania has benefited of technical assistance from Holland in order to improve the development and implementation capacity at national, regional and local level of the policies of adapting to the climate changes.

Total annual emissions of GHG

Starting with 2002, Romania sends annually to the UNFCCC secretary, the National Inventory of GHG Emissions (NIGHGE), made in accordance with IPCC technology following the reporting format common to all counties (CRF). The inventory is elaborated based on the „Guidelines Revised in 1996 Concerning the Elaboration of the National GHG Inventories" issued by IPCC, completed by "The Guide of Good Practices and Uncertainties Management" issued by IPCC (IPCC GPG 2000) and based on the "Guide of Good Practices in what concerns the land use, the change of land use and forestry" (LULUCF GPG), elaborated by IPCC in 2003, in accordance with the national provisions regarding SNEEGHG, as well as the „Guidelines Concerning the Elaboration of the National GHG Inventories" issued by IPCC (GL 2006).

NIGHGE represents an instrument of reporting the estimated anthropic GHG emissions at national level in accordance with the provisions of UNFCCC and Kyoto Protocol and the regulations in the field, realised within the National System for the estimation of the level of antrophic GHG emissions from sources or from retention to sequestration of the carbon dioxide. NIGHGE contains tables in the Commune Reporting Format – „CRF", Report to NIGHGE – „NIR" and „xml" database. NIR presents in detail the way NIGHGE was elaborated in accordance with the requests of Kyoto Protocol and contains general information, specific data for each sector of NIGHGE and other additional information requested by Kyoto Protocol.

The most recent "National GHG Inventory of Romania" was sent in May 2014 and contains the estimations of the GHG emissions / retentions through sequestration for the period 1989 - 2012.

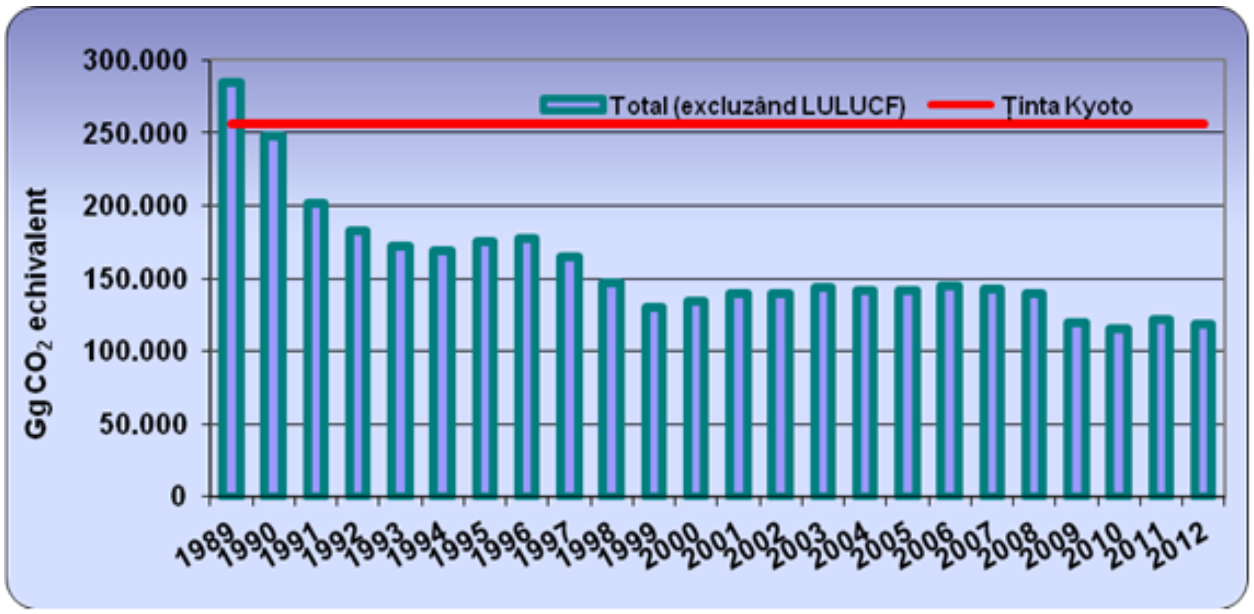
In accordance with Kyoto Protocol, Romania committed to reduce the GHG emissions with 8% between 2008 and 2012, considering the emission level from 1989 as reference.

The total GHG emissions (excluding the contribution of the area Land Use, Change of Land and Forestry Use - LUCLFU) decreased in 2011 with 54.86%, compared with the level of emissions from 1989. Based on these data there is a great possibility that Romania will accomplish its GHG reducing obligations within its period of commitment 2008 - 2012, without adopting additional measures of reduction.

As shown in figure 7.1.11, the decline of the economic activities and of the energy consumption between 1989 and 1992 has caused the decrease of the emissions. Some energy-intensive industries have significantly reduced their activities and that was reflected in the GHG emissions reduction.

The emissions started to increase until 1996 due to the revitalization of the economy. After commissioning the first reactor of Cernavoda Nuclear Plant (1996) and following the necessary structural reforms at national level, the emissions started to decrease again until 1999. After 1999, the emissions' tendency of increase reflects the economic development registered between 1999 and 2012.

Grafic 7.1.11. The level of the total GHG emissions 1989 - 2011 (without LUCLFU)



The areas for which the estimation of the GHG emissions/retentions levels were made are: energy sector, industrial processes, use of the solvents and other products, agriculture, use of lands, change of land use and forestry (*LUCLFU*) and wastes areas. The level of the total annual GHG emissions for the period 2000- 2011 is mentioned in table 7.1.2.

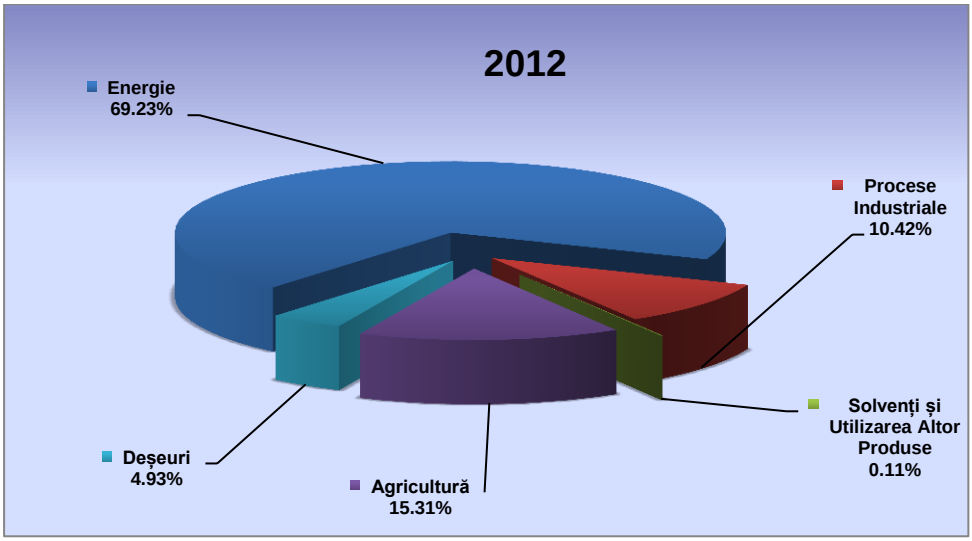
Tabel 7.1.2. Level of the total annual GHG emissions between 2000 and 2011

(*equivalent to thousands to of CO_2*)

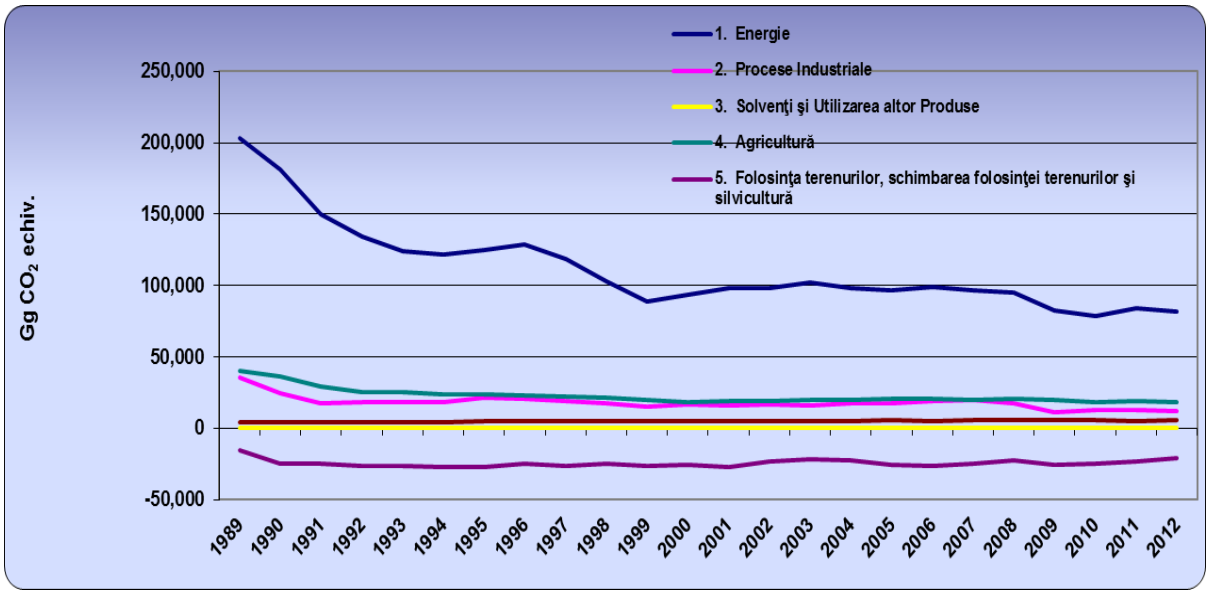
Year	***Total emissions*** *(including LUCLFU)*	***Total emissions*** *(excluding LULUCF)*
2000	108396,18	134073,69
2001	112223,10	139021,95
2002	116896,46	139697,63
2003	123006,96	144219,31
2004	118797,57	141220,66
2005	115753,30	141313,82
2006	118871,14	144776,56
2007	118028,48	142803,52
2008	117404,08	139811,77
2009	94402,93	119917,10
2010	91208,70	115798,97
2011	98467,69	121513,51
2012	98219,94	118764,15

The contribution of the areas at the total GHG emissions level for 2012 as well as their trends is showed in figures 7.1.12. and 7.1.13.

Grafic 7.1.12 *The contribution of the areas at the total GHG emissions level f or the level of 2012*



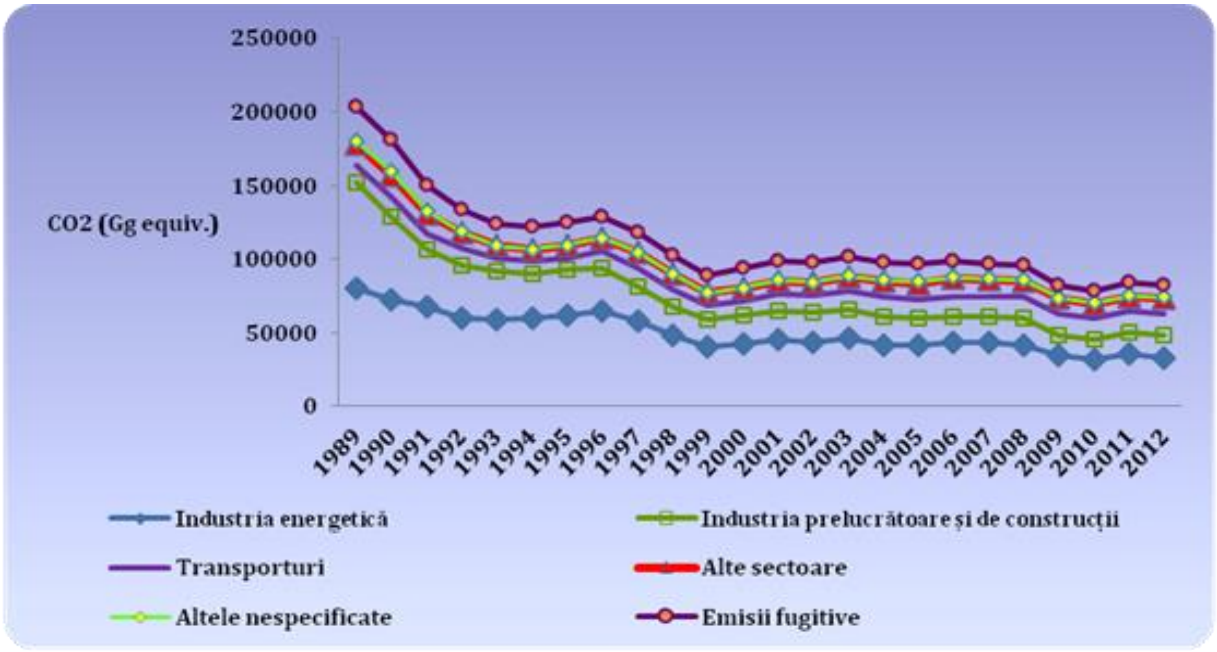
Grafic 7.1.13 *The trend of the GHG emissions by sectors 1989-2012 (in thousands CO_2 to equivalent)*



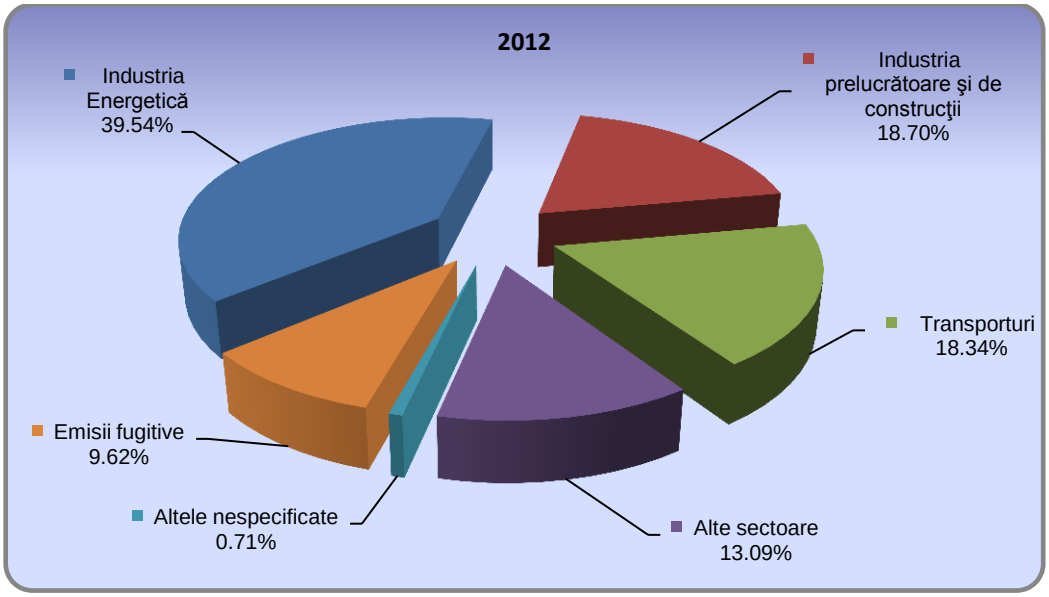
The **Energy** Sector is the most important one in terms of GHG emissions being responsible for 69.98% of the total GHG emissions generated at national level in 2011. The emissions in this sector decreased by 55% compared with the level of the reference year 1989 (fig. 7.1.14).

The contribution of the sub-sectors to the GHG emissions assigned to the energy sector is as follows: energy industry 39,54%, processing and construction industry 18,70%, transports 18,34%, fugitive emissions 9,62%, other sectors 13,09%, others not stipulated 0.71%. (fig. 7.1.15).

Graph 7.1.14. Trends of the GHG emissions in the Energy Sector (in thousands CO_2 to equivalent)



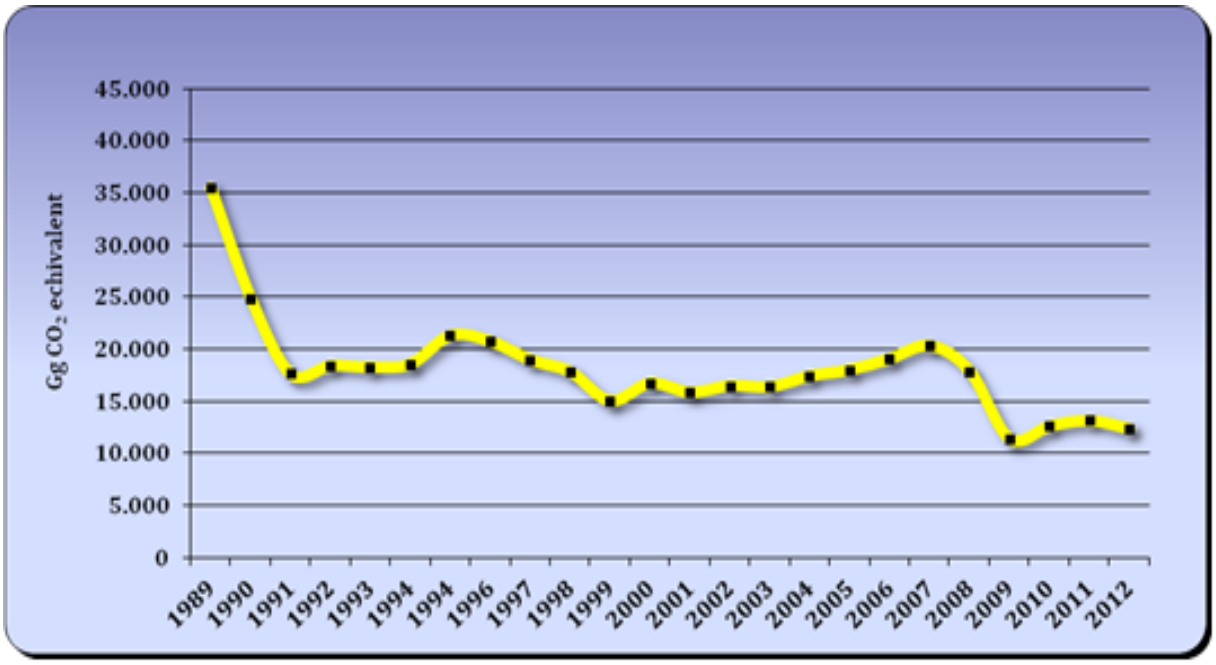
Graph 7.1.15. The contribution of the sub-sectors to the total emissions of the energy sector at the level of 2012 (%)



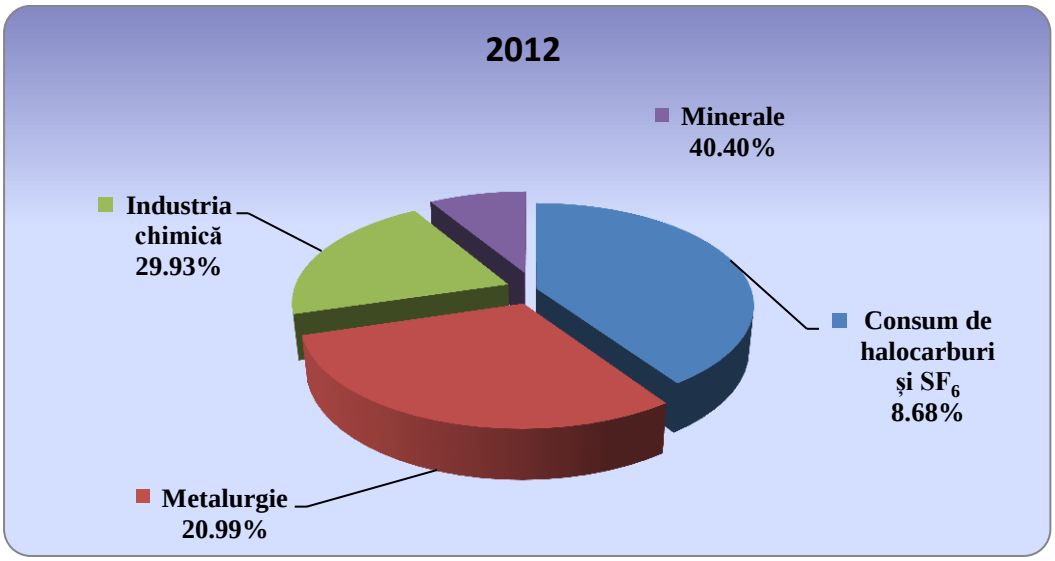
The **Industrial Process Sector** contributes with 10,42% to the total GHG emissions generated in 2012. For this area a decrease by 65,10% of the GHG emissions is recorded compared with the reference year (fig. 7.1.16), the reason of the decrease being represented by the decline or stoppage of some industrial activities.

The contribution of the sub-sectors to the GHG emissions assigned to the energy sector is as follows: production of minerals (cement, lime, chalkstone and dolomite, soda, glass etc.) 40,40%, metallurgic industry 20,99%, chemical industry 29,93%, use of halocarbide-based devices 8,68% (fig.7.1.17).

Graph 7.1.16. Trends of the GHG emissions in the Industrial Process Sector , 1989-2012 (in thousands CO_2 to equivalent)

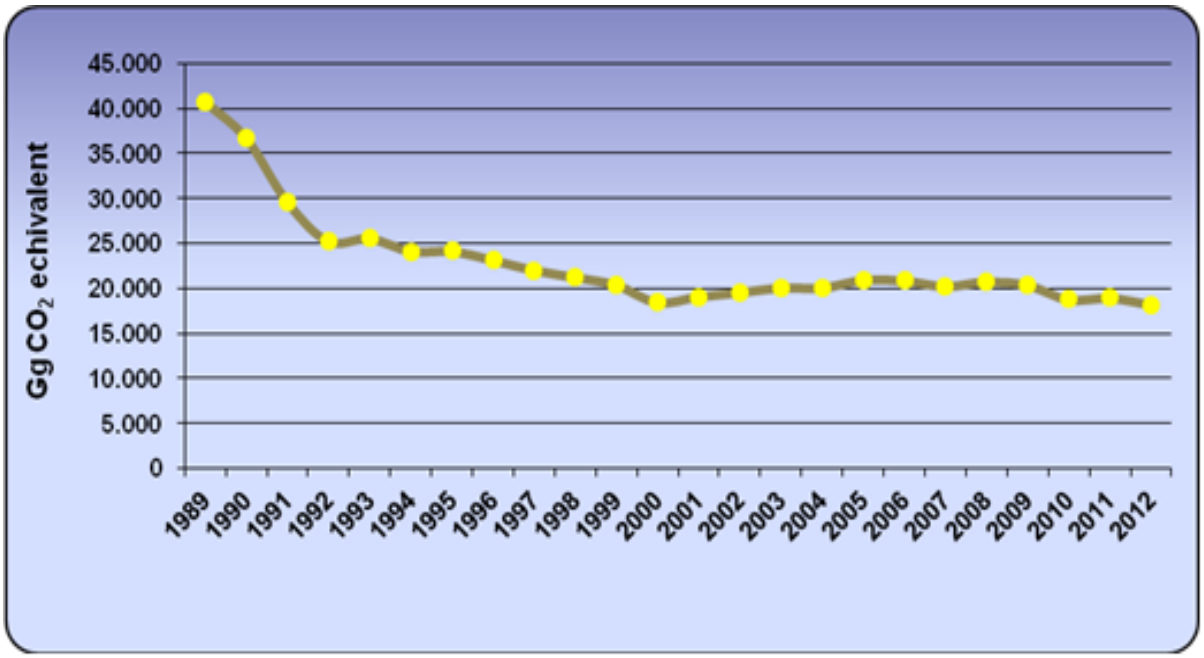


Graph 7.1.17. The contribution of the sub-sectors to the total emissions of the Industrial Process sector, at the level of 2012 (%)

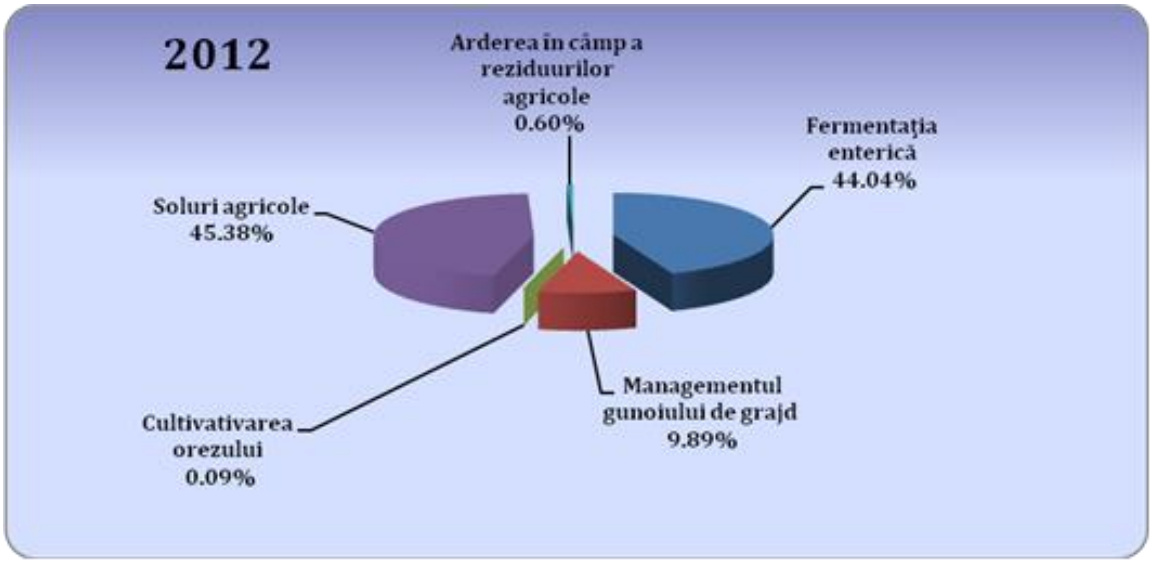


The **Agriculture** area contributes with 15.31% to the total emissions generated at national level in 2012. For this area, the level of GHG emissions has registered a decrease by 55.35% compared with the year of reference (fig. 7.1.18). The contribution of the sub-sectors to the GHG emissions assigned to the energy sector is as follows: agricultural soils 45,38%, enteric fermentation 44,04%, manure management 9,89%, burning the agricultural waste on the field 0,60%, rice cultivation 0,09% (fig.7.1.19).

Graph 7.1.18. Trends of the GHG emissions in the Agriculture Sector, 1989-2012 (in thousands CO_2 to equivalent)



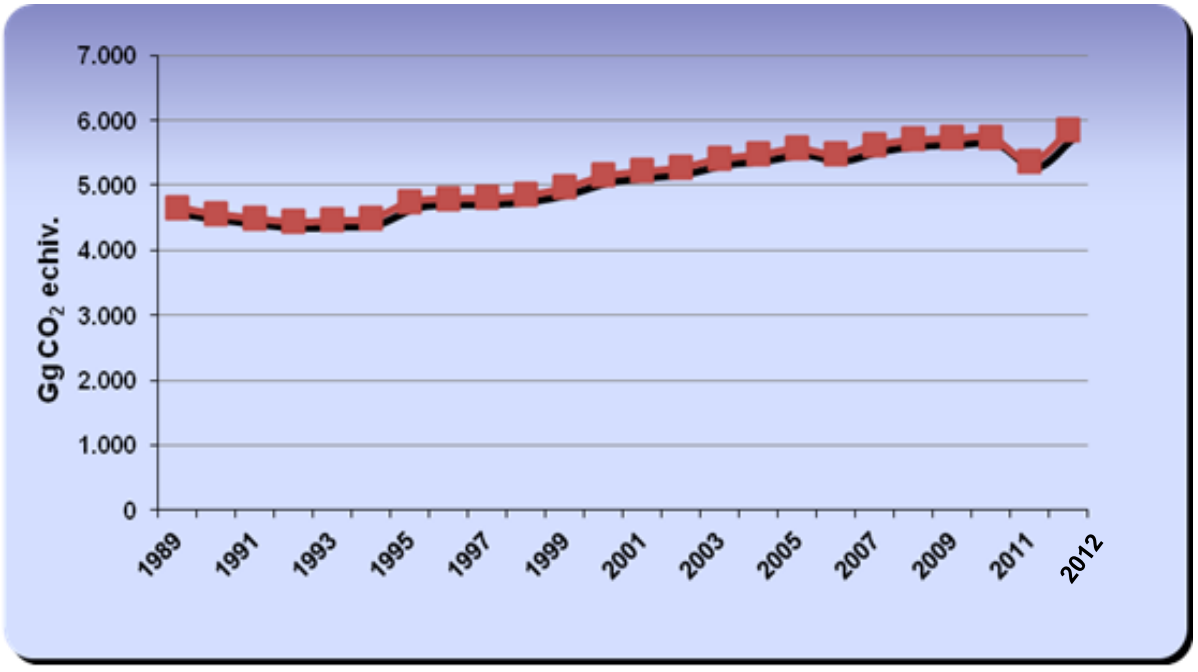
Graph 7.1.19. The contribution of the sub-sectors to the total emissions of the Agriculture Sector, at the level of 2012 (%)



For the **LUCLFU area**, the GHG quantity absorbed has increased by 34,35% in 2012, compared with the reference year of 1989. The CO_2 absorptions increased in forestland areas, while the CO_2 emissions from the land areas converted into human establishments decreased compared against the values of 1989.

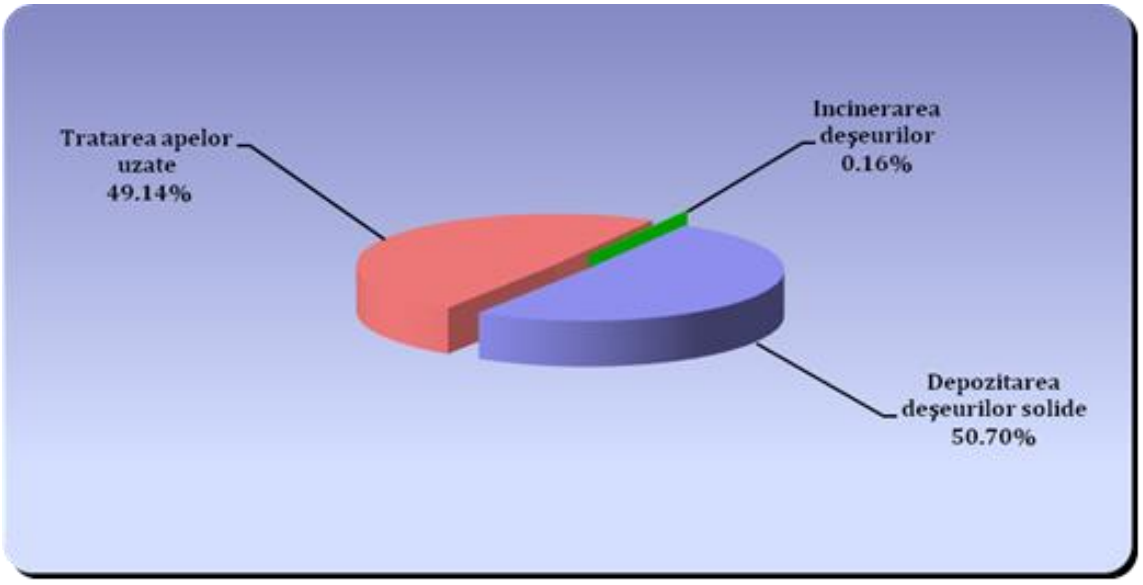
The emissions from the sector Wastes increased by 14.91% compared with the reference year 1989 (fig. 7.1.20), due to the increase of the population's consumption, increase of the arranged storage areas and of the number of persons with residence connected to the national sewing system. The contribution of this area to the total GHG emissions is of 4.93% (fig. 7.1.21).

Graph e 7.1.20. Trends of the GHG emissions in the Waste Sector, 1989-2012
(*in thousands CO_2 to equivalent*)



The most important sub-sectors with regard to the greenhouse gases emissions, in the **Wastes Sector** are as follows: solid wastes storage, with a contribution of 50.70%, and wastewaters treatment, contribution of 49.14% of the total emissions in this sector.

Graph 7.1.21. The contribution of the sub-sectors to the total emissions of the Waste Sector, at the level of 2012 (%)



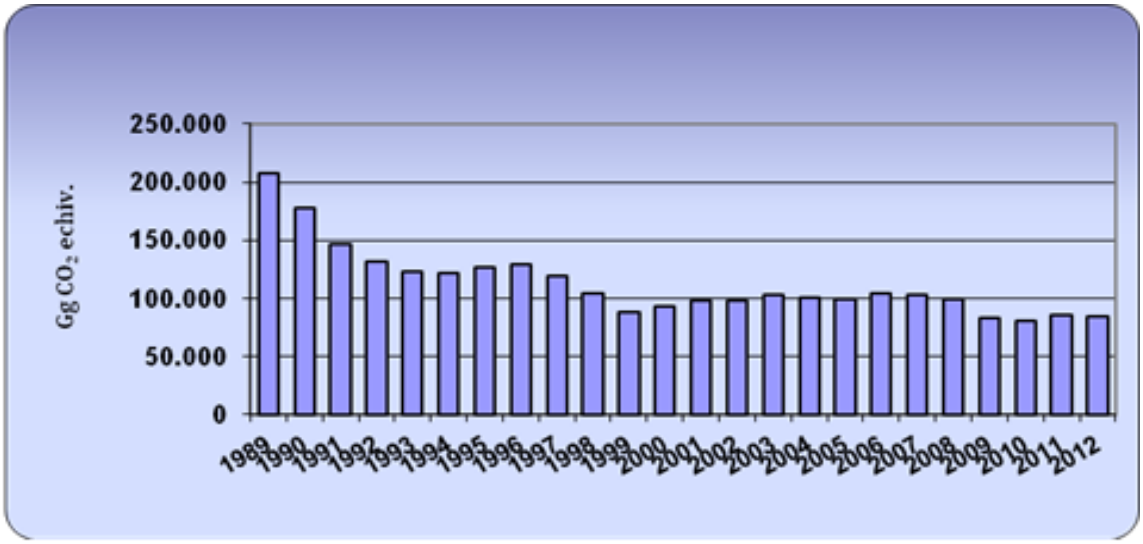
Annual emissions of carbon dioxide

The most significant GHG gas is the carbon dioxide (CO_2). The decrease of the CO_2 emissions from 207,007.45 thousand to in 1989, to 83,860.59 thousand to in 2012, is caused by the decrease of fossil fuels consumption in the energy sector, especially in the energy and heat production in the public sector and in the industrial sector of processing and constructions, as a consequence of the fact that the amplitude of the activities in these areas has significantly decreased. The annual carbon dioxide emissions levels are shown in table 7.1.3. and figure 7.1.22.

Table 7.1.3. Level of the annual carbon dioxide emissions 2000-2012, (Thousands CO_2 to)

Year	CO_2 Emissions (excluding LULUCF)
2000	92856,95
2001	97850,78
2002	98331,41
2003	102229,40
2004	99910,29
2005	99286,38
2006	103978,94
2007	103234,98
2008	99417,74
2009	82810,67
2010	79879,81
2011	85604,53
2012	83860,59

Graph 7.1.22. Level of the annual carbon dioxide emissions, 1989-2012
(*thousands CO_2 to equivalent, without LULUCF*)



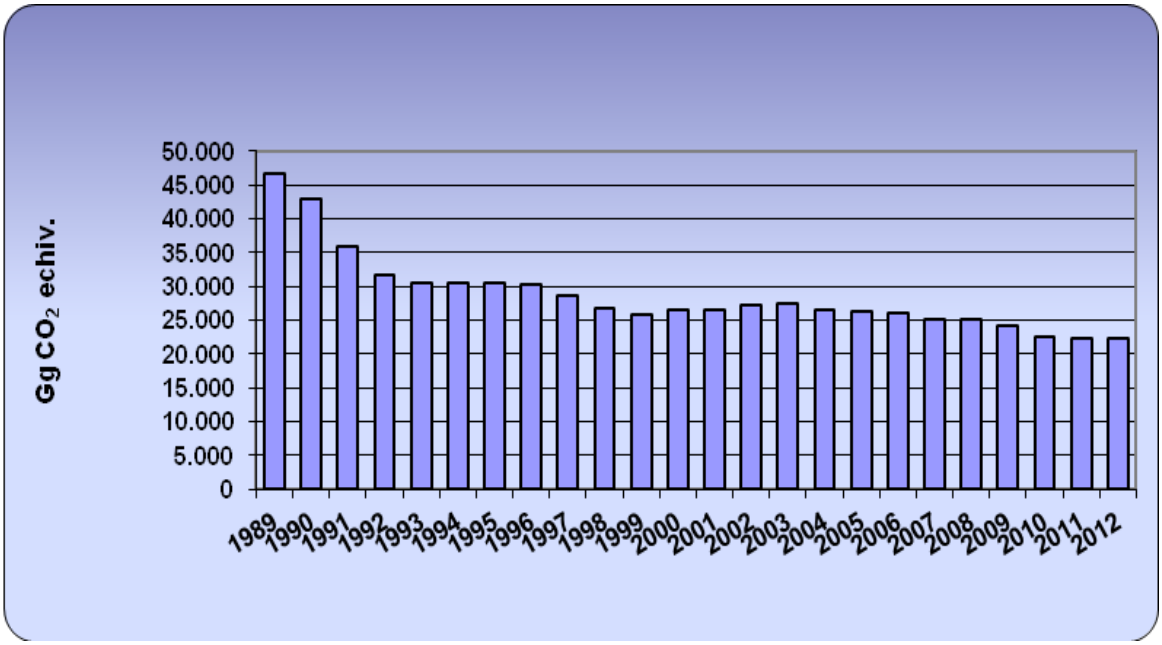
Annual methane emissions

The level of the methane emissions (CH_4), generated mainly in the activities of mining and distribution of fossil fuels and animals breeding, have decreased within the period 1989 – 2012, more abrupt during the last four years of the period. The decrease in 2012, compared against the level of the reference year 1989, is of 52.25% (table 7.1.4. figure7.1.23.).

Table 7.1.4. The annual levels of methane emissions within the period 2000 - 2012,
(*thousands CH_4 to*)

Year	CH_4 Emissions (excluding LULUCF)
2000	26414.60
2001	26436.54
2002	27231.49
2003	27330.28
2004	26428.82
2005	26367.73
2006	26036.06
2007	24983.63
2008	25113.22
2009	24070.60
2010	22590.41
2011	22231.37
2012	22237.24

Figure 7.1.23. The levels of the methane emissions 1989-2012
(*thousands CO_2 to equivalent, without LULUCF*)



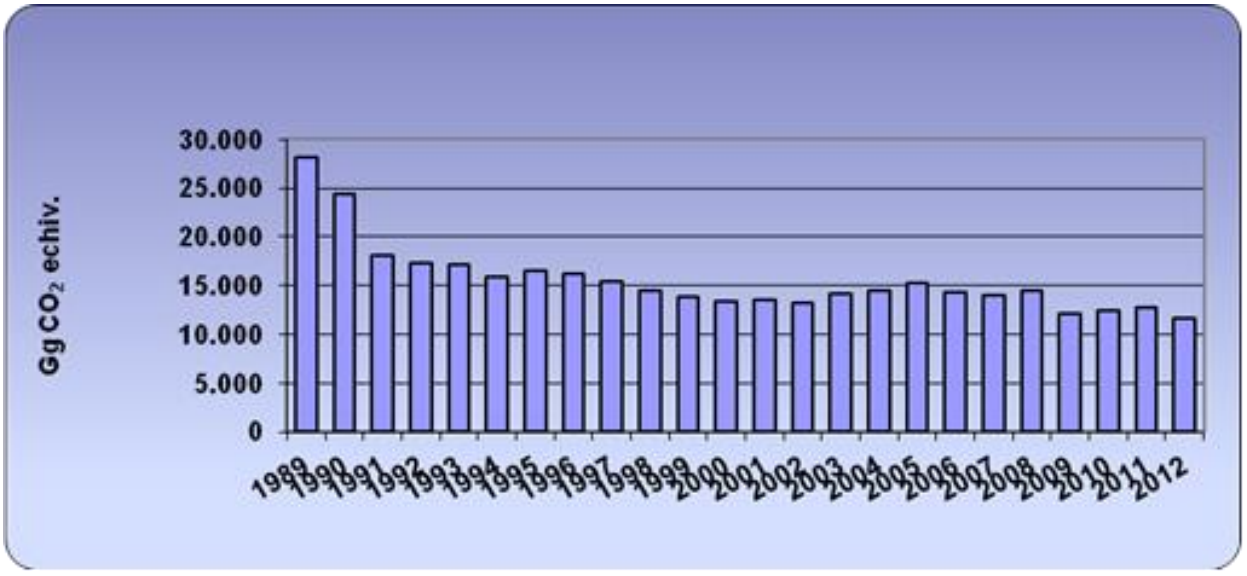
The annual emissions of nitrous oxide

The emissions of nitrous oxide (N_2O) mainly result from Agriculture – soils and Industrial Processes sector – chemical industry. The decline of these activities reflects in the evolution of the N_2O emissions level. Among the GHG, the level of this emission registers the most significant decrease: 58,78 %, in 2012 compared against the reference year 1989 (table 7.1.5 figure 7.1.24.).

Table 7.1.5 The levels of the nitrous oxide annual emissions,
within the period 2000-2011 (*thousands N_2O to*)

Year	**N_2O Emissions** (excluding LULUCF)
2000	13439.88
2001	13579.19
2002	13259.15
2003	14188.87
2004	14480.30
2005	15242.04
2006	14264.13
2007	13957.87
2008	14412.51
2009	12188.04
2010	12417.89
2011	12682.66
2012	11585.82

Graph 7.1.24. The levels of the nitrous oxide emissions, 1989-2012
(*thousands to N_2O equivalent, without LULUCF*)



Annual emissions of fluorinated gases

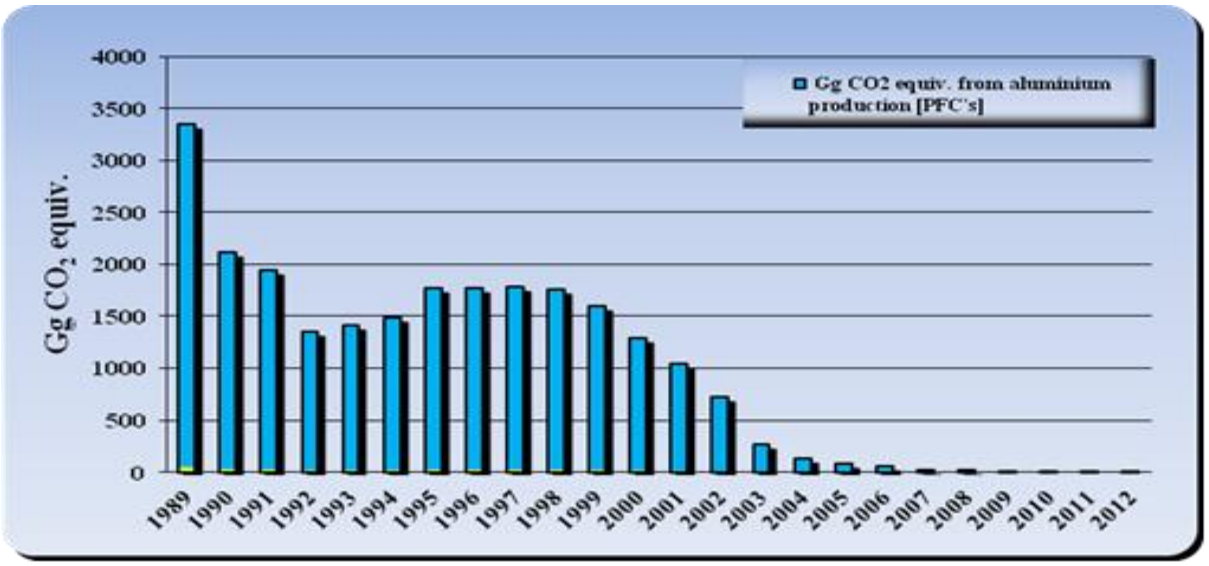
The emissions tendency of PFC coming from the aluminium production (estimated for the period 1989-2012) reflects very suggestively the used technological process in the primary aluminium production as follows: for the period 1989-1996 the technological process called SWPB was used -Side Worked Pre-baked (Anodic, pre-baked, side worked cells) for the obtaining of the primary aluminium; for the period 1997-2002 at the same time two different technological processes (SWPB and CWPB) in different proportions were used, aspect marked also through the decreasing tendency of the PFC emissions; for the period 1997-2012 only CWPB technologic process - Centre Worked Pre-baked (Anodic, pre-baked, centre worked cells) was used, technology that led to a significant decrease of the PFC emissions. The PFC emissions have been calculated basis the annual production of primary aluminium and the involved emissions factors considering the information related to the type of technological process used during time.

Compared against 1989, the PFC emissions from the aluminium production decreased in 2012 by 99.80% (table 7.1.6, graph 7.1.25)

Tabel 7.1.6. Annual PFC emissions, resulting from
the aluminium production, between 2000 – 2012

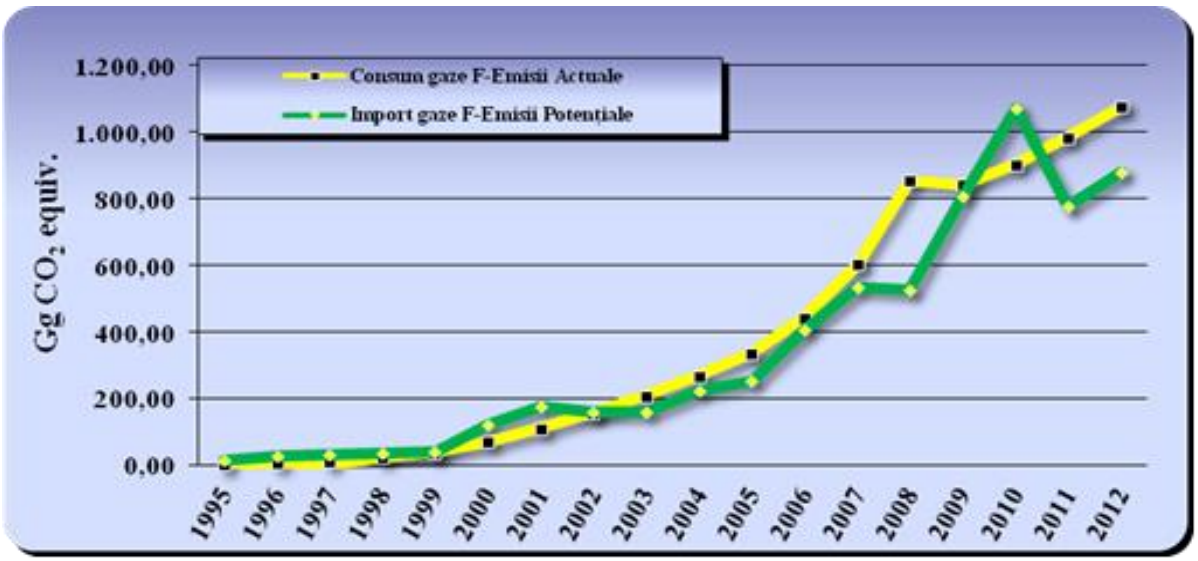
Year	**PFC Emissions** *(in thousands CO_2 to equivalent)*
2000	1292.10
2001	1044.20
2002	717.86
2003	261.50
2004	132.12
2005	81.81
2006	55.01
2007	24.20
2008	15.34
2009	7.00
2010	7.84
2011	10.92
2012	6.38

Grafic 7.1.15. Level of PFC emissions from the aluminium production 1989-2012
(Gg CO_2 equivalent, without LULUCF)



Estimations of the HFC, PFC and SF_6 emissions, from consumption and their import for the cooling appliances, air-conditioned equipment, electrical equipment as well as other activities, were made for the period 1995 - 2012. In general, the tendency of such gases followed the evolution of the Gross Domestic Product. Therefore, the increasing tendency between 1995 and 2008 was due to the GDP rising evolution (fig. 7.1.26). Instead, in the period 2009-2012, the GDP decrease significantly influenced the level of F gases emissions.

Graph 7.1.26. The tendency of the F gases emissions generated by the consumption and import of HFC, PFC and SF_6 *(Gg CO_2 equivalent, without LULUCF) 1989 - 2012*



7.2. AGGREGATED DATA ON GHG EMISSIONS PROJECTIONS

One of the major priorities in the field of environment protection is represented by the increase of life and environment's quality within the human communities and the reduction of the gap existing compared with the other EU country as well as the development regions. This supposes the decrease of the risk of natural disasters and the increase of the safety degree of the citizens, conservation of biodiversity and national inheritance and promoting a more efficient economy in terms of resources use, more ecological and more competitive.

In this context, it is necessary the correlation of the economical development diversity with the major objective regarding the fighting against climate changes, in order to support the passing to a low carbon emissions economy but also the setting into practice of the sustainable development principles in all area policies.

The reduction of GHG emissions with at least 20% compared with the level of 1990 is a target already assumed by the EU Member States as part of the objective "20/20/20" of the law package "Energy – Climate Changes", agreed by the chiefs of the states and governments at the European Council on December 13, 2008. A more ambitious commitment of reducing the GHG emissions with 30% may be assumed conditioned, until 2020, the conditionality being related by the signing of a global and comprehensive agreement for the period after 2012 through which the others international actors will undertake comparable commitments also for covering the necessary costs for the less developed member states (including Romania) from European financing.

The starting point for setting up the target for GHG emissions reduction until 2020 was the Study on the elaboration on national and sector level of the sulphur dioxide, nitrogen oxides, organic volatile compounds, ammonium, greenhouse effect powders and gases emissions prognosis for the years 2010,2015, 2020, elaborated at the level of the Ministry of Environment and Forestry. Its objective was always the long and medium-term prognosis regarding:

- the GHG emissions (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6);
- the emissions of sulphur dioxide, nitrogen oxides, organic volatile compounds, ammonium and powders.

The prognosis regarding the economic development of Romania between 2007-2020, elaborated by the National Prognosis Committee considered at the elaboration of the *Energetic Strategy of Romania for the period 2007-2020* was the base for defining the main macro-economic indicators necessary in order to establish the evolution of the GHG emissions.

The GHG prognosis was based on three *scenarios*:

1. the reference scenario *„business as usual" (BAU*), which does not include special activities for the reduction of GHG emissions ("*scenario without measures – BA);*
2. indicators but which includes policies and programmes for the reduction of GHG emissions ("*scenario with measures*");
3. scenario with additional measures – similar to the reduction scenario but which includes programmes with additional measures for the reduction of the GHG emissions ("*scenario with additional measures*").

For each sector of the National Inventory of GHG Emissions (NIGHGE) there have been identified the technological processes which cause GHG emissions and the options for their reduction.

The trajectory of the national GHG emissions reduction target with 20% compared against the reference year 1989 established by Romania through the National Reformation Programme 2012-2013 in the context of 2020 Strategy is showed in 7.2.1.

Table 7.2.1. The trajectory of the GHG emissions until 2030

Indicator	U.M.	2015	2020	2025	2030
„without measures" scenario					
Total GHG emissions (excluding LULUCF)	*Gg CO_2 echivalent*	127975,42	140509,80	149277,56	160193,77
„with measures" scenario					
Total GHG emissions (excluding LULUCF)	*Gg CO_2 echivalent*	123534,87	132910,80	141321,46	147457,43
„With additional measures" scenario					
Total GHG emissions (excluding LULUCF)	*Gg CO_2 echivalent*	121144,74	129891,53	136829,75	143891,06
GHG reduction percent (excluding LULUCF) – EU level 27	%	-	-20,00	-	-20,00

PROJECTIONS OF CO_2 EMISSIONS

Table 7.2.2. shows the tendency of the CO_2 emissions for the period 2015-2030 for the scenario "without measures, business as usual - BAU". The sub-sector "Fuels burn" is responsible for about 84% of the total CO_2 emissions, the Industrial Processes Sector contributes with about 15% while 60% of the total CO_2 emissions are generated in the EU-ETS trading schemes.

Table 7.2.2. The evolution of the CO_2 emissions for the scenario "without measures - BAU", 2015-2030

Emissions source	Estimated CO_2 emissions (Gg)			
	2015	2020	2025	2030
Energy	**75,747.25**	**80,575.27**	**81,720.59**	**84,083.74**
A. Fuels burning	75,097.25	79,925.27	81,070.59	83,433.74
1. Energy industry	31,636.70	31,834.42	31,344.24	31,200.90
Of which bellow EU-ETS	30,741.38	30,933.50	30,457.20	30,317.92
2. Processing and constructions industry	15631,01	17289,81	17864,01	18502,01
Of which bellow EU-ETS	8284,44	9163,60	9467,93	9806,07
3. Transport	16645,88	18412,39	19023,87	20398,13
4. Other sectors	10883,66	12038,66	12438,47	12882,70
Of which bellow EU-ETS	4244,63	4695,08	4851,00	5024,25
Industrial processes	**13,132.15**	**16,242.67**	**18,888.49**	**21,453.82**
Of which bellow EU-ETS	11,645.59	14,404.00	16,750.32	19,025.25
Solvents and other products used	**132.54**	**147.48**	**170.97**	**206.02**
5. Land use, land use change and Forestry (LULUCF)	**-26,644.30**	**-28,028.25**	**-21,983.28**	**-18,872.85**
Wastes	**11.70**	**13.31**	**15.15**	**17.23**
Totale CO_2 emissions	**89023,65**	**96978,73**	**100795,20**	**105760,81**
Of which under EU-ETS	**52,309.52**	**56,313.04**	**58,547.57**	**61,102.11**

The tendency of the CO_2 emissions for the period 2015-2030 for the scenarios "*with measures*" and "*with additional measures*" are showed in tables 7.2.3. and 7.2.4. The CO_2 emissions in 2020 are bigger than those in the year of reference only for the "*scenario without measures* - BAU". For the alternative scenarios these emissions are lower with about 6% and 12% compared with 1989.

Table 7.2.3. The evolution of the CO_2 emissions for the scenario "*with measures*" 2015-2030

Emissions source	Estimated CO_2 emissions (Gg)			
	2015	2020	2025	2030
Energy	**75,203.68**	**79,354.96**	**80,248.25**	**82,115.18**
A. Fuels burning	74,625.93	78,785.07	79,664.49	81,508.33
1. Energy industry	31,636.70	31,834.42	30,971.17	30,855.46
2. Processing and constructions industry	15,471.21	17,119.08	17,694.69	18,263.50
3.Transport	16,501.61	18,109.51	18,692.42	19,737.55
4. Other sectors	10,716.41	11,372.06	11,906.21	12,201.82
Industrial processes	**12,647.00**	**15,722.62**	**18,304.76**	**20,832.44**
Solvents and other products used	**130.36**	**144.20**	**165.55**	**192.23**
5. Land use, land use change and Forestry (LULUCF)	**-17,695.95**	**-19,192.57**	**-11,406.98**	**-9,128.35**
Wastes	**11.70**	**13.31**	**15.15**	**17.23**
Totale CO_2 emissions	**87,992.75**	**95,235.10**	**98,733.71**	**103,157.08**
Of which under EU-ETS	**51,778.37**	**55,741.07**	**57,556.89**	**60,055.87**

Table 7.2.4. The evolution of the CO_2 emissions - scenario "*with additional measures*" *2015-2030*

Emissions source	Estimated CO_2 emissions (Gg)			
	2015	2020	2025	2030
Energy	**73,613.65**	**78,301.13**	**79,413.68**	**80,769.84**
A. Fuels burning	73,048.93	77,743.04	78,843.94	80,176.09
1. Energy industry	31,636.70	31,443.45	30,844.31	30,271.41
2. Processing and constructions industry	15,306.67	16,954.54	17,457.13	18,025.93
3.Transport	15,287.04	17,884.73	18,467.63	19,542.00
4. Other sectors	10,518.52	11,110.32	11,674.87	11,886.75
Industrial processes	**12,647.00**	**15,722.62**	**18,304.76**	**20,832.44**
Solvents and other products used	**128.91**	**142.60**	**163.70**	**190.70**
5. Land use, land use change and Forestry (LULUCF)	**-17,954.43**	**-17,855.81**	**-9,897.14**	**-7,314.09**
Wastes	**11.70**	**13.31**	**15.15**	**17.23**
Totale CO_2 emissions	**86,401.26**	**94,179.66**	**97,897.29**	**101,810.20**
Of which, under EU-ETS LULUCF)	**51,653.13**	**55,255.73**	**57,283.37**	**59,338.69**

PROJECTIONS OF CH4 EMISSIONS

In 2015, the Energy Sector is estimated to generate 39% of the total emissions of CH_4, Wastes Management 24% and Agriculture 36%, these proportions being almost constant on the period 2015-2030. Therefore, these sectors are the target of the CH_4 emissions reduction measures.

Table 7.2.5. The evolution of CH_4 emissions for the scenario "without measures - BAU" *2015-2030*

Emissions source	Estimated CH_4 emissions (Gg CO_2 equivalent)			
	2015	2020	2025	2030
Energy	**455.16**	**511.07**	**570.40**	**651.80**
A. Fuels burning	51.35	56.98	59.25	61.80
1. Energy industry	0.57	0.57	0.57	0.56
2. Processing and constructions industry	1.35	1.49	1.54	1.59
3.Transport	1.97	2.18	2.26	2.42
4. Other sectors	44.96	49.74	51.39	53.22
Industrial processes	403.81	454.09	511.15	590.00
Solvents and other products used	**0.68**	**0.73**	**0.82**	**0.89**
5. Land use, land use change and Forestry (LULUCF)	**421.38**	**463.46**	**503.64**	**553.77**
Wastes	0,00	0,00	0,00	0,00
Emissions source	**278.33**	**295.38**	**310.58**	**323.80**
Total CH_4 emissions	**1,155.55**	**1,270.64**	**1,385.43**	**1,530.25**

Table 7.2.6. The evolution of CH_4 emissions for the scenario "with measures" 2015 -2030

Emissions source	Estimated CH_4 emissions (Gg CO_2 equivalent)			
	2015	2020	2025	2030
Energy	**410.23**	**454.71**	**517.88**	**612.19**
A. Fuels burning	51.30	56.58	58.83	61.35
1. Energy industry	0.57	0.57	0.56	0.56
2. Processing and constructions industry	1.33	1.47	1.52	1.58
3.Transport	1.96	2.15	2.22	2.36
4.Other sectors	44.94	49.39	51.03	52.85
B. Fugitive emissions from fuels	358.93	398.13	459.05	550.84
Industrial processes	**0.58**	**0.62**	**0.69**	**0.75**
Agriculture	**421.38**	**423.71**	**426.68**	**426.51**
5. Land use, land use change and Forestry (LULUCF)	0,00	0,00	0,00	0,00
Wastes	**214.64**	**196.71**	**189.48**	**172.77**
Total CH_4 emissions	**1,046.83**	**1,075.75**	**1,134.73**	**1,212.22**

Table 7.2.7. The evolution of CH_4 emissions for the scenario "with additional measures", 2015-2030

Emissions source	Estimated CH_4 emissions (Gg CO_2 equivalent)			
	2015	2020	2025	2030
Energy	**401.95**	**446.40**	**506.79**	**600.21**
A. Fuels burning	51.12	56.51	58.76	61.27
1. Energy industry	0.57	0.57	0.56	0.55
2. Processing and constructions industry	1.32	1.46	1.51	1.56
3.Transport	1.81	2.12	2.19	2.34
4.Other sectors	44.92	49.36	51.00	52.82
B. Fugitive emissions from fuels	**350.83**	**389.89**	**448.03**	**538.94**
Industrial processes	**0.58**	**0.62**	**0.69**	**0.75**
Agriculture	**411.82**	**403.97**	**403.81**	**394.13**
5. Land use, land use change and Forestry (LULUCF)	0,00	0,00	0,00	0,00
Wastes	**195.02**	**175.75**	**163.84**	**149.77**
Total CH_4 emissions	**1,009.37**	**1,026.74**	**1,075.13**	**1,144.86**

PROJECTIONS OF THE N_2O EMISSIONS

The prognosis of the N_2O emissions for the period 2012-2030 is shown in tables 7.2.8, 7.2.9, 7.2.10. The agriculture is the main source of the N_2O emissions (with about 70% of the total N_2O emissions), followed by the industrial processes (with about 20%).

Table 7.2.8 The evolution of the N_2O emissions for the scenario "without measures-BAU", 2015-2030

Emissions source	Estimated N_2O emissions (Gg CO_2 equivalent)			
	2015	2020	2025	2030
Energy	**1.64**	**1.78**	**1.83**	**1.91**
A. Fuels burning	1.64	1.77	1.82	1.90
1. Energy industry	0.38	0.38	0.37	0.37
2. Processing and constructions industry	0.10	0.12	0.12	0.12
3.Transport	0.50	0.55	0.57	0.61
4.Other sectors	0.61	0.67	0.69	0.72
Industrial processes	**4.11**	**4.40**	**4.94**	**5.35**
Agriculture	**37.64**	**43.66**	**50.65**	**58.75**
Wastes	**2.18**	**2.21**	**2.19**	**2.18**
Total N_2O emissions	**45.57**	**52.05**	**59.61**	**68.19**

Table 7.2.9. The evolution of the N_2O emissions for the scenario "with measures" 2015-2030

Emissions source	Estimated N_2O emissions (Gg CO_2 equivalent)			
	2015	2020	2025	2030
Energy	**1.64**	**1.76**	**1.81**	**1.89**
A. Fuels burning	1.63	1.76	1.80	1.88
1. Energy industry	0.38	0.38	0.37	0.36
2. Processing and constructions industry	0.10	0.11	0.12	0.12
3.Transport	0.49	0.54	0.56	0.60
4.Other sectors	0.61	0.67	0.69	0.72
Industrial processes	**3.48**	**3.73**	**4.19**	**4.55**
Agriculture	**34.64**	**38.66**	**45.65**	**48.43**
Wastes	**2.18**	**2.21**	**2.19**	**2.18**
Total N_2O emissions	**41.94**	**46.37**	**53.84**	**57.05**

Table 7.2.10. The evolution of the N_2O emissions for the scenario "with additional measures" 2015-2030

Emissions source	Estimated N_2O emissions (Gg CO_2 equivalent)			
	2015	2020	2025	2030
Energy	**1.60**	**1.75**	**1.79**	**1.87**
A. Fuels burning	1.59	1.74	1.79	1.87
1. Energy industry	0.38	0.37	0.36	0.36
2. Processing and constructions industry	0.10	0.11	0.11	0.12
3.Transport	0.46	0.54	0.55	0.60
4.Other sectors	0.61	0.67	0.69	0.71
Industrial processes	**3.48**	**3.73**	**4.19**	**4.55**
Agriculture	**34.64**	**35.66**	**41.65**	**45.85**
Wastes	**2.18**	**2.21**	**2.19**	**2.18**
Total N_2O emissions	**41.90**	**43.35**	**49.83**	**54.45**

F - GASES PROJECTIONS (HFC, PFC AND SF_6)

Table 7.2.11. Shows the levels of the HFC, PFC and SF_6 emissions from the chemical and production industry. The projections of these emissions have been established by extrapolation using the numbers of the NIGHGE from the period 2000-2006 considering the difficulties of estimating the activity data for the areas which are emissions sources.

Table 7.2.11. The evolution of HFC, PFC and SF_6 emissions, 2015-2030

GES/Year	Estimated			
	2015	2020	2025	2030
HFCs Emissions	540.80	690.22	880.91	1,124.29
PFCs Emissions	11.15	14.23	18.16	23.18
SF_6 Emissions	5.58	7.12	9.08	11.59
Total HFCs, PFCs and SF_6 Emissions	**557,53**	**711,57**	**908,15**	**1159,06**

7.3. SCENARIOS REGARDING THE CLIMATE CHANGE IN ROMANIA

In order to simulate the characteristics of the global climatic system and to plan the system's response to scenarios of the external factors (natural or anthropic) influence the atmosphere-ocean general circulation models (AOGCM) are used. The models offer information on the regional climate and the climate change at regional level. The spreading degree of the estimations obtained within an assembly of more AOGCMs is used to characterize the uncertainties in the planning of climate change. A greater spreading (in terms of both intensity of change, as well as the increase or decrease signal) shows a greater uncertainty. The average of the changes on an assembly of multi-models is considered the optimal value. (in accordance with IPCC Report 2007).

Due to its complexity, the horizontal resolution of the atmosphere component of these global patterns is somewhere between 400-125 km, which is enough for the practical necessities regarding the study of the impact the climate change has on different ecosystems.

For downscaling compared to AOGCM pattern, there are 2 methods used, mentioned including in the last IPCC Report in 2007:

1. ***dynamic method*** represented by regional climate models (RegCM) which are connected to the side conditions with the global climate models;
2. ***statistical method***, which is based on statistic relations, established basis the observations data between the climate variations at local / regional scale and atmosphere variable (at a bigger scale). In both cases the quality of the products obtained through downscaling depends on the quality of global models. Both methods have advantages and disadvantages therefore for a certain region it is considered ideal two use the two methods in order to better estimate the uncertainties.

The projections regarding the climate change in Romania (water temperature and precipitations) for the period 2001-2030 compared with the period 1961-1990 have been carried on through two methods of

downscaling applied to some global climate models (AOGCM) or regional (RegCM), under the conditions of the **IPCC A1B** emission scenario which to involve a weighted rate IPCC of increase of the GHG concentration for 21st century.

A1B scenario involves a future where the economy will grow rapidly, the global population will continue to increase until the end of the century and afterwards a decrease will be registered and new technologies will be set into practice rapidly. This scenario supposes an equilibrium regarding the use of the energy source (fossil fuels and alternative energy), meaning that it will not be used only one source of energy, the entire energy supply chain benefiting of similar levels of technological increase.

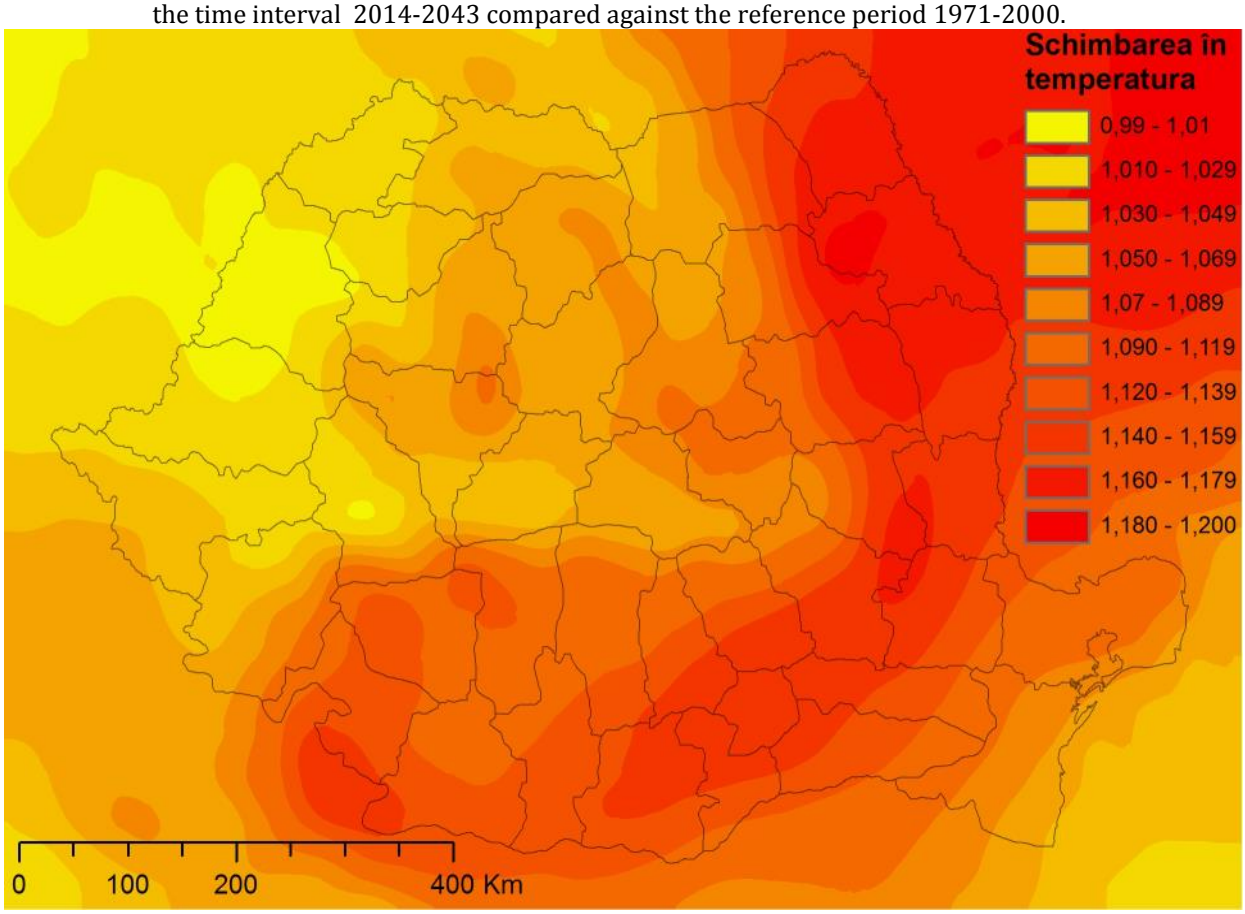
The climate scenarios presented within this paper represents a synthesis of a research study made by the National Administration of Meteorology and financed by the Ministry of Environment.

In accordance with the 4th Evaluation Report of IPCC published in 2007 the differences between the climate scenarios for the beginning of the 21st century based on different GHG emissions scenario are insignificant. The differences increase, as we get closer to the end of the 21st century. The changes of the climate parameters mentioned for the period 2001-2030 are calculated as differences between their average value for the period 2001-2030 and the average value for the period 1961-1990.

7.3.1. TEMPERATURES INCREASES DURING 2014-2043

The climatic models simulate the evolution of the global climatic system given the rise of the GHG atmospheric concentration, based on the physics laws, using numeric methods. The horizontal spatial resolution of the atmospheric component of such global models is still coarse enough (from 400 Km to 125 Km), which might be insufficient for some practical necessities related to the regional and local impact of the climate change. In order to obtain information at a finer scale, regional climatic models (dynamic downscaling) and statistical methods for regional and local scale projection (statistic downscaling) might be used.

Figure 7.3.1 The increase if multi-annual average temperature (ºC) during the time interval 2014-2043 compared against the reference period 1971-2000.



(A set of numerical experiments averages with 11 regional models were used, under scenario A1, the European project FP6 ENSEMBLES)

The climatic scenarios are created based on projections of the global increase of greenhouse gas emissions and aerosols, which are conditioned by socio-economic factors (population increase, economic development, anticipated technological changes).

A1B emissions scenario type (IPCC, 2007) assumes a moderate increase in the concentration of greenhouse gases for the 21st century. A2 emissions scenario assumes an accelerated rate of growth of greenhouse gas concentrations for the 21st century. Scenario B1 is a more integrated world and more environmentally friendly in terms, which translates to more, lower greenhouse gas emissions compared to scenarios A1B and A2, which is especially a world with a sustained increase in global population and other indices of development that result in the highest emissions (in 2100) of IPCC SRES scenarios. In preparing the Report of the Fifth Intergovernmental Panel on Climate Change study (IPCC), 4 new scenarios were included, on greenhouse gas concentrations: RCP2.6, RCP4.5, RCP6, and RCP8.5. They differ by increases in global radiative projected to be reached at the end of the century (2.6 W / m2, 4.5 W / m2, 6 W / m2 and 8,5W / m2). The differences between climate scenarios are small at the beginning of the project, but they increase as we approach the end of 21st century.

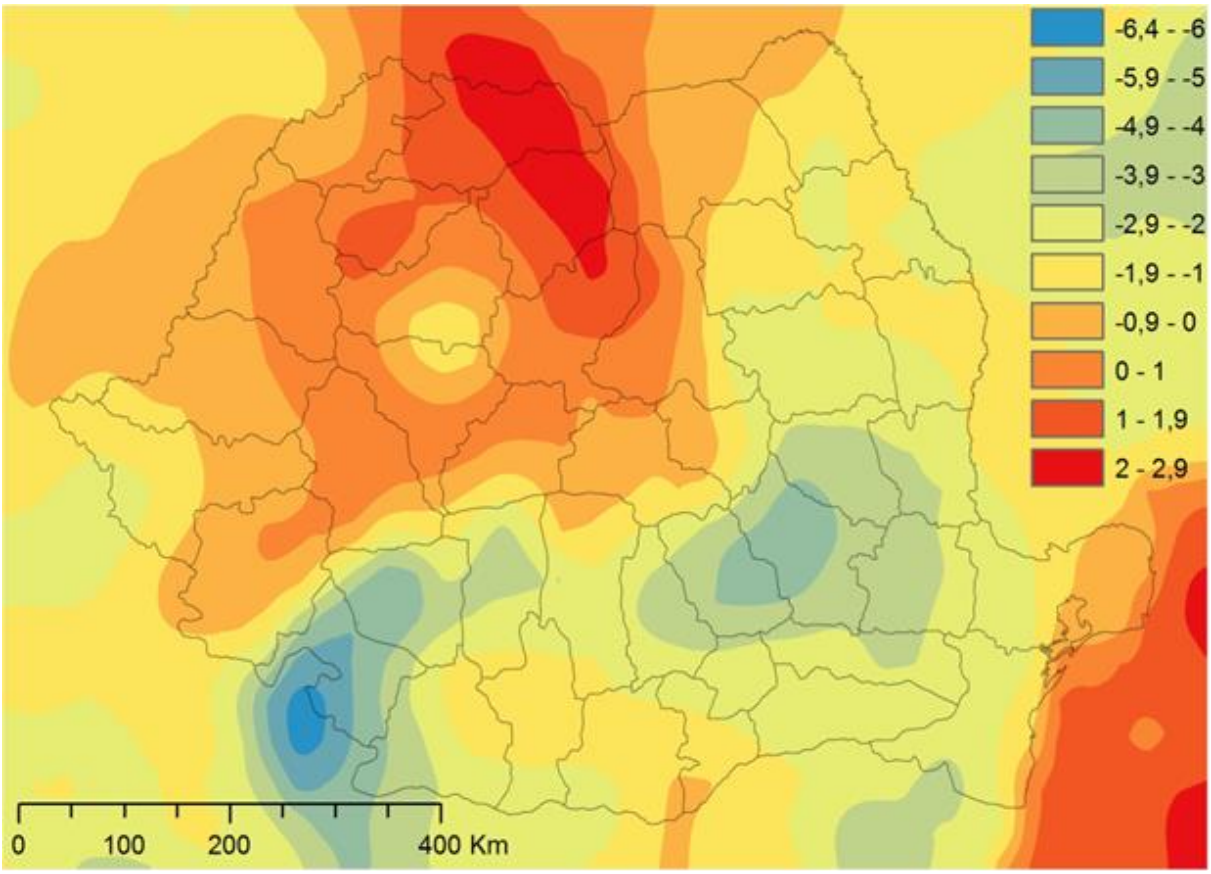
Another concept used in climate modeling is the set of numerical experiments with climate models. To limit the uncertainties related to the way models were built and their variability, they are not used to estimate climate change results of a single experiment with a single model. An average calculated using the results of a series of numerical experiments with several models is considered to minimize inherent uncertainties regarding characteristics of the models used (IPCC, 2007) and it will be used below.

Estimates of average annual temperature change using the average of a set of 11 regional experiments is illustrated in Figure 7.1.1 for Romania and is based on the generation of models CMIP 3, which led to the fourth report of the Intergovernmental Panel on Climate Change (IPCC) published in 2007. Future projections under A1B scenario suggests that the regions most affected by increasing the annual average temperature are the southern and eastern Romania, even if thermal growth will occur throughout the country.

7.3.2. CHANGES OF THE PRECIPITATIONS MODULES DURING 2014-2043

Estimates of the multiannual average rainfall quantities, using an ensemble average of 11 regional experiments are illustrated in Figure 7.1.1.2 for Romania and is based on the generation of models CMIP 3, which was the basis of the report of the Intergovernmental Panel IV Climate Change (IPCC) published in 2007. It should be noted that uncertainties related to projections of precipitation are higher than in the case of projection temperatures due to local factors that influence in a greater measure precipitation, than temperature. Future projections under A1B scenario suggests that the regions most affected by the reduction of annual precipitation are the Bărăgan and southwestern Romania.

Figura 7.3.2 Difference between Average annual precipitation amounts (in%) corresponding to intervals 2014-2043 and 1971-2000. *(uses the mean value of an assembly of numeric experiments with 11 regional models, under **scenario A1B** (FP6 ENSEMBLES European project).*



7.3.3. WEATHER-RELATED EXTREME EVENTS AND NATURAL DISASTERS

The category of extreme weather events that might cause in Romania important damages or even natural disasters includes phenomena such as: heavy rains/floods, land falls, ice dams on the water courses, hail, electric storms, glazed frost, avalanche, storms, snow storms, dryness, heat waves, cold snaps.

According to the data of the Natural Disasters Insurance Pool (PAID), for Romania, the highest exposure to natural disasters is associated to earthquakes, floods and landfalls, which might cause human casualties and high economic costs across the entire country. PAID is part of the Romanian Catastrophes Insurance Program managed by the Ministry of Internal Affairs and Administration. According to the legal provisions, PAID is managing the mandatory house insurance, covering three basic risks specific for Romania - *earthquake, floods and landfalls.*

The IPCC Special Report on extreme events and disasters risk management for adapting to climate change (IPCC, 2012), suggests that there is an increased frequency of extreme heat episodes, already statistically identified on global data observations of many continental regions (including those in Europe), and the increase may be related to climate change. Working Group II for the Fifth Report of the IPCC has just released findings on the impact of climate change and adaptation required, in March 2014. For Europe, key risks identified to be related to climate change are those relating to river floods, coastal flooding, heat waves, wild fires, droughts (IPCC, 2014).

These conclusions are also valid for Romania. The risks of extreme thermal phenomena (heat waves, wild fires, droughts) are becoming increasingly important as climate change intensifies its signals.

7.4. MEASURES FOR ATTENUATING AND ADAPTING TO THE CLIMATE CHANGES

The main actions included in the Guide on adjusting to the effects of climate changes (2008) are:

I. Improving the existing climate scenarios and evaluating the impact at the level of socio-economic sectors;

A new generation of global climate models (CMIP 5) is to be soon available for the researchers, in their attempt of finding answers that are more detailed and with an improved precision to the questions related to the evolution of the magnitude of the climate change signal at spatial and temporal scales finer and finer. These shall constitute the basis of the 5th Report of the Intergovernmental Group for Climate Changes (IPCC) to be published in 2013-2014. Regional climate models and statistical methods could be applied to the results of the numeric experiments with the new generation of models in order to update the information related to the effect of climate changes in Romania.

II. Developing socio-economic scenarios coupled with the national circumstances and the development policy

Such socio-economic scenarios must be coupled with the climate models through some indices that translate the effect of the climate change in the dynamics of the ecosystems, hydrology, agriculture, energy and water resources management, tourism, health etc.

III. Establishing a new integrated approach in order to understand the inter-sector correlations influencing the physical and socio-economic vulnerability locally;

Integrated approaches target the statistic-dynamic simulation coupling the physical components with those socio-economic ones.

IV. Preparing analyses for establishing the framework related to the adjustment to various levels, in order to supply the contributions to preparing the national legislation on adjustment.

The national, regional and local projections of the integrated approaches shall provide the elements required for planning a durable development, to embed the adjustment to the climate changes with the effects at all levels.

Examples of adjustment actions locally and regionally*:*

- using in agriculture some species withstanding intense and persistent dry seasons, also considering the risk on biodiversity;
- forestation of slopes with risk of floods propagation;
- re-dimensioning the sewage systems in urban agglomerations;
- reducing the losses in the water distribution networks (from 50% now to 20% in 2025);

- re-evaluating the water sources at the level of hydrographical basins and sub-basins under climate changes conditions;
- planning the actions locally and regionally in order to cope with the heat waves mostly affecting people with chronic diseases registered by authorities (heart and lung diseases, psychic diseases).

Examples of adjustment actions nationally:

- evaluating the legislation in order to mitigate the risk of exposure to the effects of the climate changes – consumer protection, alimentation, public health.

Other actions that can be implemented to adapt to climate change are:

- Develop of integrated programs to reduce spoilage and anthropogenic influence on hydrographic basins geomorphology, conservation of the natural flow regime and the preservation of biodiversity , conservation and restoration of natural areas on flood risk areas identified;
- Measures to increase the multiannual regularization of flows;
- Encouraging investment in hydrographic basins infrastructure;
- Supporting the actions to increase the efficiency of water use in agriculture and technological measures to adapt crops to become more resistant to drought and low amounts of water;
- Promoting land use management ;
- Promoting integrated information system on climate change adaptation ;
- Support measures to expand national forest (including forest plantations);
- Promotion of environmental friendly technologies in forestry activities.

7.4.1. USE OF THE MECHANISMS UNDER KYOTO PROTOCOL

The Kyoto protocol establishes the use by the signing Parties, of three flexible mechanisms of international cooperation with the target of reducing the costs of the actions for limiting and reducing the GHG emissions:

- Joint implementation (**JI**);
- Clean Development Mechanism (**CDM**);
- International Emissions Trading (**IET**).

The mechanisms of Kyoto Protocol are "*voluntary*" which means that each country thinks and applies its own policy weather they use them or not. The **JI** and **CDM** mechanisms ensure an emissions reduction by developing specific investments projects in the eligible countries where the conditions for setting up the projects are more convenient.

7.4.2. JOINT IMPLEMENTATION

Romania is successfully involved within the investments project of Joint Implementation by cooperating with different states in order to arrange the transfer of technology for the reduction of the GHG emissions, increase of energy efficiency of the places where these investments are implemented and improvement of environment quality. Thus, ten Memorandums of Understanding (MoU) were signed representing the legal framework for the joint implementation projects with: Switzerland, Holland, Norway, Denmark, Austria, Sweden, France and Italy, Finland and World Bank (within the Prototype Carbon Fund). The list of **JI** projects and the national procedure regarding the use of **JI** mechanism and for the projects approval by the authorities for environment protection are available on the internet address of the Ministry of Environment (www.mmediu.ro).

For Romania, the **JI** projects consist in modernisation, rehabilitation and improvement of the energetic efficiency and the implementation of "*environment friendly technologies*":

- the building of cogeneration plants or changing of some thermal plants in cogeneration plants;
- fuel change in the energy production plants or in the industrial plants and the use of low-carbon fuels;
- rehabilitation of the centralised heating systems
- promoting unconventional energy and building production plants for "Clean energy";
- methane recovery from urban landfills;
- rehabilitating and turning into more efficient plants the groups of thermal plants;
- forestation and/or reforestation of some areas.

The list of the projects promoted within the JI mechanism that received support / approval letters, is presented in bellow table:

Tabel 7.4.2.1 a. List of projects included in the Joint Implementation Mechanism, *that received approval letter*

Nr. crt	Proiecte JI
1	Afforestation of a 7000 ha degraded agricultural land area
2	The "Rumeguş 2000" Project (Întorsura Buzăului, Gheorghieni, Huedin, Vlahiţa, Vatra Dornei)
3	Use of geothermal energy in central heating systems in Oradea and Beius zone 2
4	Rehabilitation CET Timisoara Sud
5	Boiler efficiency increase at Holboca CET Iasi II
6	Improving energy efficiency in district heating systems in Drobeta Turnu-Severin
7	Modernisation of 3 hydros at Porţile de Fier I hydropower
8	Rehabilitation of cement plants Aleşd and Câmpulung
9	Upgrading 4 hydros at Porţile de Fier II hydropower
10	Cogeneration in Târgovişte
11	Biogas recovery from Focşani and Târgu Mureş landfills
12	The use of biomass for energy production in Neamţ County
13	Upgrading CET Timişoara Center
14	Hidroelectrica development portfolio Module 1 JI
15	N2O emissions reduction at three (3) nitric acid production plants NA2, NA3 and NA4 of Azomureş SA company
16	JI project to reduce N2O at nitric acid plant II of SC DONAU CHEM SRL
17	Casimcea Wind Park - Alpha
18	Renewable energy production facilities at Babadag, Tulcea
19	Reduction of N2O at SC Nitroporos SRL nitric acid plant
20	Reduction of N2O at SC Chemgas Holding Corporation SRL nitric acid plant
21	Dorobanţu Wind Park

Tabel 7.4.2.1 b. List of projects included in the Joint Implementation Mechanism, *that received approval letter*

Nr. crt	JI Projects
1	Upgrading CET Bacău
2	Rehabilitation of Timişoara district heating
3	Rehabilitation and modernization of Zalău Power Plant
4	Energy efficiency project at Turceni Energy Complex
5	Cogeneration CTZ Cluj-Napoca
6	Rehabilitation of centralized heating system in Iaşi
7	The installation of a steam turbine (22 TKL) at Termoelectrica Giurgiu plant
8	Management of energy consumption combined with improved heating system in Reşiţa
9	Enhancing the production efficiency for heat and electricity cogeneration at AMONIL Slobozia
10	Boiler replacement project
11	Wind project at Peştera and Valea Dacilor
12	Procera Biodiesel Factory, Fundulea
13	Catalytic reduction of N2O inside the ammonia burner at Petrom SA - Doljchim nitric acid plant.
14	10 MW installed on micro hydro power plants for electricity production in Caraş Severin and Alba
15	Construction of four (4) 10 MW wind parks in Constanţa region
16	Mireasa Wind Park
17	Cogealac - Construction and operating wind farm
18	Reduction of N2O at III SC DONAU CHEM SRL nitric acid plant
19	Wind farm with an installed capacity of 9 MW, Oraviţa
20	Reduction of N2O at SC Nitroporos SRL nitric acid plant
21	N2O reduction at SC AMONIL SA nitric acid plant
22	JI project to reduce N2O at SC GA PRO CO CHEMICALS SA nitric acid plant

7.4.3 INTERNATIONAL EMISSION TRADING (IET)

Each state included in Appendix B of Kyoto Protocol has the right to issue a certain quantity of GHG gases for the period 2008-2012, in accordance with the Assigned Quantity through Kyoto Protocol.

The assigned quantities - called **AAU's** („assigned amount units"), as defined in the Protocol, are registered and traded through the National GHG Emissions Register (1 AAU = 1 to CO2 equivalent, calculated basis the global warming potential).

In accordance with the data in the National Inventory of GHG emissions sent to UNFCCC secretary in 2013, the level of the GHG emissions in 2011 was approximately 54.86% lower than the level of 1989. Therefore, Romania will be able to accomplish its obligations of reducing the GHG emissions in the commitment period 2008-2012, without adopting additional measures for GHG emissions reduction.

In 2010 it was established the legal framework in order to allow the international emissions trading in accordance with art.17 of Kyoto Protocol (the excess of AAU). In accordance with O.U.G. no. 29/2010 and H.G. no. 432/2010, the trading of the excess AAU assigned to Romania through the Kyoto Protocol will be made within the "green investments plans", instruments for the ensuring environmental benefits because it will finance the projects that generate reductions of the GHG emissions. Between 2008 and 2010, Romania has a minimum available quantity of 50.000.000 t CO2 equivalent, per year.

For the first period of commitment to Kyoto Protocol 2008-2012, the AAU excess traded by the Romanian Government is of maximum 300.000.000 AAU's and the incomes resulting from this trade are mostly a financing source for the green areas, as well as a small percent of maximum 2% for the information and awareness campaigns and research studies in the field of climate changes. The amounts resulted from the AAU excess trading the Environment Fund is financed and the money is managed by the Environment Fund Administration.

The amounts agreed for the "green investments" are used for the following categories of projects:

- „clean technologies", including coal gasification and high efficiency cogeneration without limiting to those;
- modernisation and rehabilitation of the power groups;
- increase of power production from renewable sources;
- improvement of the efficient energy use in buildings;
- reduction of the GHG emissions in Agriculture;
- reduction of the GHG emissions in Transportations by stimulating the use of hybrid and electrical vehicles;
- forestation of some lands, including degraded agricultural lands;
- waste management with the reduction of GHG emissions.

7.4.4 IMPLEMENTATION OF THE SCHEME OF TRADING THE GHG EMISSIONS CERTIFICATES

The scheme of trading the GHG emissions certificates (called "EU ETS"), regulated through the Directive 2003/87/CE was implemented in Romania, starting with 1st January 2007 the date of acceding to EU. This directive was transposed into national legislation by HG 780/2006 and several ministerial orders relating to periods of trading emissions of greenhouse gases. In the 2012-2013 period, the national legal framework needed to implement the scheme for the third trading period and has been completed and improved by a series of acts (OM no. 3420/2012, OM no. 659/2013, MO no. 2970/2013, OM no. 89/2013, OM no. 654/2013).

Certificat de emisii de gaze cu efect de seră = titlul care conferă unei instalaţii dreptul de a emite 1 tonă de CO_2, valabil pentru îndeplinirea scopului schemei

At Community level, the methodology for monitoring and reporting emissions of greenhouse gases for the third trading period, ie 2013-2020, is covered by Regulation no. 601/2012 and the rules of free allocation of emission allowances greenhouse gas emissions are set out in Decision no. 278/2011.

Trading scheme is a policy tool developed at EU level to reduce CO2 emissions, based on the principle of "limited and markets." The mechanism enables traders covered scheme, through investments they made in low-carbon technologies and increase energy efficiency to reduce CO2 emissions in a cost effective manner, being able to market certificates if the actual emissions generated by production activities are below the limit of emission allowances allocated free of charge. EU legislation in the field of trading scheme emissions of greenhouse gases, applicable for the period 2013-2020 provides that operators (operators) that have industrial installations subject to the scheme may receive allowances to emit CO2 allocated "free" to be able to cover CO2 emissions from production activities they perform. Allocation is done by the European Commission, on the basis of allocation principles applicable

to all Member States and some benchmarks, set by the European Commission based on the most advanced industrial installations in terms of greenhouse gas emissions at EU level, during 2007-2008.

Romania was among the first Member States that have sent in October 2011 to the European Commission national implementation measures, the document containing the list of operators and preliminary number of allowances for greenhouse gas emissions allocated free of charge in 2013-2020 . In light of the work they perform, in this list were included major operators in the energy sector - public and private capital, including district heating systems supplying heat for the population and industrial installations in industrial sectors and economic impact and social impact at national level, such as cement production, production of chemicals, petroleum refining, iron and steel, non-ferrous metal production. For the development of national implementation measures and determining the number of allowances allocated preliminary for the period 2013-2020, Romania has used the European Commission's Guidelines for the implementation of the allocation principles set out in Decision 2011/278 / EU, applicable to all Member States . Also, throughout the process of drafting this document, the Ministry of Environment and Forests has organized technical consultations with operators and accredited bodies have verified and validated data on the activity of each installation completed during the mission "in country visit" made by European Commission representatives at the Ministry of Environment and Forests in May of 2012.

The final, revised version of national implementation measures, which contains a number of 216 plants, was submitted to the European Commission in April 2013 after a detailed evaluation of the data notified by the environmental protection authority, including the consistency of the data provided the operators of eligibility under the scheme, especially for the free allocation of allowances.

Since the third trading period 2013-2020, activities in areas such as: production of ammonia, nitric acid, the bulk organic chemicals, aluminum production were included in the EU ETS. In 2013, under ETS, 201 plants were allowed to carry out the emitting CO2 or CO2 equivalent, these activities are specified in Annex 1 of HG 780/2006.

Based on Decision 2013/448 / EU on national implementation measures for transitional allocation "free" certificates of greenhouse gas emissions in accordance with Article 11 para. (3) of Directive 2003/87/EC, adopted by the European Commission (COM) on September, 5th, 2013, the number of allowances allocated annually was established, for the period 2013-2020, at European level. For the year 2013, the National Implementation Measures (NIMS) a total of 23,749,891 free certificates for 176 operators in Romania, were allocated . Since the third trading period, the number of allowances allocated shall be adjusted annually based on the level of activity in the previous year.

To support economic operators which own factories subject to the trading scheme, the Ministry of Environment and Climate Change hosted during 16 to 24 September 2013, a technical discussion session where they talked about issues related to legislative changes medium and long term at European level in the field of reducing carbon dioxide emissions and how they will influence the activity of economic operators, given that the main objective of EU climate change policy is moving to a competitive economy, reduced carbon dioxide emissions, in order to contribute to the mitigation of climate change.

New entrants to the EU ETS (the "green field Investments") and facilities where extensions were made that led to an increase in CO2 emissions due to increasing production capacity of those facilities during 2013-2020 may benefit from free allocation of allowances for greenhouse gas emissions from new entrants reserve (NER), managed by the European Commission, on a "first come first served" allocation granted under Decision 278/2011 and methodology for allocating emission allowances for greenhouse gas reserve for new entrants for the period 2013-2020 approved at national level by OM no. 89/2013.

For 2013, RNI has allocated a total of 510,487 allowances for greenhouse gas emissions for a total of 12 facilities.

Since the third trading period, for electricity producers, a mechanism was approved, to allocate transitional free of emission allowances of greenhouse gas emissions by HG 1096/2013. The electricity producers that receive transitional free allocation of emission allowances for greenhouse gas emissions were included in the National Investment Plan (NIP), provided they use the value of certificates to finance the investments referred to in this exclusive plan (modernization of infrastructure, introduction of clean technologies, diversification of the energy mix and sources of energy supply).

Emissions of greenhouse gases from installations covered by the EU ETS scheme are subject to verification, verification methodology is provided by *Regulation 600/2012 of the Commission on verification of emission reports, greenhouse gas emissions and tonne-data kilometer reports and accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and the Council. Since 2013, the verification bodies are accredited by the National Accreditation Authority - RENAR, according to the provisions of SN 14065 and Regulation 765/2008 of the European Parliament and of the Council laying down requirements for accreditation and market surveillance relating the marketing of products and repealing Regulation (EEC) No. 339/93*.

The total amount of greenhouse gases emissions generated by ETS installations in 2013 was 42,414,701 t CO2, a decrease of 11.4% compared to 2012 emissions, reduction being due, mainly, because of the low level of industrial production by economic crisis (Chart 7.4.4.1 and Table 7.4.4.2). Considering the total number of allowances allocated for the year 2013 revealed a deficit of 18,154,324 certificates that operators have purchased on carbon market in order to achieve compliance with the provisions of the EU ETS Directive.

Graphic 7.4.4.1.

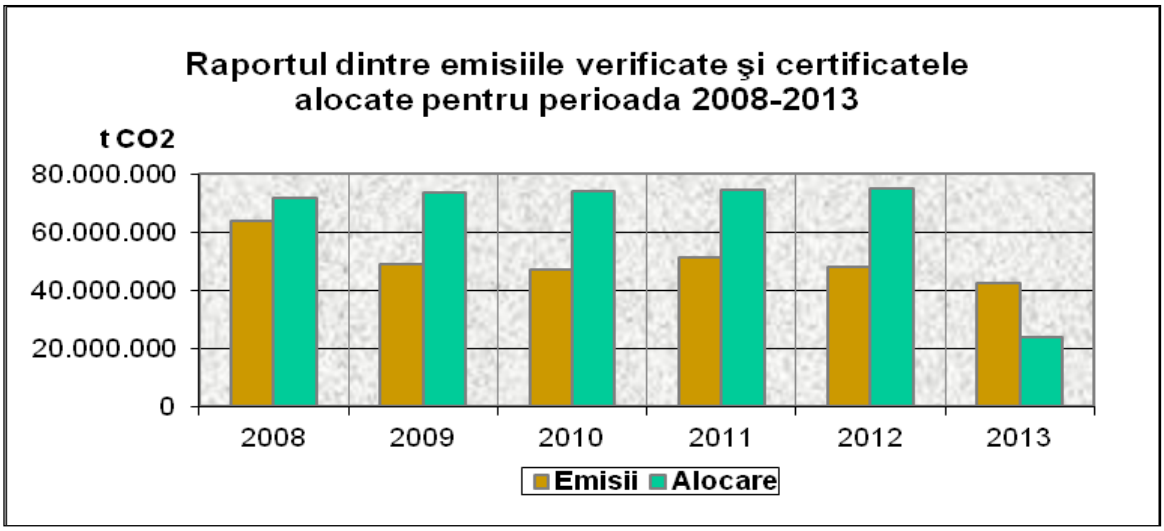


Table 7.4.4.2 *Total verified emissions compared to total allowances allocated during 2008-2013 (tons CO_2)*

Year	2008	2009	2010	2011	2012	2013
Total emissions	63709638	48993089	47344348	51238935	47857376	42414701
Allocated	71625822	73704133	74317217	74631204	75172503	23749891

In terms of share, the EU ETS sectors emissions per total verified emissions, for the year 2013, represent as follows: the energy sector represents 61.3% of total emissions, and it is the sector with the highest number of installations covered by the EU ETS scheme. CO_2 emissions from installations for the production of cement clinker is 9.9%, while facilities for refining petroleum products had a share of 5.4% and the production and processing of ferrous metals (iron and steel) a share of 10 2%. Since 2013, these sectors fell under the EU ETS: chemistry sector (production of nitric acid, ammonia and bulk organic chemicals), with a contribution of 10.2% in 2013 and the production of aluminum, with a share of 0.9%. The other sectors (glass, ceramics, pulp and paper) had a minor role in 2013, less than 1% (Chart 7.4.4.3. And Table 7.4.4.4).

Graphic 7.4.4.3.

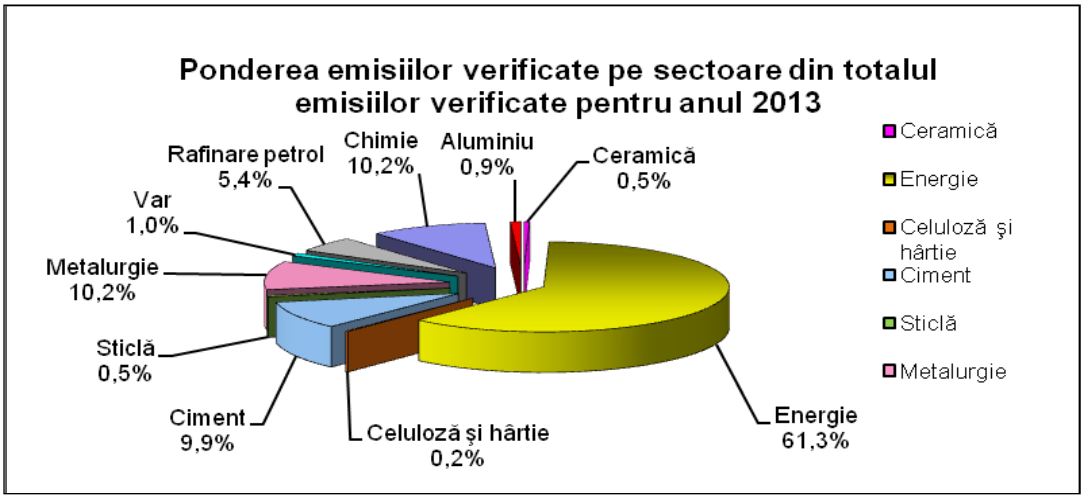


Table 7.4.4.4. *The amount of verified emissions by sector, 2013 (tonnes CO_2)*

Ceramics	Energy	Pulp and Paper	Cement	Glass	Metallurgy	Chalk	Oil refining	Chemistry	Aluminium
197700	25985717	95233	4203368	194288	4305203	408054	2307640	4326361	391137

Of the 201 facilities participating in the EU ETS in 2013, a rate of 52% is "Small Emitters" - installations whose verified emissions are less than 25,000 tonnes CO_2 / year, of which 67 plants had verified emissions lower than 10,000 tonnes CO_2 / year. A total of 24 plants had emitted to the atmosphere more than 500,000 tons of CO2 / year. (graph 7.4.4.5. and 7.4.4.6 table.)

Graphic. 7.4.4.5. Installations classification under the EU ETS Trading Scheme

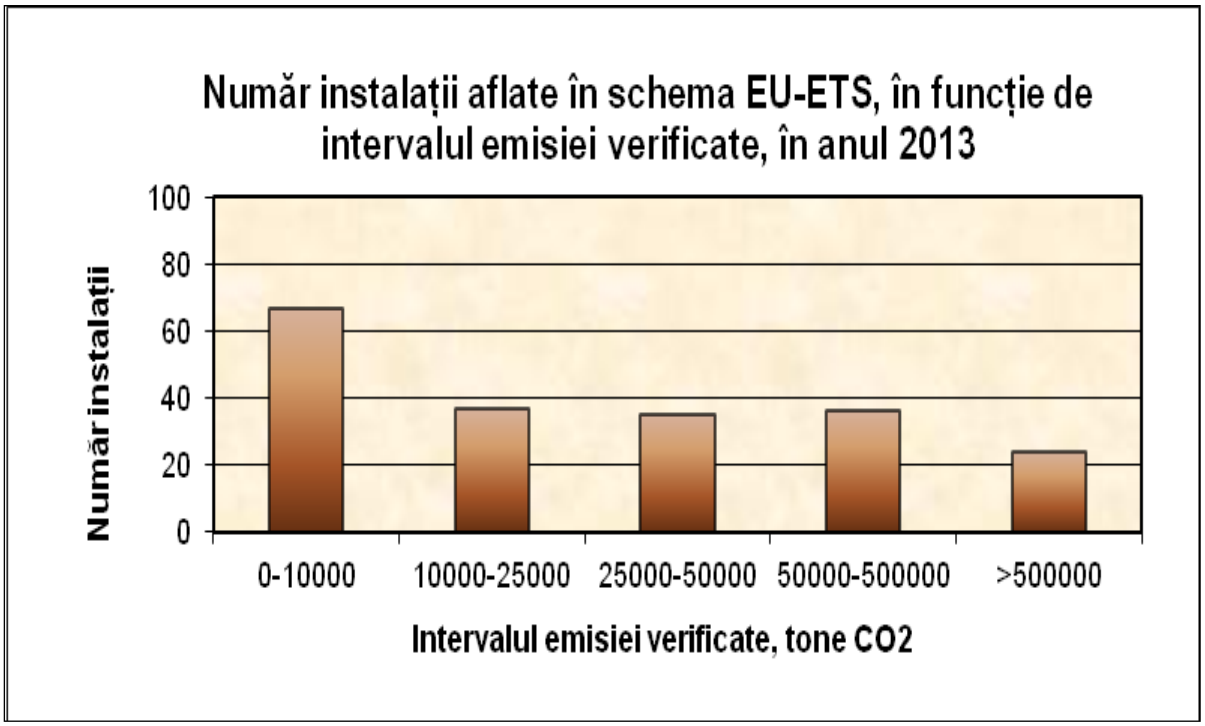


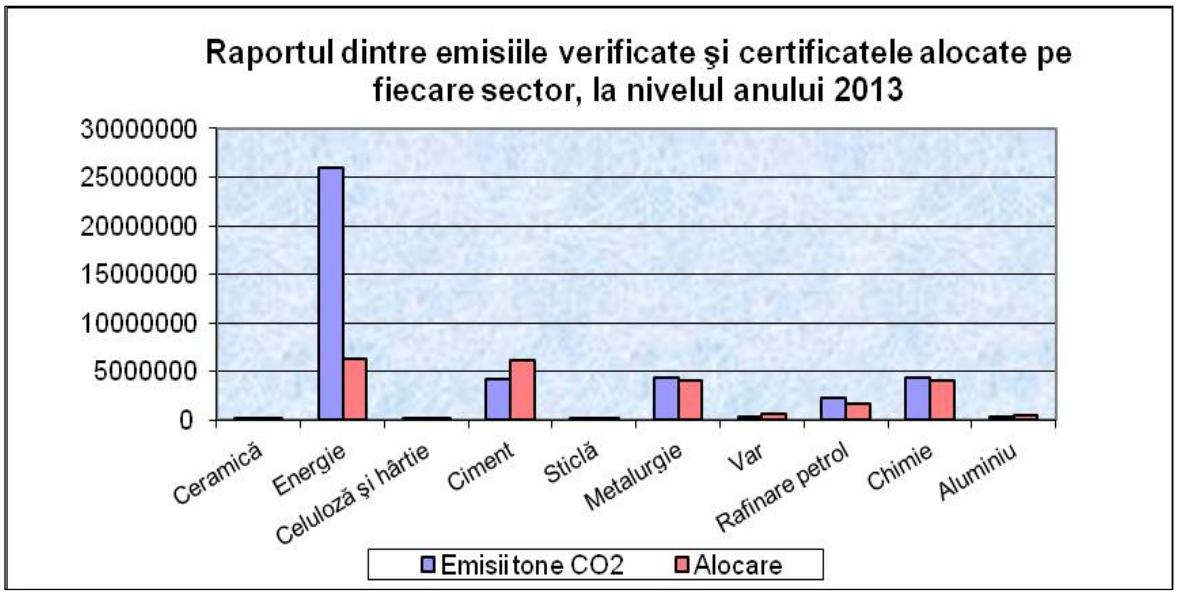
Table 7.4.4.6. *Number of plants distributed on emission levels*

Verified emissions (tonnes CO_2)	0-10000	10000-25000	25000-50000	50000-500000	>500000
Number of facilities	67	37	35	36	24

In 2013, the pulp and paper recorded the lowest level of CO2 emissions compared to other sectors (0.2% of total emissions), the allocations representing a percentage of 91.50% of the emissions of this sector.

The energy sector was the most disadvantaged in terms of the number of allowances allocated compared with verified emissions from this sector in 2013, with a percentage of 24.08% of total emissions allocation (chart 7.4.4.7.).

Graphic 7.4.4.7. Verified emissions situation and number of allowances allocated in 2013



7.4.4 INCLUDING THE *AVIATION* INDUSTRY IN THE TRADING SCHEME OF THE GHG EMISSIONS CERTIFICATES

Starting with 1st January 2012 the "*aviation*" sector enters under the incidence of the trading scheme which refers to all the plane flights leaving an airport of a EU state or all the planes that are landing on the airport of a EU member state.

For this purpose, the European Committee has published *Directive 2008/101/CE for changing Directive 2003/87/CE for the inclusion of the aviation activity within the trading scheme (EU ETS)* and Decision 2009/339/CE for changing Decision 2007/589/CE for the inclusion of the Monitoring and reporting guide of the GHG emissions and of the km-to from the aviation activities.

Directive 2008/101 / EC has been transposed into national legislation by HG 780/2006 establishing the trading scheme for emissions of greenhouse gases, as amended and supplemented in its latest addition by HG 204/2013 for amending HG no. 780/2006, the decision making process being carried out during 2009.

The main responsibilities in the implementation process, belong to the Ministry of Environment and Climate Change respectively jurisdiction for:

- verification and plans approval for monitoring CO2 emissions and monitoring tonne-kilometer data, plans drawn by aircraft operators, aviation activities covered by Directive 2008/101 / EC;
- evaluating annual monitoring reports for CO2 emissions and annual tonne-kilometer data reports, verified by accredited inspection bodies according to the principles of Annex V of Directive 2008/101 / EC.

A part of the aircraft operators under Romanian administration and established by the European Commission through Regulation (EU) no. 815/2013 EC amending Regulation (EC) no. 748/2009 on the list of aircraft operators which performed an aviation activity listed in Annex I to Directive 2003/87/EC, submitted to the competent authority plans to monitor emissions of greenhouse gases for verification and approval. Plans for monitoring emissions of greenhouse gases for the year 2013 were approved by the National Environmental Protection Agency (NEPA), in accordance with Government No. 780/2006 regarding the establishment of trading scheme of greenhouse gas emissions, as amended and supplemented.

In the context of the 2012 compliance, aircraft operators under Romanian management could opt on the application of the *"Decision nr.377 / 2013 of the European Commission regarding temporary exemption from the requirements of Art. 16 of Directive 2003/87 / EC* with respect to reporting of CO2 emissions and returning the

certificates for the year 2012 (known as "stop the clock" Decision). A comprehensive strategy to address emissions from international aviation growing in a pace would be the appropriate way and the most effective for reducing aviation emissions.

As a result of the of the 38th Session of the ICAO Assembly in 2013, the European Commission adopted the "EU Regulation 421/2014 amending Directive 2003/87 / EC establishing a scheme for trading emission of greenhouse gases in the Community in the implementation, from 2020,of an international agreement on the application of a single measure based on global market for emissions from international aviation ", in which such derogations on flights to and from aerodromes from non European Economic Area (EEA) are specified..

7.4.6. IMPLEMENTATION OF THE LAW PACKAGE „*ENERGY – CLIMATE CHANGES*"

In December 2008, The European Parliament adopted the law package "Energy – Climate change" which, at European level, was established the accomplishment of 3 long-term major objectives:

- *reduction of GHG emissions with 20% until 2020 (compared with 1990) and with 30% if an international agreement is signed;*
- *a 20% of renewable energies in UE's final consumption of energy until 2020, including a target of 10% for bio fuel, of the total fuel consumption in the Transportation field;*
- *increase of energetic efficiency with 20% until 2020.*

It was estimated that the laws' package will reduce the costs of accomplishing the GHG emissions objective at European level with about EUR 8.5 billion per year, and the health systems of the member States could save up amounts six times higher for the health of the population. Additionally, the improvement of the energetic efficiency and the use of renewable sources of energy will result in a significant reduction of the use of fossil fuels the main sources CO2 emissions.

Directive 2009/29/CE for changing the Directive 2003/87/CE in order to improve and extend the trading scheme of GHG emissions certificates is a part of the law package being approved by the European Commission and published in 2009, applicable starting 2013. At national level this Directive is implemented by HG No.780 / 2006, with subsequent amendments and national implementation measures (NIMS).

In order to achieve the EU objective of reducing emissions of greenhouse gases by 2050, the Ministry of Environment and Climate Change establishes, maintains and coordinates the implementation of strategies, plans and programs on climate change and ensure the implementation and updating of policies and measures needed to this area.

Information on the implementation of Directive 2009/29 / EC amending Directive 2003/87 / EC so as to improve and extend trading scheme emissions of greenhouse gases (EU ETS post - Kyoto) and Directive 2008/101 / EC the inclusion of aviation in the EU ETS trading scheme and the activities carried out by the environmental protection authorities to ensure implementation of legislation in this area are made available to all stakeholders on web addresses: www.mmediu.ro, and http: //ec.europa.eu/dgs/clima/mission/index_en.htm (EC).

7.5. TRENDS

7.5.1. RESULTS OF THE RESEARCHES AND OBSERVATIONS DONE BY THE NATIONAL ADMINISTRATION OF METEOROLOGY

There is already in place a clear rising tendency of the average temperature in all regions of the country, with higher values during winter and summer. The rising tendency of 0.2°C per decade is similar to the global temperature rising tendency (Busuioc and all., 2010). Such tendency of air temperature mean values associates rising tendencies of the frequency and intensity of some extreme phenomena related to the thermal aspect: more intense and more numerous heat waves, increased thermal extreme threshold values, diminution of cold snaps during the cold season. All such tendencies typical for Romanian regions might be mainly attributable to climate changes, still global (IPCC, 2007; IPCC, 2012; IPCC 2013). Under climate changes conditions not accompanied by a global limitation of the emissions, these shall also continue to rise in the years and decades to come and they shall get worse towards the end of the century. It is advisable that the adjustment measures targeting such tendencies are a priority.

In case of precipitations, the spatial picture is less coherent and the assignment of observed climate changes tendencies is more problematic. The seasonal details of the evolution of the observed precipitations

show that during wintertime, there is a decreasing tendency of the precipitation quantities in the regions outside the Carpathian arch, more acute in the southern and western regions. During spring and autumn, the variation tendencies of the precipitations quantities have a regional nature, difficult to include in a general picture. During autumn, there are rising tendencies of the precipitation quantities in the northern and south-eastern regions.

7.5.2. ACTIONS FOR FIGHTING AGAINST CLIMATE CHANGES

The specific measures adopted at national level in order to fulfil the primary identified in the field of environment protection are:

- Respecting the commitments undertaken through Chapter 22 – Environment protection and the Provisions of the International Conventions and Protocols Romania is a part of;
- Achieving the investments in the field of environment protection in order to observe the assumed transition period;
- Gradual internalisation of the main environment cost within the energy price;
- Promoting "environmental friendly" clean technologies";
- Acomplishing the investments regarding the use of the international cooperation mechanisms under the Kyoto Protocol ("Joint Implementation" investment projects and the implementation of the "green investments schemes").

The three important targets of Romania's Energy' Policy on medium and long-term are:

1. increasing the security of energy supply;
2. increasing the economic competitiveness;
3. reducing the impact on the environment.

At national level, there was prepared and promoted, the legal framework for ensuring the implementation of the measures regarding the improvement of the energy efficiency and promotion of the renewable energy sources through:

- Reducing of the negative effects of the energy production process on the climate requires real and constant actions. Within this context, Romania needs to act constantly and consistently in order to get in line with the European actions promoting *Lisbon objectives;*
- Prompt actions in the field of *energy efficiency and renewable sources of energy,* in order to limit the forecasted global temperature increase, respectively of the greenhouse gas emissions, at European and implicitly, national level;
- the actions aiming the promotion of the energy efficiency and renewable resources of energy will contribute both *to the reduction of the negative impact of the pollutant factors of the environment as well as* to the increase of the supplying security reducing the grade of dependence for the energy imports of Romania.

*Within the context "*Improvement of environment quality*", one of the strategic objectives of the National Development Plan (NDP) is the protection and improvement of the environment quality in accordance with the economic and social necessities of Romania in order to ensure a significant improvement of life's quality by encouraging sustainable development. This objective will be achieved by promoting and accomplishing the bellow mentioned priorities:*

- Improving the life standards by offering *public utilities services at the requested standards of quality and quantity in the water and wastes sectors,* development of the water and waste water infrastructure systems at localities level, creating /consolidating the regional specialised companies , developing the integrated systems of wastes management (wastes collection, transport, disposal in the targeted areas; closing down the non-compliant deposits);
- *Improving the environment management sector systems*, with focus on: developing the specific systems *of waters and wastes management, of natural resources management (*conservation of the biological diversity, ecological reconstruction of the deteriorated systems, prevention and intervention in cases of *natural risks* - especially floods.

In line with the national Programme of Rural Development 2007–2013 both *the agriculture and the Romanian forestry fund* may play an important role *in the fight against climate changes,* strongly felt in the last years through floods, high temperatures and prolonged periods of drought. These phenomena affect the agricultural and forestry productivity as well as the valuable habitats and ecosystems.

Agriculture and forestry may significantly contribute to the fight against climate changes through:

- *Forestation for the absorption and sequestration of the GHG emissions.* The forests have an important contribution to the reduction of the CO_2 level and the purification of the air. The changes in the use of land (including the forestation of the agricultural or non-agricultural land) influence directly the carbon balance – especially through the set up of young forests with a high growing speed which absorb larger quantities of CO2 compared with the older ones;
- *Use of the biomass* as a source of renewable Energy;
- *Ecological agriculture* may significantly contribute to the protection of the water and soil resources, conservation of biodiversity, and diminution of the climate change effects.

Forestry management and arrangement has to become one of the major objectives of the National Strategy of Floods Prevention. The forests play an important part in the regularization of the water flows, in ensuring the water quality and protecting some important sources of water for the local communities without other alternative sources of water. This is the situation of the forests located in the areas of protection of the underground or surface water resources as well as of the forests located on the slopes associated with the natural or barrier lakes.

Forests have an important function in maintaining the land stability, including for erosion control, landfalls and avalanches. The forestation with local species will also aim the agricultural lands with erosion problems and landfalls. To conclude, in order to ensure a sustainable forests management, which is one of the leading objectives of the national forestry policy, it is necessary to apply the measures with the purpose of improving the forests management in order to increase its economic, ecological and multifunctional value.

Romania has an increased frequency of floods, especially in the spring due to the snow melting and the blocking of the rivers with blocks of ice, as well as in the summer due to the heavy rains when the river flows increase above the normal limit. In the last 16 years, the frequency of floods has increased being a consequence of the climate changes, illegal forests cutting but also due to the lack of maintaining the infrastructure for floods prevention. In accordance with the latest European and national statistics their frequency and intensity is increasing.

The most important measures for the protection of the water and soil resources are intended for the agricultural environment (especially by supporting the green cultures) and the first forestation of the agricultural and non-agricultural lands.

These measures are complementary, meaning that the support offered in order to *start green cultures,* will be accessible to the farmers which have arable lands and will contribute on a larger scale to the reduction of the nutrients loss and soil erosion, and the forestation has the capacity to solve the severe problems of soil erosion including on very degraded areas. The agro-environment measure (through its requirements) contributes to the reduction of the fertilisers' consumption in the agriculture, participating at the same time in the protection of water resources.

8. ENVIRONMENT, HEALTH AND LIFE QUALITY

8.1. AIR POLLUTION AND HEALTH

By air pollution, one understands modification of air quality resulting from natural phenomena, especially anthropogenic which exceed the air self-cleaning mechanisms.

Natural sources of air pollution specific to certain areas, are known and measures to protect the population, through a permanent information and an effective intervention, can be taken. Among these sources are: volcanic eruptions, forest fires, soil erosion caused by currents of air, stretches of desert. Besides, there are general natural phenomena that occur at certain times (depending on atmospheric and geographic conditions) and refers to the decomposition of organic matter with release of gases (CH_4, H_2S, NH_3, CO_2), disturbing by odor and which can sometimes accumulate to dangerous levels.

Anthropogenic sources of air pollution are local heating, industrial and traffic activities, listed in order of their occurrence.

In Romania, the main air pollutants are particulate matter, nitrogen oxides and sulfur dioxide.

Suspended particles of small size (less than 10 microns) is the fraction that can have an impact on population health especially on the upper respiratory tract and the size below 2.5 micron (breathable) are those that can penetrate to the level of pulmonary alveoli, with irreversible effects both locally and systemically, depending on other pollutants that can be adsorbed on their surface.

In the period between 1997-2008, 13-62% of Europe's urban population was exposed to concentrations of particulate matter (PM_{10}) in ambient air that exceeded the limit values for the protection of human health established by EU legislation. It is known, however, that in the case of particulate matter, due to their different action by the composition, size and exposure time, adverse health effects may also occur also at daily averages below the limit value for human health protection.

The most vulnerable age group are children, because their body is not yet developed and they spend more time outdoors.

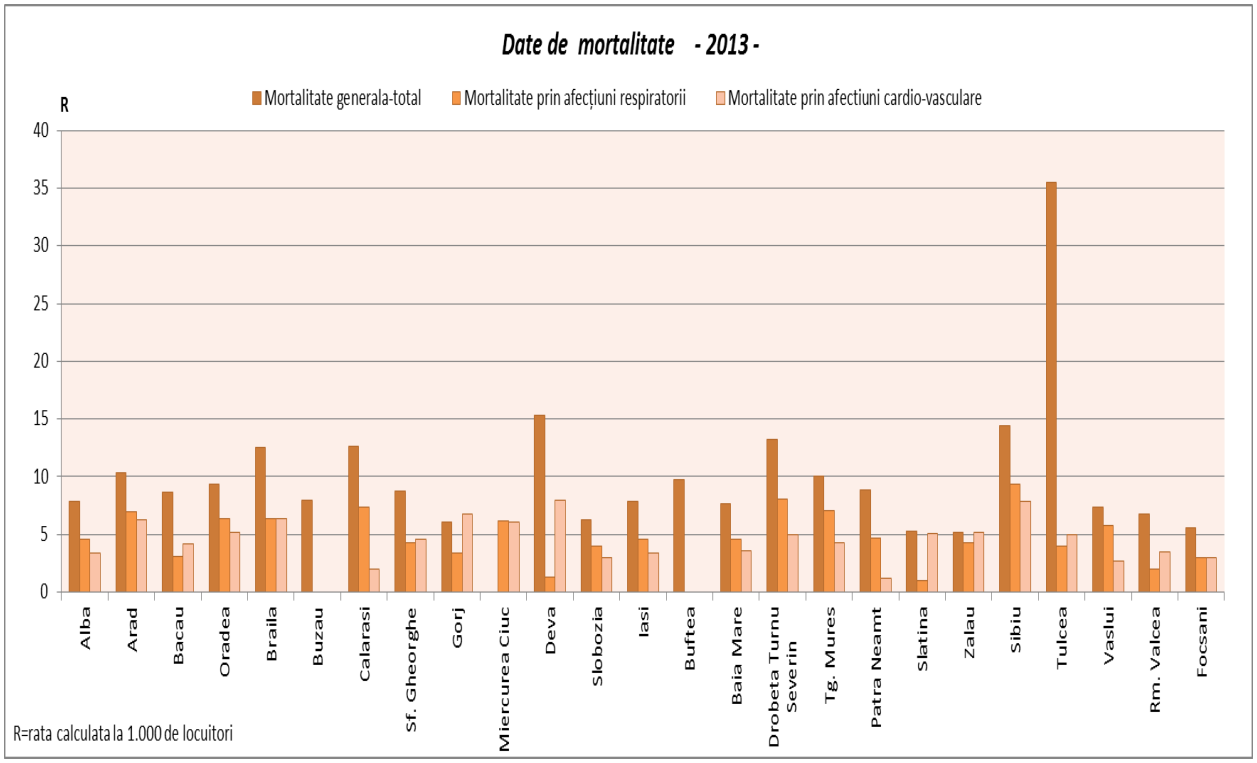
The main health indicators that can be influenced by air pollution refers to respiratory and cardiovascular diseases, mortality being the closest indicator in evaluating a process.

Following cardiovascular and respiratory mortality health indicators we can have indirect monitoring of the action that air pollution can have on the health of the population.

The figures below show the evolutionary trends of the two indicators for 25 cities, for 2013, included in a study by the National Institute of Public Health.

Data for 2013 are being processed.

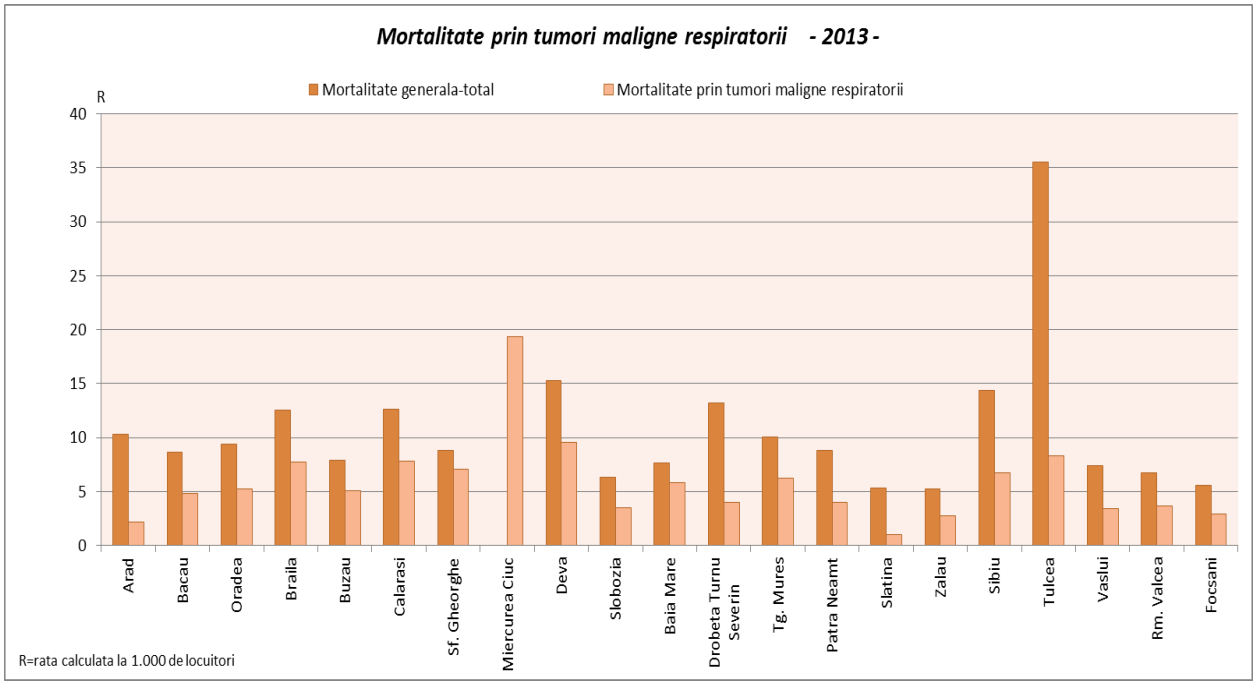
Fig. 8.1.1 *Overall mortality, mortality from respiratory and cardiovascular diseases in 2013*



Source: National Institute of Public Health

In the charts below are presented the evolutionary trends of the two indicators for 21 cities for 2013, included in a study of the National Institute of Public Health.

Fig. 8.1.2 *Mortality due to malignant respiratory diseases for 2013*

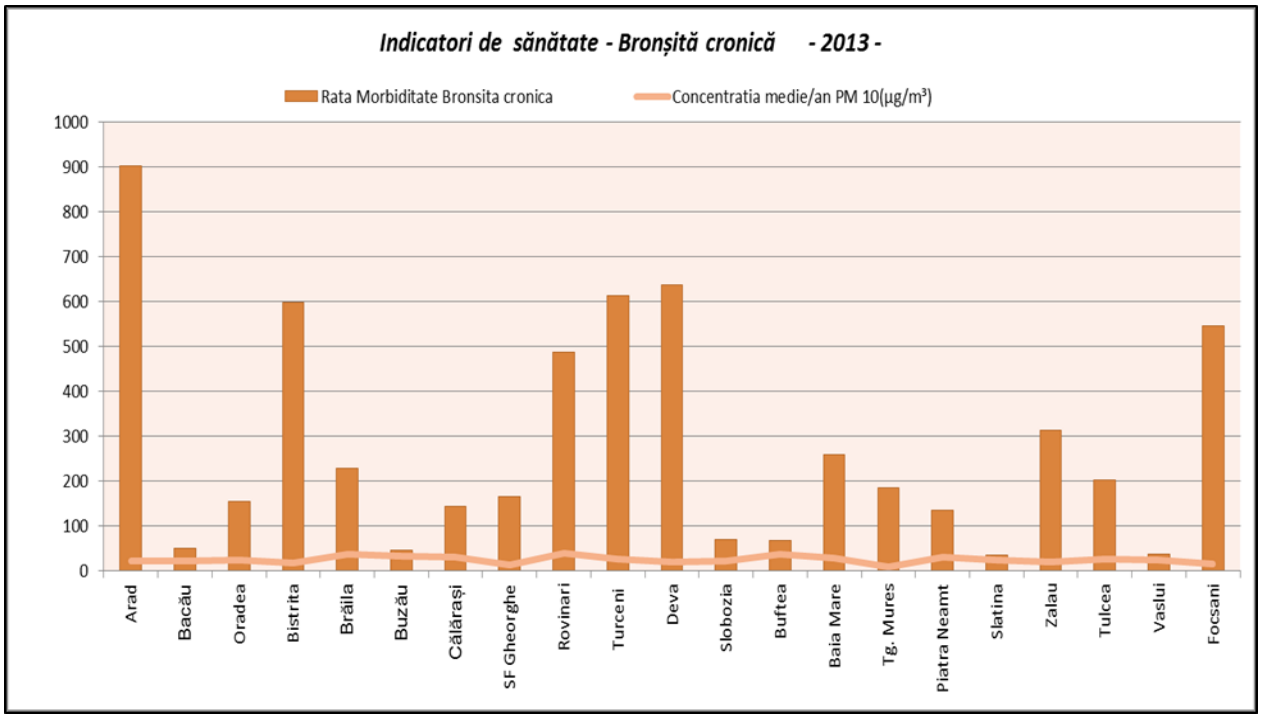


Source: National Institute of Public Health

Respiratory mortality continues to occupy a significant percentage of overall mortality in urban areas, explained by the fact that air is more polluted in urban areas, the main source being the traffic, so that health indicators are influenced by a high percentage.

Preliminary data for specific health indicators that can be influenced by air pollution for 2013 can be seen in the chart below.

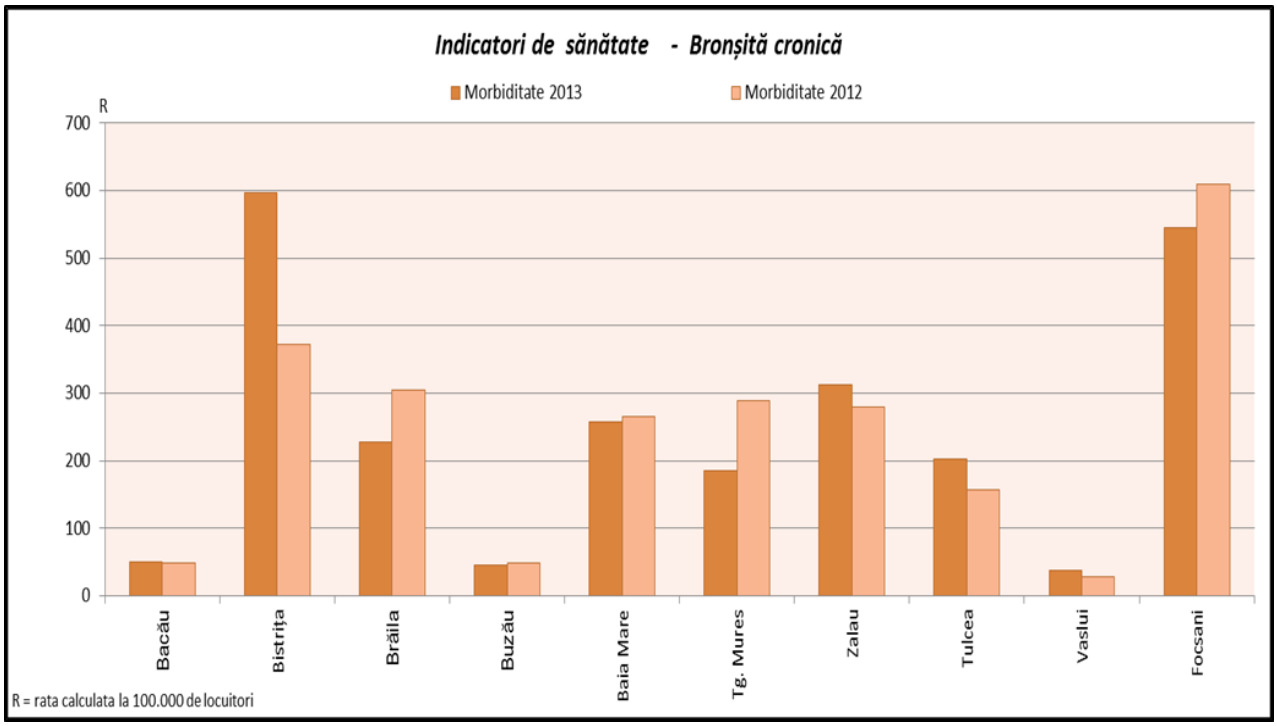
Fig. 8.1.3 *Health indicators - chronic bronchitis - 2013*



Source: National Institute of Public Health

Preliminary data for specific health indicators that can be caused by air pollution, for 2012-2013, according to a study made by the National Institute of Public Health, for a total of 10 cities are represented in the chart below.

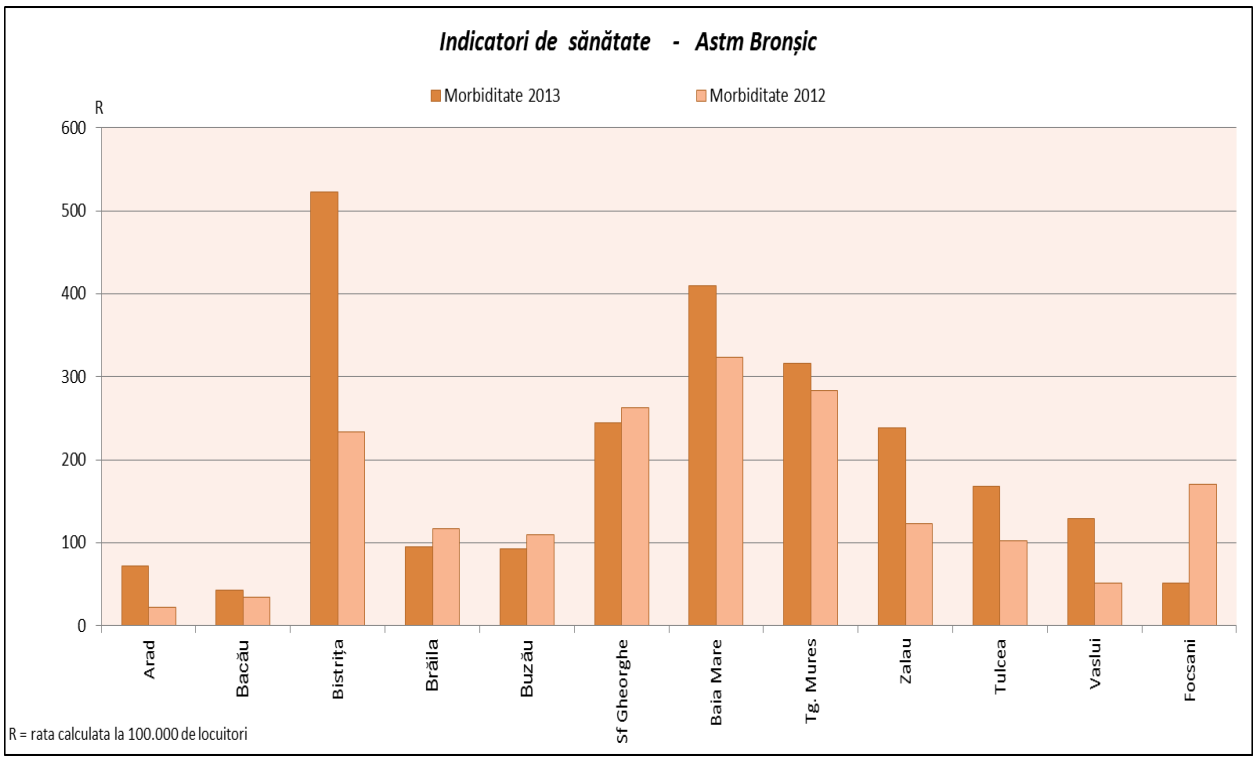
Fig. 8.1.4 *Health indicators - chronic bronchitis - morbidity for the period 2012-2013*



Source: National Institute of Public Health

Preliminary data for specific health indicators that can be caused by air pollution, for the period 2012-2013, according to a study made by the National Institute of Public Health, for a total of 12 cities are represented in the chart below.

Fig. 8.1.5 *Health indicators - asthma - morbidity for the period 2012-2013*



Source: National Institute of Public Health

8.2. THE EFFECTS OF THE POLLUTED WATER ON HEALTH

8.2.1. DRINKING WATER

For humans the most important water was, is and will be the drinking water, which has a great influence on the health of the human body.

Quality of the water distributed in centralized system in areas with more than 5,000 inhabitants or volume distribution over 1000 m^3/day is monitored according to Law. 458/2002 on water quality republished in the Official Gazette no. 875 of 12th of December 2011, which is the transposition of Directive 98/83/EC - Quality of water intended for human consumption, regulating drinking water quality, aiming at the protection of human health against any type of contamination thereof by providing clean and sanogenous water. This was amended by Law 311/2004, published in Official Gazette No. 582/30.06.2004, introducing under its incidence the sources providing drinking water in rural areas, respectively wells. In 2012, Law 458/2002 was republished.

Water quality monitoring, inspection and sanitary approval of public water supply systems and public wells, is made by the county Public Health Departments and that of Bucharest, according to GD 974/2004 for the approval of Regulation for surveillance, health inspection and monitoring the quality of drinking water and Procedure for sanitary authorization of the production and distribution of drinking water, published in Official Gazette no. 669 of 26th July 2004.

Chapter 22 of the Treaty of Accession of Romania to the European Union establishes that notwithstanding the provisions of Articles 5 (2) and 8 and Annex I, Parts B and C of Directive 98/83/EC (transposed into Romanian legislation by Law no. 458/2002 with subsequent amendments), the values set for the following parameters do not apply entirely in Romania under the conditions set out below :

- Until 31st December 2015 for ammonium, nitrates, turbidity, aluminium, iron, lead, cadmium and pesticides in agglomerations with more than 10,000 inhabitants;
- Until 31st December 2015 for ammonium, nitrate, aluminium, iron, lead, cadmium, pesticides and manganese in agglomerations of between 10,000 and 100,000.

Romania shall ensure compliance with the Directive, with the intermediate targets presented in the tables of Annex VII to the Act of Accession.

The data presented relate to drinking water, water intended for human consumption either in its natural state or after treatment, used for drinking, food preparation or other domestic purposes, regardless of its origin and whether it is supplied through distribution network, the tank or distributed in bottles or other containers and all types of water used as a source in the food industry for the manufacture, processing, preservation or marketing of products or substances intended for human consumption unless the competent authorities have approved the use of water and it is proven that water used does not affect the quality and health of food in its finite form.

The water source was represented by: - surface water – 64.72%; ground water – 32.48%; other sources – 2.8%.

The number of the supply areas (ZAP) with population over 5,000 or with a distribution volume of more than 1,000 m^3/day is 332.

Distribution of large ZAP's/counties is as follows:

Alba – 9	Călăraşi – 4	Hunedoara – 12	Satu Mare – 4
Arad – 11	Caraş-Severin – 6	Ialomiţa – 7	Sibiu – 5
Argeş – 11	Cluj – 15	Iaşi – 8	Suceava – 8
Bacău – 8	Constanta – 28	Ilfov – 7	Teleorman – 6
Bihor – 10	Covasna – 5	Maramureş – 7	Timis – 7
Bistriţa-Năsăud – 6	Dâmboviţa – 5	Mehedinţi – 2	Tulcea – 2
Botoşani – 6	Dolj – 9	Mureş – 17	Vâlcea – 3
Brăila – 5	Galaţi – 4	Neamţ – 6	Vaslui – 4
Braşov – 9	Giurgiu – 1	Olt – 4	Vrancea – 6
Bucureşti – 6	Gorj – 7	Prahova – 28	
Buzău – 6	Harghita – 7	Sălaj – 5	

Percentage of population supplied in a centralized system in areas with more than 5,000 inhabitants or volume distribution over 1000m3/day = 48%.

Parameters monitored, according to Law 458/2002 republished and according to GD 974/2004, were, in mostly of the counties, as follows: *Escherichia coli (E. coli), enterococci, coliforms, Clostridium perfringens*, number of colonies at 22ºC and 37ºC, conductivity, total cyanide, total chromium, copper, fluoride, nickel, nitrate and nitrite at the outlet of the treatment plant, nitrites in distribution network, nitrate/nitrite (formula), lead, aluminium, iron, ammonium, chloride, colour, taste, smell, oxidability, pH, turbidity.

- **The effects of water pollution on the health of the human body**

- **Water infectious pathology**

Waterborne diseases continue to make over 25,000 victims on a daily basis. The major disease carrier is through ingestion (directly, or through water contaminated aliments), but infection is also possible by washing and bathing (*leptospirosis, schistosomiasis, tularaemia*) and breathing (*aerosols with Legionella*). The main (predominant or possible) waterborne diseases are: *microbial diseases; viral diseases; parasitical diseases*.

The waterborne infectious pathology dropped significantly at the beginning of the XXth century; however, during the past decades, it is statistically increasing, fact caused by some viral and parasitic diseases which were included in the waterborne diseases, preoccupying specialists to a greater extent. Microbiological quality of water is decreasing in most countries and germs are more resistant to disinfectants. Decreased immunity of the population, mainly by improving general hygiene, led to an increase in the susceptibility to waterborne diseases. It is expected that the microbiological safety of the water will be a big problem in the next century.

- **Viral diseases**

There are over 100 types of pathogen viruses which can be spread by water. Many viruses could survive for a long time in the surface waters: *poliomyelitis virus* up to 180 days, Echo *virus* up to 115 while *Coxsackie's virus* more than two years. The waterborne viral diseases could be usually induced by enteroviruses (*poliomyelitis*, *Coxsackie* A and B, *Echo*, *hepatitis A virus*, and others), *rotaviruses* and *caliciviruses*, C and E *hepatitis virus*, *parvoviruses*, as well as *toroviruses*, *coronaviruses* and *picobirnaviruses*.

In developed countries *gastroenteritis* with viral aetiology tends to overtop, in terms of frequency, the bacterial diseases. *Rotaviruses*, *enteric adenoviruses*, *caliciviruses* and *astroviruses* are mainly to blame. *Rotaviruses* (particularly type A) affect mostly newly-born and babies; to people with low immunity, they might cause chronic diarrhoea. *Enteric adenoviruses* (subgroup F - serotypes 40, 41, rarely 31) cause gastroenteritis particularly to children under 6 months, diarrhoea could persist up to 12 days. Infections with *caliciviruses*,

particularly with the *Norwalk Agent*, predominantly affect temporary communities and there are indices that they generate a large percentage of nonbacterial acute diarrheic diseases. *Astroviruses* are being incriminated in some countries as the second agent causing viral diarrheic diseases after rotaviruses.

• Bacterial diseases

Waterborne spreading is incriminated for *typhoid fever*, *dysentery*, *cholera*, *diarrheic disease* for babies, *gastroenteritis*, *brucellosis*, *tularaemia* etc.

In the past, waterborne microbial epidemics took its toll. The cholera epidemics from the UK, 1849, caused over 110,000 deaths. Cholera times is not yet finished: the pandemic started in 1961, in Indonesia, caused over 1,000,000 cases of disease and over 10,000 deaths in America. Bacterial diarrheic diseases continue to jeopardize public health, even in developed countries.

• Parasitic diseases

A large number of parasitic diseases can be waterborne:
- caused by *protozoa*: *amebiasis, giardiasis, trichomoniasis, coccidiosis, balantidiosis*;
- caused by *cestodes*: *cysticercosis, echinococcosis, cenurosis, himenolepidosis*;
- caused by *trematodes*: *fasciolosis, dicroceliosis, schistosomiasis*;
- caused by *nematodes*: *ascaridosis, trichocephalosis, oxiurosis, strongyloidiasis, ankylostomiasis, filariasis*.

Giardiases have been given more and more importance lately, whose presence in the temperate area has been longed ignored. Presently, *lambliasis* is rated to be the most largely spread parasitosis with faecal-oral route of transmission to human, waterborne method being indubitably proven. This might cause serious epidemics, with thousands of cases. Man and over 40 species of animals could be the host. Waterborne *Cryptosporidiosis* is about to become a big threat to public health. It was first diagnosed in humans in 1976.

- **Non-infectious waterborne pathology**

Various chemical substances dissolved in water might have important effects on the health of living organisms, in general, and human being in particular. Such substances could be harmful above a certain concentration. Others create problems when concentrations are too low. Finally, there are harmful substances no matter the concentration. Using this criterion, we can group the biological effects of water substances in three categories:

a) *Toxic substances with threshold effect*: toxic only above a certain concentration (threshold); below such threshold there are no visible health effects. Such substances are *cyanides* or *nitrates*, which become toxic above a certain concentration which require a high dose, because it does not accumulate, or various metals toxic above threshold concentration, which can be gradually reached through the bioaccumulation phenomenon.

b) *Genotoxic substances:* these are toxic substances with harmful effects: *carcinogen* (causing cancer), *mutagen* (causing genetic mutations) or *teratogen* (causing malformations), possible for any concentration, so there is no established threshold below which such substances are not harmful. The category of genotoxic substances harmful to man includes *arsenic*, some *synthetic organic substances*, many *halogenated organic compounds*, some *pesticides* etc.

c) *Essential elements:* these are substances that must be included in the organism's diet. Some of these are carried predominantly or exclusively through water and for this reason their shortfall or quantity shortages affect the health of the respective living organism. In the same time, higher concentrations are equally harmful, just like toxic substances with threshold effect. Such essential substances for human beings are *selenium*, *flour*, *iodine* etc.

The non-infectious waterborne pathology is based on three mechanisms:

- *modifying the content of micro- and macro- chemical elements in water;*
- *contaminating water with toxic chemical substances;*
- *contaminating water with radioactive elements.*

- **Modification of micro and macro elements content**

Iodine, fluoride deficiency, endemic can produce tireopata endemic dystrophy (endemic goiter) and dental caries. Water is a relatively minor source of iodine (most coming from the food), but the deficiency is induced not only by the insufficient amount of intake, but also by interfering of iodine absorption by too high quantity of Ca, F or Mn. Fluoride can counteract the methemoglobinisant effects of nitrates. Excess fluoride exists in many areas (natural or artificial reasons - pollution) and causes fluorosis and in high doses osteosclerosis and osteofluorosis spondylitis. Water fluoridation is highly controversial. It is practiced in various countries like Switzerland, USA, etc.. Most countries have given it up and have even banned it.

Water hardness negatively affect washing process (including the human body), but positively affects cardiovascular disease, hard water being considered a protective factor. More recent studies consider that not the hardness itself is beneficial, but calcium (Ca) and magnesium (Mg), whose compounds are major factors determining the hardness. Clinical studies show a positive effect of calcium (Ca), magnesium (Mg), chromium (Cr), vanadium (Fr), manganese (Mn) and zinc (Zn), but sodium (Na), copper (Cu), and cobalt (Co) are incriminated for adverse effects.

- **Water contamination with toxic chemical compounds**

From the toxins circulating through the water, some have natural origin, but most come from groundwater pollution.

• **Nitrate** (NO_3-) can be a major problem, their concentration in drinking water above permissible limits being common in our country. In vegetables, nitrates are highly concentrated. Nitrates in themselves are of concern only at very high concentrations that seldom are achieved in water. The nitrites resulting from nitrate under certain conditions in the body and abiotic reservoirs and galvanized pipes, where nitrates are reduced to nitrites to nitrates generating a secondary poisoning, are in fact harmful.

• **Nitrites** (NO_2) result from either nitrates before consumption (reduction in wells etc.) or in the lumen of the digestive tract, in the case of migration, in different circumstances, to the stomach and small intestine of the reducing elements of intestinal biocenosis. Our country has a high incidence of methemoglobinemia with significant mortality. In 1984-1995, there were 2346 cases of methemoglobinemia in children under one year old and 80 deaths. There are indications that the figure is much underestimated because of the difficulty of diagnosis. Source is also the faecal contamination of water, but morbidity strongly increased primarily through the widespread use of fertilizers in agriculture substances. In 1988, 36% of wells in Romania had nitrate concentrations above 45 mg/l. In Iaşi county, from sporadic cases of methemoglobinemia two decades ago, the number has reached hundreds of cases annually. Nitrites are incriminated also for gastric cancer by means of nitrosamines which they form under certain conditions (*"tertiary nitrate toxicity")*.

• **Arsenic** (As) has been reported in water at concentrations sometimes significantly above the accepted values. As is more toxic in trivalent form than in pentavalent state and inorganic compounds than in organic form. The metallic form is less toxic.

• **Selenium** (Se) is sometimes present in high concentrations in some water sources. It is essential for human, the needs being 0.05-0.2 mg/day. Deficit affects health (eg Keshan disease). In excessive doses it causes skin, gastro, respiratory problems, etc.. It reduces the toxicity of mercury and arsenic for animals, and in turn is less toxic in the presence of zinc.

• **Cadmium** (Cd) generated Itai - Itai disease, that made in Toyama (Japan) more than 200 victims. The permissible limits are often exceeded. Bioaccumulation is strong. In the human body the kidney is mainly affected. One source of contamination is the pipe zinc that has cadmium an impurity. It is suspected for possible carcinogenic effects, also.

• **Inorganic mercury** (Hg) is absorbed less from water, but it may be bacteria methylated and methyl mercury is absorbed 95%. Like other heavy metals, mercury accumulates in the body and can be absorbed through water indirectly through the consumption of fish and other products. Among other things, mercury causes serious effects on the new-born, the case of Minamata (Japan) being famous.

• **Lead** (Pb) is frequently found among pollutants and can cause poisoning especially chronic - lead poisoning due to bioaccumulation. WHO recommends not allowing any amounts for children or pregnant women. Many water pipes are still made of lead. If water stagnates or has certain physicochemical characters it can dissolve lead and lead to poisoning.

• **Chromium** (Cr) is an essential element for life in quantities of 0.05-0.2 mg/day for humans. In high concentrations, it is toxic. Metallic form is nontoxic, but its salts are toxic. Hexavalent chromium is 100 times more toxic than the trivalent one.

• **Copper** (Cu) in too high concentrations in water is toxic. It caused casualties in Germany. It does not bio-accumulate in humans. It can come from copper pipes, which are attacked by soft or acidic waters.

• **Cyanides** (CN) are salts of hydrocyanic acid, and acid and its salts (cyanates, especially sodium, potassium,...) are highly toxic to humans and animals. The action is acute, through respiratory blocking at the biochemical, cell level. The lethal dose for humans is 0.57-1 mg/kg of body weight. For fish the lethal concentration in the water is estimated at 0.05 mg/l cyanide ion. In the case of cyanides there is no bio-accumulation and there is not evidence of a possible chronic toxicity.

• **Aluminium** (Al) in increased amount is toxic to the central nervous system. In the human body there are about 300 mg of aluminium. Its role and metabolism is not completely understood. Normally it is less soluble, but at very acid or alkaline pH, its solubility increases strongly.

• **Nickel** (Ni) seems to have a biological role, too, but is toxic in larger quantities. Nickel salts can cause allergies and even cancer.

• **Asbestos** is a group of silicate minerals with filamentary structure, which are used to manufacture fire and heat resistant materials and asbestos cement sheets and pipes, many used for water. In many countries it is prohibited to use asbestos because asbestos fibres are carcinogenic. *It gets in the water from minerals from the*

soil and subsoil, from various pollution and asbestos cement pipes if the water hardness is reduced, which caused the abandonment of asbestos-cement pipe for drinking water.

• For elements such as Ba, Be, Ni, Ag, etc, World Health Organisation does not consider necessary to establish limits.

• Organic pollutants in water are of enormous diversity, consistent with spectacular propagating spectrum of substances synthesized by the current industry. There are over 10 million chemicals, over 100,000 are sold and so they are increasingly spread. In terms of toxicity, only about 3500 are relatively completely studied, of which 600 have been declared as sensitive to human health. There are also natural organic toxic compounds, such as cyanobacteria toxins that may be hepatotoxic, neurotoxic or skin irritating etc. and have been found even in drinking water pipes!

Since measurement of toxic organic substances is not part of the usual tests on water quality, contamination undiscovered or discovered late are common. WHO puts great emphasis on surveillance and their limitation. *(source: http://www.greenagenda.org/eco-aqua/potabil.htm)*

According to Directive 98/83/EC, Member *States shall report to the European Commission data* on *quality of drinking water in the form of tri-annual reports*. *Next reporting period covers the years 2011, 2012*, *2013*, and the report *will be submitted to the European Commission in early 2015.*

The evaluation of quality parameters for drinking water for the period 2011-2012 is described in ***Chapter 3. WATER, subchapter 3.5.1 Drinking water***.

In 2013 there were no records of waterborne epidemics of the population. In Romania, the most frequent intoxications caused by drinking water are intoxications caused by the water drunk from fountains contaminated with nitrates and nitrites, over the admissible health thresholds. In this case, the impact on human health is manifested in children in particular on newly born.

8.2.2. BATHING WATER

In Europe, bathing water must conform to the standards set in the 2006 Bathing Water Directive (source Bathing Water Directives, http://ec.europa.eu/environment/water/water-bathing/), which updates and simplifies the previous legislation. The Directive must be implemented by Member States by December 2014. EU publishes an annual summary report on bathing water quality, based on reports which Member States must submit before the end of the year. For this year's report, all 27 Member States, as well as Albania and Switzerland monitored and reported bathing water quality, taking into account, most of them, the new provisions.

Legislation

EU legislation on bathing waters that include all surface waters of the territory used for bathing for which it is expected a large number of users and for which there is a prohibition or permanent advice against bathing (hereinafter "*bathing waters in natural designed areas*") (Directives 76/160/EEC and 2006/7/EC) is implemented in Romania by law:

- GD. 459/2002 on the approval of the Norms on water quality in natural designed bathing areas;
- GD. 88/2004 for the approval of Norms on the surveillance, sanitary inspection and control of natural areas used for bathing, published in Official Gazette no. 133/13.02.2004;
- GD. 546/2008, as amended and supplemented by Government Decision no. 389/2011 regarding the management of bathing water quality;
- M.H. Order no. 183/2011.

Thus, according to:

GD. No. 88/2004, Art. 28 (1) *"Institute of Public Health will develop The National Report on the quality of bathing water in natural areas for bathing and send it to the Ministry of Health, Ministry of Agriculture, Forests, Water and Environment and the Ministry of Transport Constructions and Tourism, in the month of December of each year "and (2)" The National Report on the quality of bathing water for bathing in natural areas for bathing will be sent to the European Commission, as from the date of accession to the European Union* ".

GD. 546/2008, as amended by Government Decision no. 389/2011, Art. 43 (1) *"For each bathing water, The Ministry of Public Health, through ISPB, sends to the Ministry of Environment and Sustainable Development and the European Commission the monitoring and evaluation results regarding the bathing water, and a description of the main management measures which were adopted "and* Art. 45*" ISPB elaborates the Annual National Report on bathing water quality, which is submitted to the Ministry of Public Health and the Ministry of Environment and Sustainable Development until December 31st ".*

MH Order 183/2011 approving the Methodology for monitoring and evaluation of bathing areas, Art. 20, " The National Institute of Public Health elaborates the Annual National Report on bathing water quality, that contains the monitoring and evaluation results on the bathing water quality and a description of the main management measures adopted, which is submitted for approval to the Ministry of Health ".

The Ministry of Health is required to prepare the Annual National Report on the Quality of Bathing Water (RNCAI).

For the elaboration of RNCAI 2013, were conducted activities in two distinct phases:

- inventory of natural areas for bathing waters and scheduling of water quality monitoring ;
- bathing water quality monitoring in inventoried areas

The inventory of natural areas for bathing waters and scheduling of water quality monitoring

INSP - CRSP Timişoara requested the County Public Health Directorate, in collaboration with the basin water administrations (BWA), to draw up the list of natural areas for bathing, until May 15th.

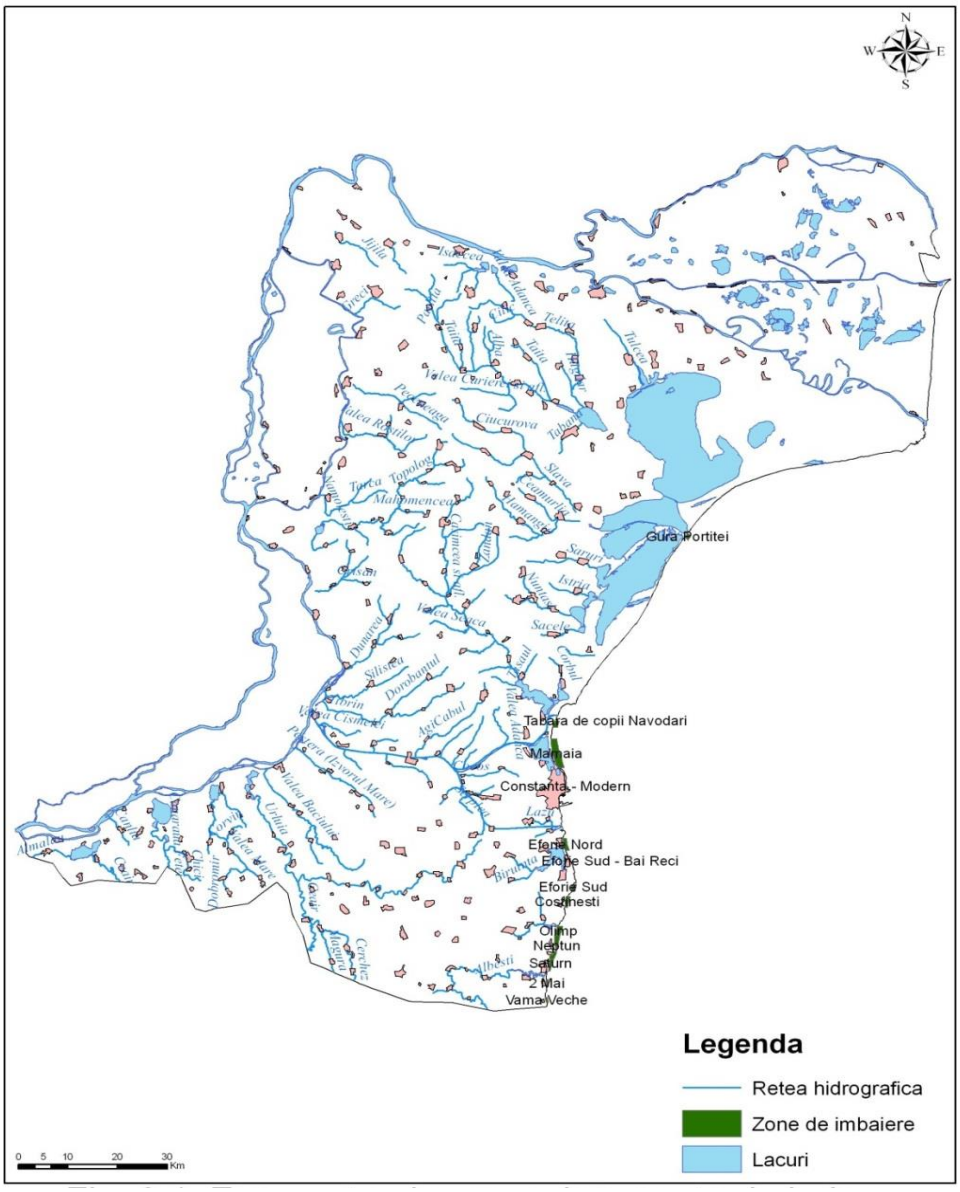
For compiling this list were considered:

- the number of people (who use the areas) that the public health departments consider to be high, based on trends in recent years, infrastructure and services provided or other measures taken to promote bathing;
- surface water quality information received from BWA;
- suggestions, comments and / or complaints made by the public consulted in this regard.

By May 15th, as required by the legislation in force, PHD Constanta and PHD Tulcea submitted to CRSP Timisoara the lists of bathing areas and the sampling calendar for bathing waters analysis. Bathing areas reporting is carried out by Romania since 2007 for coastal areas. Compared to the areas listed in 2012, was added the bathing area at Lake Ciuperca, Tulcea, fig. 8,2,2,1,

2013 bathing season was in the period June 1 st to September 15th.

Fig. 8,2,2,1 *Natural areas for bathing*



For each identified bathing water and included in the list above, PHD Constanta and Tulcea have established the monitoring points and determined their spatial coordinates.

The monitoring point for each area was set by experts in PHD CT and TL in the location where the highest number of users was estimated or the greatest risk of pollution was predicted, taking into account the bathing water profile in the previous years. It was established a single monitoring point for each area according to EC guidelines for reporting (EIONET).

The list of identified bathing waters, containing also the set monitoring points, their coordinates and the monitoring schedule, were received by INSP- CRSPT before May 20th.

These were sent to the MH, on the site of which was displayed (http://www.ms.gov.ro/?pag=182 *"List of bathing areas proposed for the 2013 season*"), so it can consulted by potential users.

Also, data from the list of bathing areas was introduced into a single model provided by EIONET in Excel format. The sheets "*BWQD_2006_IdentifiedBW"* (encoding of bathing areas, geographical coordinates, type and category of water) and the *"BWQD_2006_SeasonalInfo"* (bathing season range, the classification in terms of quality of bathing water, the number of seasons for which the data interpretation is done, activities with the public) were posted on the EIONET platform before the start of the bathing season (01/06/2013 - 09/15/2013).

According to the MH Order 1030/2009 on the approval procedures for sanitary regulations related to location projects, planning, construction and operation of objectives that carry out activities with risk for the health of the population, each arranged natural bathing area requires a sanitary authorization. The assessment of the beaches offered by its operator prevents health risks for users.

PHD CT case identified and reported 48 designated areas. All identified areas are located at the Black Sea. PHD TL identified and reported two approved areas. An area is located on the Black Sea, and the second at Ciuperca Lake (freshwater), a newly identified area in 2013.

Bathing water quality monitoring in inventoried areas

PHD CT and TL carried out the sampling in accordance with the established schedule in the preseason. There were complied with the requirements of the legislation regarding the monitoring range:

- the first sampling for monitoring was performed 15 days before the start of the bathing season;
- during the bathing season, the bathing water samples were taken from each monitoring point within two weeks, at a maximum of 4 days from the date specified in the monitoring scheduled program - except for a sampling carried out in Tulcea due to the weather conditions

Starting with the 2012 bathing season, the reporting to the EC regarding the monitoring parameters analysed in bathing waters was restricted to two microbiological parameters. These are set out in column A of Annex 1, "*Quality Parameters*" for GD. 546/2008, achieving the following equivalences:

- *intestinal Enterococci parameter* ,monitored in accordance with Annex. 1 "Quality Parameters" for GD. 546/2008 is equivalent with the Faecal Streptococci parameter set out in criteria no. 3 of Annex to the Water quality standards for water in natural designed bathing areas, approved by Government Decision no. 459/2002, as amended;
- *coli parameter*, monitored in accordance with Annex. 1 "Quality Parameters" to Government Decision no. 546/2008 is the equivalent of faecal Coliformi parameter set out in criteria no. 2 of Annex to the Water quality standards for water in natural designed bathing areas, approved by Government Decision no. 459/2002, as amended.

To analyse the Intestinal Enterococci and Escherichia coli, PHD TL and CT, in monitoring the bathing waters, used as reference methods those set out in Annex 1, "Quality Parameters" to GD. 546/2008, respectively in Directive 2006/76/EC.

For sampling the microbiological analysis mentioned above, the PHD TL and CT have followed the procedure laid down in Annex 5 "*Rules of sampling for microbiological analysis*" to GD. 546/2008, respectively in Directive 2006/76/EC.

The analysed samples results

For 2013, INSP - CRSP Timisoara is designated by the MH, responsible for reporting to the EC on bathing water quality. Thus, the monitoring results of the analysis carried out in the 2013 bathing season by PHD CT and TL were sent to INSP - CRSP Timişoara, which centralized the data, made the annual assessment of the quality of bathing waters and filled in, according to the model provided by EIONET (BWQ_2006.xls) the sheet "*BWQD_2006_MonitoringResults*" (the date of the water sampling, the test results for intestinal enterococci and E. coli).

In the annual results interpreting was taken into account the above mentioned legislation in force and the indications of the EC and EIONET specialists.

Therefore**,** the revaluation of the „*BWQD_2006_SeasonalInfo*" sheet for the bathing water classification was performed in accordance with the "transition period".

Constanţa County Results

The compliance statement on natural bathing areas and reported to the Constanta County EC, in terms of bathing water quality based on the results of the microbiological analysis bulletins (*intestinal Enterocytes and E. coli*) in 2013 is shown in Table 8.2. 2.1.

Table 8.2.2.1

Water Types	SUM: 48									
	C(I) no.	C(I) %	C(G) no	C(G) %	NF no.	NF %	NC no.	NC %	Stop no.	Stop%
Sea	48	100	17	35,42	0	0	0	0	0	0

Tulcea County Results

In Tulcea County, in 2013 there was introduced a bathing area which is located on a freshwater lake. The compliance statement on natural bathing areas in Tulcea County, in terms of bathing water quality based on the results of the microbiological analysis bulletins (*Enterocici intestinali şi E. coli*) in 2013 is shown in Table 8.2.2.2.

Table 8.2.2.2

Water Type	SUM: 2									
	C(I) no.	C(I) %	C(G) no	C(G) %	NF no.	NF %	NC no.	NC %	Stop no.	Stop%
Sea	1	100	0	0	0	0	0	0	0	0
Lake	1	100	0	0	0	0	0	0	0	0

Results in Romania

The compliance statement on natural bathing areas in Romania, in terms of bathing water quality based on the results of the microbiological analysis bulletins, in 2013 is shown in Table 8.2.2.3.

Table 8.2.2.3

Water Type	SUM: 50									
	C(I) no.	C(I) %	C(G) no	C(G) %	NF no.	NF %	NC no.	NC %	Stop no.	Stop%
Sea	49	100	17	34,70	0	0	0	0	0	0
Lake	1	100	0	0	0	0	0	0	0	0
TOTAL	50	100	17	34,00	0	0	0	0	0	0

Legend:

sum *- the total number of natural areas for bathing;*

C (I) *- number and percentage of natural areas for bathing, where the sampling frequency was consistent with the law and whose values correspond to the values required in the Annex to GD no. 459/2002;*

C (G) *- number and percentage of natural areas for bathing, where the sampling frequency was consistent with the law and whose values correspond to the reference values in the Annex to GD. 459/2002;*

NF *- number and percentage of natural areas for bathing, where the sampling frequency was inadequate;*

NC *- number and percentage of natural areas for bathing, where sampling values did not correspond with the mandatory values in the Annex to GD. 459/2002, that are not analysed or for which there is no data available;*

stop *- number and percentage of natural areas for bathing, where bathing was prohibited during the bathing season.*

There have been no prohibited or restricted areas during the 2013 bathing season.

According to Table. 8.2.2.3, all natural areas for bathing reported by Romania to the EC in 2013, for which was carried out a bathing water analysis, were consistent in the sampling frequency and determined values with the mandatory values required by the legislation in Romania.

Of the 50 natural areas for bathing reported by Romania to the EC in 2013, for which there have been carried out bathing water analysis, only 17 (34.7) were in line with the sampling frequency and the determined values, with the reference values required by the legislation in Romania. In all these bathing areas the water is of marine type.

During the 2013 bathing season were not reported short-term pollutions and was not declared the existence of any abnormal situation. Therefore, the „*BWQD_2006_AbnormalSituations*" sheets " for recording abnormal situations and "BWQD_2006_ShortTermPolut" for recording short-term pollution episodes, were not filled out.

PHD CT and TL were not forced to take special management measures in the bathing areas because there have not been found changes in the quality of the bathing water and were not identified any risks of negative consequences on the health of users.

BWQ_2006_2013" was posted on the EIONET platform on 1912.2013.

Evaluation of natural bathing areas for preventing a possible health risk to population who attend nearby areas

Health Risks

The bathing water risks to human health might be classified as follows:

- *mechanical risks* – bruises, wounds /excoriations, fractures, drowning (death);
- *biological risks* – various infectious (viral, bacterial, parasitical) diseases might occur following contact with water, and due to accidental ingestion of bathing water.

Identifying and evaluating the pollution causes which might affects the bathing water and which might be detrimental to users health:

- *evaluating the cyanobacteria proliferation potential;*
- *evaluating the macroscopic algae and/or phytoplankton proliferation potential;*
- *prognosis on the nature, frequency and anticipated duration of the short-term pollution;*
- *details of all possible pollutions causes, inclusively the management measures adopted and the schedule for their elimination;*
- *the management measures adopted throughout the short-term pollution, as well as the identity and contact data of the authorities responsible for adopting such measures.*

Possible health risks that could occur to people who attend natural bathing areas were assessed by interpreting data from

(**1**) – the bathing water quality monitoring

(**2**) – the assessment and health inspection sheet 1 (Annex 1 of GD no.88/2004), bathing areas profiles and pathology related to bathing. This analysis of a possible risk is necessary in order to enforce established measures and to oversee their implementation, in order to prevent such risks.

The bathing water quality monitoring – monitoring results obtained throughout the bathing season in 2013 (listed at point 2) revealed no potential risk of disease caused by intestinal enterococci and E. coli. Sheet 1 submitted for the assessment and health inspection for bathing areas did not identify the presence of any risks.

The profiles of the bathing areas located on the MH website were used to assess the occurrence of possible risks.

PHD CT and TL have not found / reported for 2013 season, illnesses or accidents that may be related with the bathing water quality conditions in the area.

Informing the public

The Ministry of Health posted on its website at http://www.ms.ro/?pag=182 the bathing areas list and the timetable for bathing water monitoring (before the start of the bathing season); bathing water quality for designated areas in Constanta (after the end of the bathing season).

PHD Constanta posted on its website http://www.dspct.ro/s36/monitorizarea-calitatii- apei-de-îmbăiere-in-sezonul-estival-2013/ the bathing water quality throughout the season after each monitoring (every 2 weeks). The water quality was communicated by categories, without displaying the values determined.

PHD Tulcea presented on its website at http://www.dspjtulcea.ro/index.php?l=ro&t=84 in English, the designated bathing areas and the dates when there were planned the sampling of of bathing water in order to determine the quality. The bathing water quality throughout the season, after each monitoring (2 weeks range only until 31 August 2013) were posted for 2 swimming areas in Tulcea County (Gura Portiţei http://www.dspjtulcea.ro/index.php?l=ro&t=90 and Lake Ciuperca http://www.dspjtulcea.ro/index.php?l=ro&t=91).

The water quality was communicated by categories, without displaying the values determined.

An instrument in the new technologies (Internet) which are available to the public interested to obtain timely accurate information on bathing water quality monitoring results in various areas of EU bathing, which enable efficient information and comparable data, is performed by the *Eye on Earth – WaterWatch* platform (EoEWW).

EoEWW shows the bathing water quality data submitted by SM European Environment Agency every year (last 6 years) and respectively those during the bathing season. The latter are shown in *"Near real time"*, which means displaying data obtained from fortnightly monitoring and can be viewed by the public online at http://www.eyeonearth.org/map/ waterwatch /.

This year, Romania was invited to join the service and provide microbiological results for all samples.

The results of microbiological analysis (intestinal enterococci and E. coli) were sent by email, by a unitary model (used in SEIS), according with the timetable for monitoring bathing water for the 2013 season, every 2 weeks, by CRSP Timisoara. All data were transmitted by email, as well, to the European Topic Centre on Inland, Coastal and Marine Waters (ETC-ICM).

Institutional collaboration

Working with Constanta and Tulcea PHDs had allowed Romania to fulfil its obligation on reporting of the bathing water quality data to the EC. For the future it would be advisable to have better tech on IT field that would allow Tulcea PHD to get a quick and timely movement of data.

Working with MMSC- Since the obligation to implement the Directive on the management of bathing water quality (2006/7 / EC) belongs to both the Ministry of Health (that oversees the technical implementation and the reporting to the European Commission), and to the Department for Water, Forests and Fisheries (that oversees the implementation of the environmental acquis)

Conclusions

Romania as a member state of the European Union monitored and reported to the EC in a standardized and consistent way, the bathing water quality of 2013 season. This has served its purpose of protecting public health in relation to designated bathing waters areas in Romania.

In Table. 8.2.2.3 have been underlined the following:

- All natural areas for bathing reported by Romania to the EC in 2013, for which they have been carried out a bathing water analysis, were consistent, from the point of view of the sampling frequency and determined values, with the mandatory values in the legislation in force in Romania.
- Of the 50 natural areas for bathing reported by Romania to the EC in 2013, or which they have been carried out a bathing water analysis, only 17 (34.70%) were compliant from the point of view of the sampling frequency and the determined values, with the reference values of the legislation in force in Romania. In all these areas, the bathing water is of marine type.

Source: Ministry of Health - National Report on the quality of bathing water in 2013 of natural areas for bathing, dr. Rodica Ioana-Lupșa

Table 8.2.2.4

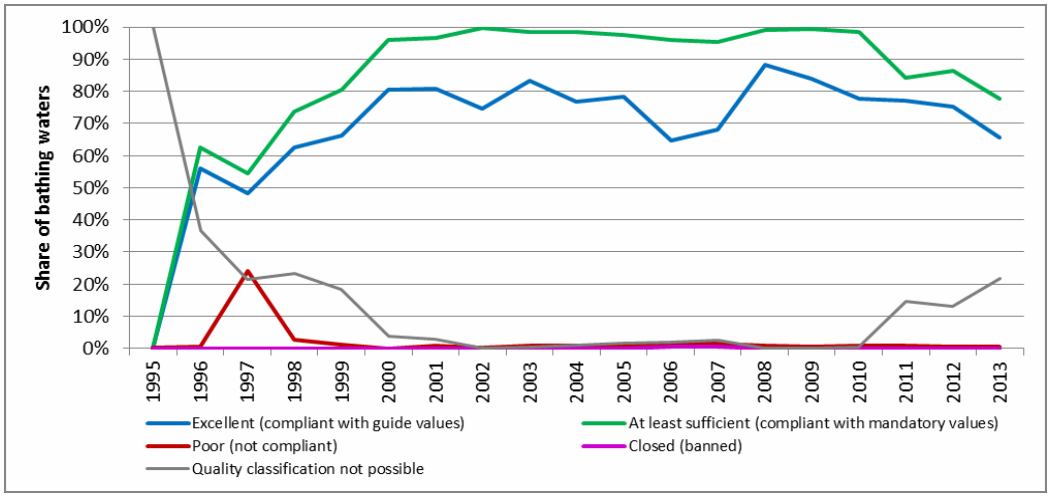
Quality of the bathing waters of the Romanian beaches evaluated by the Ministry of Health during 2008-2013

YEAR	***Number of assessed areas (Coastal bathing areas)***	***Complies with the guide and mandatory values* Excellent / %***		***Complies with the mandatory values Good / %***		***Not compatible poor / %***		***Forbidden /closed area / %***		***Insufficiently monitored areas / %***	
2008	49	1	2,0	48	98,0	1	2,0	0	0,0	0	0,0
2009	49	4	8,2	49	100,0	0	0,0	0	0,0	0	0,0
2010	49	1	2,0	49	100,0	0	0,0	0	0,0	0	0,0
2011	49	43	87,8	49	100,0	0	0,0	0	0,0	0	0,0
2012	49	4	8,2	49	100,0	0	0,0	0	0,0	0	0,0
2013	50	17	34	50	100,0	0	0	0	0	0	0

Bathing waters which were compliant with the guide values were also compliant with the mandatory values for five parameters in accordance with Directive 76/160/EEC or is mandatory value Escherichia coli Class **CG (excellent).*

(source http://www.eea.europa.eu/themes/water/status-and-monitoring/state-of-bathing-water/state) or Ministry of Health, National Institute of Public Health

Graph 8.2.2.2 *Evolution of bathing waters in monitored areas, during 1995-2013*



Source: http://www.eea.europa.eu/themes/water/status-and-monitoring/state-of-bathing-water/state

• Global quality of bathing waters of EU member states in 2013

Stormwater discharges, caused when channels can not accommodate heavy rains, are still a problem in some areas, although better water treatment and fewer discharges of untreated sludge channel improved water quality.

In the early 1990s, only about 60% of bathing sites had excellent water quality, while 70% met the minimum standards.

In 2013, bathing waters in Europe were generally of high quality. In over 95% of bathing sites were observed the minimum requirements for water quality, and in 83% of these area have been met the more stringent requirements, obtaining the qualification "excellent".

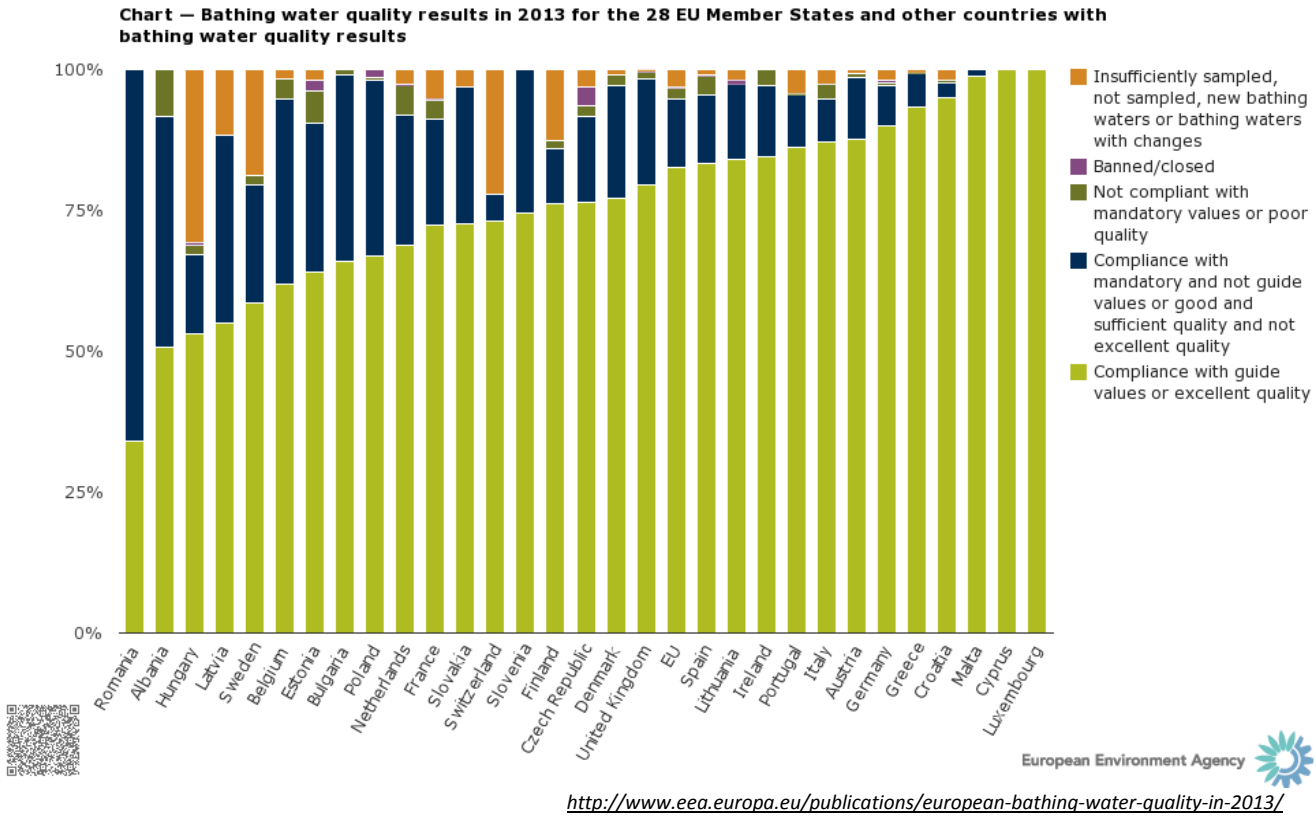
The proportion of bathing areas with low water quality was only 2%.

The proportion of areas in which were observed the minimum requirements in 2013 was about the same level as in 2012.

However, the proportion of bathing areas evaluated as "*excellent*" increased from 79% in 2012 to 83% in 2013. In coastal areas, water quality was slightly better, 85% of these areas achieving *excellent*. *(http://www.eea.europa.eu).* (graph 8.2.2.3).

(source: *Annual report of the European Environment Agency (EEA) and European Commission on bathing water*, http://www.eea.europa.eu)

Graph 8.2.2.3 *Quality of the bathing waters reported in 2013 for the 27 EU member states and other countries*



http://www.eea.europa.eu/publications/european-bathing-water-quality-in-2013/

8.3. EFFECTS OF WASTE MANAGEMENT ON THE POPULATION'S HEALTH CONDITION

Some of the unwanted consequences of human civilization are waste occurrence, quantitative increase and diversity. Of the total amount of municipal waste, most of it is domestic waste and assimilable to domestic waste (about 72%), and approximately 45% of it is biodegradable waste. The waste comes both from households and from operators, commercial spaces, offices, public buildings, health care facilities, and public spaces (parks, public gardens, squares, streets). Municipal waste disposal is done exclusively by storage on landfill. So far, in Romania installations for the incineration of municipal waste are not yet commissioned.

Waste cause not only hardships and high costs related to waste pick up, transport, neutralization, disinfection and disposal into the natural environment, but also potential risks for health.

The direct risks for the health state are linked to the presence in waste of the pathogen organisms (*bacteria, viruses, protozoa, helminths*), of the organic substances subject to decomposition resulting in intermediary badly-smelling compounds and potentially toxic, and of toxic chemical substances themselves, morbidity causes such as infectious diseases and intoxications, frequently epidemical**.**

There are also indirect risks caused by the contamination of water sources and implicitly of aliments, by unsanitary waste management.

Moreover, inadequate storage and collection of waste serves as shelter and food for rats, flies, bugs and other vectors playing a passive role in diseases transmission. Not only the general population, but mainly those working in health and sanitation fields are subject to such risk, plus a higher risk of exposure to accidents caused by dust, flammable materials and other hazard materials, as well as road traffic during transportation or indiscipline of some members of society. Also, solid waste might contain toxic substances**.**

Correct disposal of domestic waste water is an important environmental sanitation condition, protecting soil and surface water sources from the risk of toxic pollution with detergents, disinfectants, insecticides, as well as pathogens, in the majority of intestinal origin.

House connection to the sewerage system is the best safeguard of the environment and in particular the protection of ground and surface water sources, but also of the individual sources where aquifers are not deep enough to ensure water protection. Almost a quarter, 23.55% of the residents of individual houses, with no sewage system, have the bathroom outside their houses, showing an increased risk of non-sanitation by infiltrating pathogens, and the development of insects and rodents that can transmit infectious and parasitic diseases**.**

Waste generated by medical activity

The Ministry of Health, through the National Institute of Public Health from Bucharest, prepares the National synthesis "*Monitoring and inspection of the management system related to waste generated by medical activity*" and updates the national database related to waste generated by medical activity.

The synthesis is included in PN II

- National monitoring program for determinant factors related to work and lifestyle, respectively the field
- Protecting health and preventing diseases associated to the risk factors in the life environment, activity
- Management system monitoring of the waste resulting from the medical activity, in accordance with MH Order no. 422/2013 approving the technical norms for implementation of national health programs for 2013 and 2014.

The database is done through a system of monthly, quarterly and annual reporting of data collected by health units with private and public beds, coordinated by public health departments of local and regional public health centers, based on the methodology for collecting and reporting of data. The main objectives of the synthesis and thus of the national database are: regular assessment of the waste management system, carried out in hospitals with beds, qualitative and quantitative determination of waste produced in hospitals with beds, *identifying risks that can be generated by this category of waste*, minimizing the amount of medical waste generated by health units and proposing measures aimed at improving the management of waste produced in hospitals.

At the end of 2012 was approved, issued and published in the Official Gazette MH Order no. 1226/2012 approving the Technical regulations on the management of medical waste and data collection methodology for the national database of medical waste.

The year 2013 is basically the first year of implementation of the new legislation on medical waste management, namely technical standards and methodology for data collection at health units in the country. Collection and reporting of data to the national database waste from medical activity was based on the methodology of data collection, represented by the Minister of Health Annex 2 Order no. 1226/2012. Data

collection methodology is applied monthly at the level of public and private hospitals with beds and the reporting is also done monthly to the county public health departments. The National Institute of Public Health, through CMCER, developed electronic reporting models and data processing activities on medical waste management resulted from medical activities for healthcare facilities, public health departments and regional public health centers. The county public health departments, following the centralization of data, report quarterly to the regional public health centers. The Regional Public Health Centres process the data reported by local departments of public health and forward the situation to the National Center for Monitoring of Community Environmental Risks (CMCER) of the National Institute of Public Health (NIPH).

Annually, CMCER processes data on a national level, develops the synthesis report and sends it to the Ministry of Health.

Data types and quantities of waste that reflect the management of waste from healthcare facilities, can be found in ***Chapter 6, section 6.6.3 Waste generated by medical activities.***

The statistics regarding waste from medical activities can be found on the website of the Ministry of Health or the National Institute of Public Health. (http://www.ms.ro/, https://www.insp.gov.ro/)

8.4. EFFECT OF PESTICIDES AND CHEMICAL SUBSTANCES ON THE ENVIRONMENT

Pesticides (plant protection products) are biologically active substances or formulated products containing active substances, plant protecting or synergist agents, in the form they are applied in agriculture and forestry and are intended for one of the following uses:

- **(a)** - protection of plants or plant products against all harmful organisms or prevent the action of such organisms (phytopathogens, weeds, insects and field rodents);
- **(b)** - influencing the vital processes of plants, such as substances that affect their growth, other than fertilizers;
- **(c)** - preserving plant products, in so far as such substances or products are not covered by specific Community provisions on preservatives
- **(d)** - destroying undesired plants or parts thereof
- **(e)** - controlling or preventing the growth of unwanted plants.

• Impact on health

For humans, the risk of poisoning, acute or chronic, can be of professional, accidental or voluntary nature and by environmental contamination - soil, water sources, food, air – with major implications later on.

Unprofessional acute intoxication with chemicals monitoring – according with the chemicals framework legislation - Regulation (EC) no.1907/2006 - REACH – within the Methodology for Unprofessional acute intoxication with chemicals monitoring in 2012, were analysed and interpreted health risk data related to poisoning by chemicals (pesticides for agriculture, non-agricultural, disinfectants, detergents, etc.). Public health monitoring involves the collection, analysis and systematic and continuous interpretation of risk data related to events generated by the use of chemicals.

Under the chemicals framework legislation, Regulation (EC) no.1272/2008 (CLP) on classification, labelling and packaging of substances and mixtures, analyses and interpretes data on health risks related to intoxication with chemicals (pesticides for agriculture, non-agricultural disinfectants, detergents, etc.). The main objective is to decrease cases of accidental and voluntary poisoning, and reducing the number of fatal and serious cases.

In 2013, in the County Sanitary Departments were recorded and centralized the cases of poisoning on standard forms (Declaration Sheets regarding the acute unprofessional intoxication with chemicals) and reported quarterly to the National Institute of Public Health - Bureau of RSI and Poisons Information.

In 2013 there were recorded 1153 cases of unprofessional acute poisoning with chemicals and 100 fatalities. Of the 1153 cases of poisoning recorded, most patients, 670 were in the age group 15-59 years, 322 in the age group 0-14 years group 159 people aged 60 and over 60 years.

The way that the poison entered the body was mainly oral ingestion, in 1008 cases, 96 cases inhalation, 15 dermal cases, 1 ocular case and 33 unknown cases.

Regarding the severity of poisoning there were recorded 237 cases without consequences, 375 cases of forms with low severity, 77 cases of medium severity, 46 high severity and 318 cases unknown.

Regarding the class of the products that caused the unprofessional acute poisoning with chemicals, agricultural pesticides was present in the majority of cases - 201 cases, followed by 187 disinfectants cases, 183 detergents cases, 162 cases caused by non-agricultural pesticides.

The large number of poisonings with pesticide products (201) imposes a more rigorous control performed by the responsible bodies regarding the compliance with legal provisions governing the pesticides regime, and should elucidate how some products have reached the population.

It is necessary a closer supervision of children in the family, because in 2013 there were reported 322 cases of unprofessional acute poisoning with chemicals in children and it should be done a better information and education of adults who use pesticides in agriculture and human sanitary prophylaxis.

Source *Ministry of Health, National Institute of Public Health (http://www.ms.ro/, https://www.insp.gov.ro/)*

• Impact on the environment

An essential factor for increasing productivity and reducing the crop losses is the use of products to protect the plants, which lead to obtaining highly qualitative products, at advantageous prices, contributing to environment protection

Therefore, the durable use of plants protective products, in the meaning of the provisions of framework directive 2009/128/CE, is a key-element in obtaining a durable agricultural production, and implicitly, to create a competitive agricultural system at European and international level.

In the context of making the national legislation compatible with the European Union acquis in the phytosanitary field, the national legislation transposed the Directive 2009/128/CE of the European Parliament and Council dated 21 October 2009 to establish a communitarian framework for the durable use of pesticides, through G.E.O. no. 34/27.06.2012 to establish the institutional action framework for the durable use of pesticides across Romania, published in the Official Gazette of Romania, Part I, no 435 dated 30.06.2012.

The durable use of pesticides is primordially focused on reducing the dependency of chemical methods for plants protection which shall reduce the impact of plants protection activities on flora and fauna and shall preserve biodiversity, especially by establishing concrete measures of promoting some adequate concepts of agricultural environment, such as crops rotation, etc.

The concept of sustainability integrates three components, namely: economic, environmental and social.

The main issues to reduce the risk associated with the use of plant protection products both directly and indirectly, on farms, along watercourses and natural protected areas, are established in the National Plan of Action for the sustainable use, including indicators for monitoring the use of plant protection products containing active substances of particular interest, and the availability of alternatives. The measures included in the national plan aim to reduce dependence on chemical methods of fighting pest, disease and weed control, providing professional users (farmers) specific information regarding integrated pest management and non - chemical alternative methods such as multipurpose protection areas known as part of the areas or agricultural parcels that maintain ecological balance and contribute to biodiversity conservation (increasing the number of species, of insect pollinators, of predatory insects and other non-target organisms, providing corridors for wildlife, reducing runoff and risks of pollution with plant protection products of the water sources adjacent to agricultural fields, while avoiding soil erosion.

To implement the specific provisions set out in the National Action Plan, one should take into account other relevant objectives of the Common Agricultural Policy, such as recycling measures and actions to boost agriculture, the sector policies in environmental field (water, soil and biodiversity) and human health policies.

Due to the risk to the environment and human health represented by the substances and chemical preparations, management and monitoring of such substances is of particular interest from all responsible parties.

Reducing the risks associated with the use of plant protection products requires the efficient and at European Union standards of the authorization process of plant protection products which establishes the use of these products. The designated national authority for the authorization of plant protection products is the National Commission for approval of plant protection products (CNOPPP). In accordance with the legislation in force, CNOPPP has the following relevant tasks related to fulfilment of the objectives of the National Plan of Action:

- approval of products for which dossiers were submitted for evaluation through the European procedure under *Directive 91/414/EEC concerning the introduction on the market of plant protection products, implemented by Government Decision no. 1559 of 23rd September 2004, on the procedure for approval of plant protection products for placing on the market and their use in Romania*;
- reassessment of existing approvals and aligning them to the current requirements of the European Union on the approval and use of plant protection products;
- review of approval certificates in accordance with EU legislation
- participation in the process of re -evaluation by *Worksharing* of existing approvals;
- participation in the area homologation to meet the obligations of membership arising from the European Union membership status;
- approval of plant protection products by applying the principle of mutual recognition of plant protection products;
- granting parallel trade permits.

NEPA is represented in the CNOPP with the members and the president and is involved in the evaluation of product files.

In this context, in 2013, *143 files* were evaluated by the National Commission for approval of plant protection products through national proceedings, for the issuance of *the environmental permits for plants protection products* necessary in order to have them homologated. NEPA issued 143 environmental permits.

The National Environment Protection Agency evaluated, through the Community procedure and drafted environment and ecotoxicology reports for *14 plant protection products.*

- ***Fertilizers***

NEPA is represented in the CNI, by a member and vice-president and is involved in the evaluation of product files for issuing environmental permits

In this context, in 2013, 37 cases were evaluated for issuing environmental permits for fertilizers, required for their approval by the National Commission of Fertilizers.

NEPA issued 37 Environmental Fertilizer Permits.

- ***Biocide***

NEPA is represented in the NCBP by members and vice-president and is involved in the evaluation of product files.

The National Commission for Biocide Products authorised the marketing, in 2013, of *biocide products* according to the provisions of the Directive 98/8 concerning the marketing of biocide products, for which NEPA prepared environment and eco-toxicology evaluation reports for 352 products for national approval and for 30 products for mutual recognition.

- ***Import and export of certain dangerous substances and preparations (PIC)***

In the field of import and export of restricted substances regulated by *Regulation (EC) no. 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous chemicals (PIC),* NEPA updated the inventory of importers/exporters of PIC with related information for 2013. In 2013, were imported *1,827,100.00 kg* of substances and 130,842.46 kg of mixture containing substances covered by Regulation 689/2008. In 2013, were exported 3638.5 kg of substances and 90,320 kg of mixture containing substances covered by Regulation 689/2012.

To perform imports in 2013, the National Authority designated under Regulation 689/2008 - MMSC, issued import authorizations.

- ***Regulation 1907/2006 for the registration, evaluation, authorization and use restriction for REACH chemicals and***
- ***Regulation (CE) 1272/2008 on classification, labelling and packing of substances and mixtures (CLP)***

Operators are advised through the national office for technical assistance HELPDESK – REACH, CLP. In 2013, there were *128 requests* from the operators which were advised through the HELPDESK- REACH and *32 requests* from the operators which were advised through the HELPDESK- CLP, respectively

In 2013, ANPM updated the national database following the inventory of the economic operators working with harmful substances and mixtures/items, as follows:

- ***NEPA updated the specific inventories on substances regulated by the Montreal Protocol (ODS) and alternative, persistent organic pollutants, mercury***

8.5. ENVIRONMENT AND HEALTH - PERSPECTIVES

Initiatives aimed at ensuring environmental protection need time to give results. Orientation of the economy towards new directions requires a long-term vision, which is why the EU has launched a series of environmental action programs. The European Commission initiates and defines a new policy and new environmental legislation. It also promotes the integration of environmental concerns into other policy areas and ensures that measures are effectively implemented in the Member States.

In the 1970s and 1980s, the focus was on traditional environmental issues, such as the protection of species and reduction of pollutant emissions. Current systematic approach takes into account the links between different subjects and their overall size and encourages the promotion of ecological approaches in the areas of industry, energy, agriculture, fisheries and transport.

Europe 2020 Strategy recognizes that future growth will be achieved in the context of growing constraints on resources and rising prices.

Environmental policy will play a key role, seeking a balance between the limits of the planet's resources and needs of future generations to create more opportunities for growth, more jobs and more income sources. *(source http://ec.europa.eu)*

In assessing the possible influences of environment and human health four priorities have been identified

- climate changes;
- nature and biodiversity;
- natural resources and waste;
- environment, health and quality of living.

These four issues have been selected as starting points, since they are the current priorities of European strategic policies

Thus, virtually all environmental determinants and their changes are reflected in the health of the population and thus the quality of life. Primarily monitoring the health of the population, of the indicators they represent, could lead to the identification of the main environmental determinants that may influence the quality of life and thus to take administrative, planning and educational measures, suitable for the area.

Given that the environment provides the necessary conditions of life, there were established at international level, some days dedicated to the environment, forming the "ecologist's calendar" marked by activities organized by governmental bodies and institutions and non-governmental organizations, such as:

- *March 22nd – Water Protection World Day*
- *March 27th – Water's World Day*
- *April 1st – Birds' World Day*
- *April 15th – Forest Day*
- *April 22nd – Earth's Day*
- ***June 5th – Environment's World Day***
- *June 8th – Oceans' World Day*
- *September 16th – Ozone's World Day*
- *October 4th – Animal Protection's World Day*
- *October 6th – Habitat's World Day*

These days, dedicated to environmental events, marked by activities organized by authorities and governmental and non-governmental organizations, are an opportunity to increase awareness, raise awareness and educate the public on the need to protect the environment factors and the importance of living in a clean, unpolluted environment.

The movement **"Let`s Do It, World!"** is the largest ever organized social movement in the world and managed to mobilize more than 7 million volunteers involved in many cleaning and educational activities. In 2012, a complex network of volunteer teams and NGOs have organized 84 cleaning activities of 1 day in Asia, Africa, North America, South America and Europe and have managed to collect over 67 000 tonnes of waste.

After the success of the first three editions in 2010, 2011 and 2012 attended by over 650 000 volunteers who collected more than 1.6 million bags of waste, the National Cleaning Day of Romania has become a tradition that unites Romanians all over the country.

The project brings together authorities, companies, NGOs, media representatives, public and volunteers to clean the whole country in one day. ***"Let`s Do It, Romania!"*** *currently means a lot of hard work and passion, and visible results obtained during the 3 years since the project was born. In recent years we have made great strides in raising awareness among Romanians about the problem of garbage in nature and, equally, we were able to mobilize for cleaning hundreds of thousands of people to bring about positive*

*change in Romania. Slowly, Romanians begin to understand our message and become ambassadors to pass this message on. Equally, we know that we are just at the beginning and that much remains to be done, both in the environmental education and prevention, but also in the mobilizing action. Beyond the ecological significance, "Let`s Do It, Romania!" is an invitation to take action and change something when things do not go as we would like them to go, so we are waiting for you to come and join us. It is important to point out that such an initiative has continuity and that it is developing from year to year, "*said the project representatives. *(source http://www.letsdoitromania.ro)*

The period 16 to 22 September is, each year, the ***"European Mobility Week"***. The theme of the 12th edition, in 2013, was **"Clean air - it's your move"**.

The campaign raises awareness of the impact of transport on local air quality, and encourages citizens across Europe to improve health and wellbeing by changing their behaviour regarding the daily mobility. The 2013 European Mobility Week coincides with the European Year of the Air. Air pollution continues to have a major impact on the health of European citizens, leading to respiratory and cardiac complications, premature deaths and shorter life expectancy.

Air pollution affects the environment, resulting in acidification, loss of biodiversity, ozone depletion and climate change. Urban traffic is a growing source of air pollution - especially when it comes to particulate matter and carbon dioxide. Therefore, local authorities have the responsibility to develop urban transport strategies that meet the conditions of mobility, environmental protection, improve air quality and make the city a better place to live in. Confirming the support for the campaign, Janez Potočnik, European Commissioner for Environment, said: *"This year, we will focus on the impact that transport and our everyday choices have on the quality of the air we breathe and our health. By raising awareness and providing alternative transportation options, cities can become more attractive places for people to live in, they can make a major contribution to protect our health and promote a more sustainable future for all of us because when comes to* ***fresh air, it's your turn!*** *" (source http://www.anpm.ro)*

8.6. ENVIRONMENTAL RADIOACTIVITY

Radioactivity is the property of the nuclei of some chemical elements of releasing corpuscular and electromagnetic radiations though spontaneous disintegration. This is a natural phenomenon happening in the environment

Natural radioactivity is caused by terrestrial radioactive substances (such as U-238, U-235, Th-232, Ac-228 etc.), plus cosmogenic radioactive substances (H-3, Be-7, C-14 etc.) and the cosmic radiation, which all together form the background radiation. Terrestrial radioactive substances are found in the nature from the beginning of times, and their abundance depends on the geologic conformation of various zones, varying from one place to another. The extra-terrestrial component of natural radioactivity consists of cosmic radiation from outer space origin and the Sun. The cosmogenic radioactive substances are formed in the high layers of the atmosphere, by interaction of cosmic radiation and stable elements.

All ionizing radiations, terrestrial or cosmic, for the natural background of radiations acting upon the living organisms.

There are natural radionuclides and artificial radionuclides, which ended up in the environment through different ways:

- intentionally, following nuclear tests and through discharges from various nuclear installations;
- accidentally, following defections to nuclear installations (examples: the nuclear accidents from Cernobîl, Fukushima.

The National Network for the Surveillance of Environmental Radioactivity (NNSER) is part of the Integrated System for Environment Pollution Supervision across Romanian territory, within the Ministry of Environment and Climate Changes (M.E.C.C.).

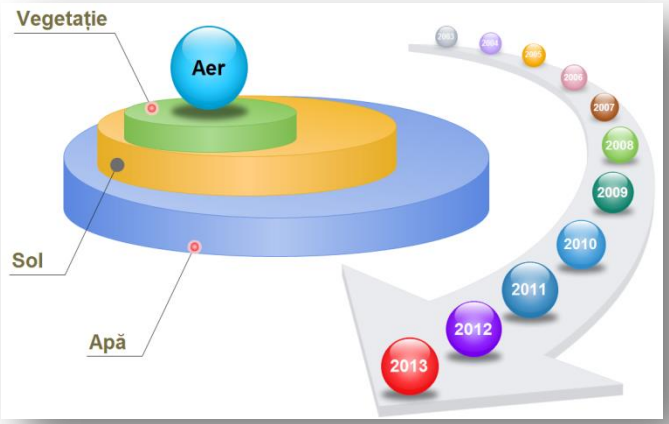
The scientific, technical and methodological coordination of NNSER is provided by the National Reference Radioactivity Laboratory (NRRL) within the National Environmental Protection Agency (NEPA).

In 2013, NNSER had 37 operational Environment Radioactivity Supervisory Stations (ERSS), laboratories which are part of the organization and administrative structure of the County Environmental Protection Agencies and 88 automatic monitoring stations for the gamma dose flow induced in the air (figure 8.6.-1). Their distribution in Romania covers all forms of relief.

Figure 8.6.-1. *The National Network for the Surveillance of Environmental Radioactivity*

Out of the 37 ERSSs, 9 were operational 24 hours/day (ERSS Cernavodă, ERSS Constanţa, ERSS Bechet, ERSS Craiova, ERSS Piteşti, ERSS Babele, ERSS Cluj, ERSS Toaca and ERSS Iaşi), while the remaining ERSSs worked 11 hours/day.

The analyses run for the monitored environment factors (air - through aerosols, wet and dry atmospheric deposits, waters – through surface and phreatic waters, uncultivated and cultivated soil, spontaneous and cultivated vegetation) were as follows: global beta, spectrometric beta and spectrometric gamma, as well as testing the gamma dose flow.



In monitoring the environment radioactivity, the objectives are as follows:

- quick detection of any radiological significant increases of the environment radioactivity across the national territory;
- quick notification of the decision-making factors in case of radiological emergency and supporting the decisions related to the implementation in real time of the protection measures, using the data from field;
- controlling the radioactive pollution sources with environment impact, according to the legal provisions, and within the limits allowed nationally;
- evaluation of doses taken by population following additional radiations, generated by practices or radiological accidents;
- continuous follow-up on the natural radioactivity levels, very important in evaluating the consequences of a radiological emergency situation;
- providing information to the public.

Under NRRL - NEPA coordination, NNSER developed in 2012, two types of programs for environment radioactivity monitoring. These are:

- ✓ **The national standard monitoring program for environment radioactivity factors**, unitarily applied by all ERSS within NNSER; such program is permanent and tracks the evolution in time of the environment factors radioactivity;

- ✓ **The monitoring program for the areas with natural background modified from anthropogenic point of view** – this is specific for each area; in 2013, 20 ERSS were involved in the development of this program, in parallel with The national standard monitoring program for environment radioactivity factors

8.6.1. THE NATIONAL STANDARD MONITORING PROGRAM FOR ENVIRONMENT RADIOACTIVITY FACTORS

8.6.1.1. AIR RADIOCTIVITY

Monitoring the air quality from the point of view of radioactivity is the first way of identifying the presence of natural and artificial radionuclides in the atmosphere, outside the natural background limits.

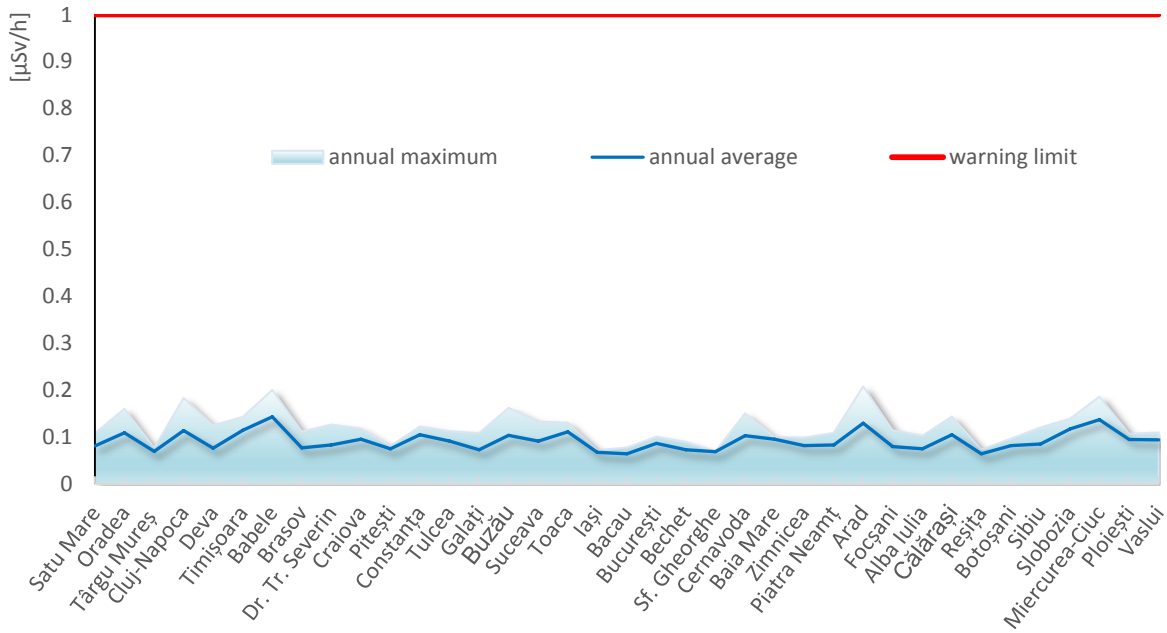
For this purpose, the following determinations are done: gamma doze flow, global beta and spectrometric gamma over atmospheric aerosols, as well as over total (wet and dry) atmospheric deposits and global beta determinations over wet atmospheric deposits.

➢ Gamma dose flow

The gamma dose flow rate is determined hourly. The readings are the first indication on the atmosphere radioactivity. The annual variation of the gamma dose flow rate for the year 2013

The average annual variation of the gamma dose flow recorded in 2013 within NERSN, was in the range from 0.064 to 0.143 μSv/h and is shown in Figure 8.6.-2. The error associated with this analysis is below 15%.

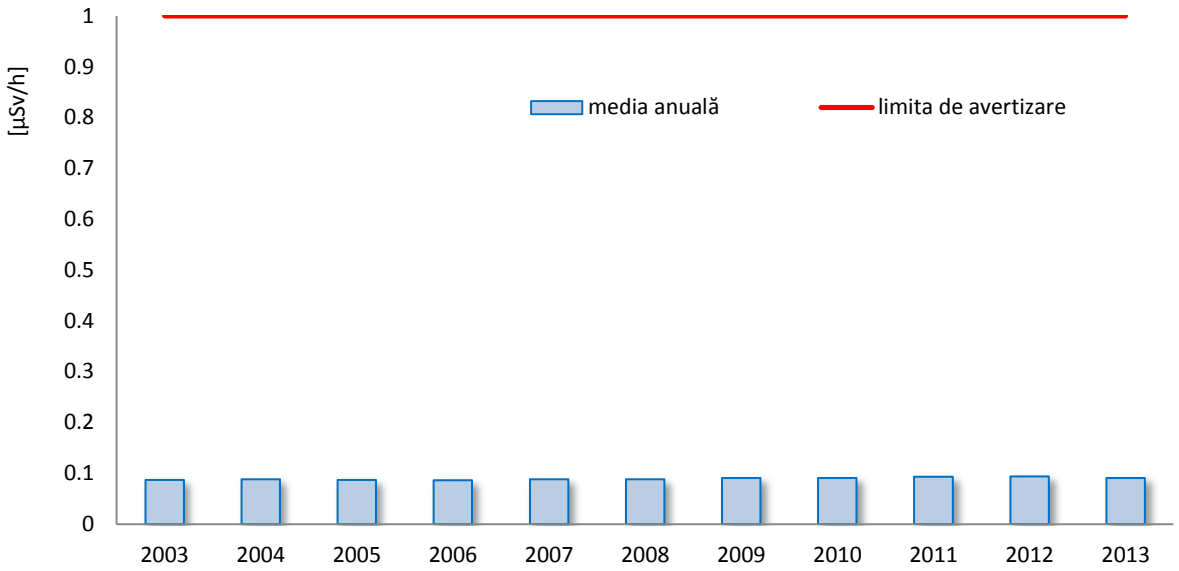
Figure 8.6.-2. *Annual average variation of the gamma dose flow absorbed in the air across the Romanian territory, in 2013*



Note: the warning limit for the gamma dose flow (as per O.M. nro 1978/2010) is 1 μSv/h.

The multi-annual variation trend, at national level, of the gamma dose flow in the period 2003-2013 is shown in figure 8.6.-3.

Figure 8.6.-3 *The multi-annual variation trend of the gamma flow in the air recorded in Romania*



The value of the 2013 annual average, 0,091 µSv/h was maintained in the range of variation of the previous years, from 0.086 to 0.094 µSv/h.

➢ Atmospheric Aerosols

The samples of atmospheric aerosols are taken by suction on filters, subject to global beta and spectrometric gamma analyses.

The atmospheric aerosols sampling is made within ERSS according to the specific working hours, as follows:

- 4 suctions: 02 – 07 (A1), 08 – 13 (A2), 14 – 19 (A3) şi 20 – 01 (A4);
- 2 suctions: 02 - 07 (A1) şi 08 – 13 (A2).

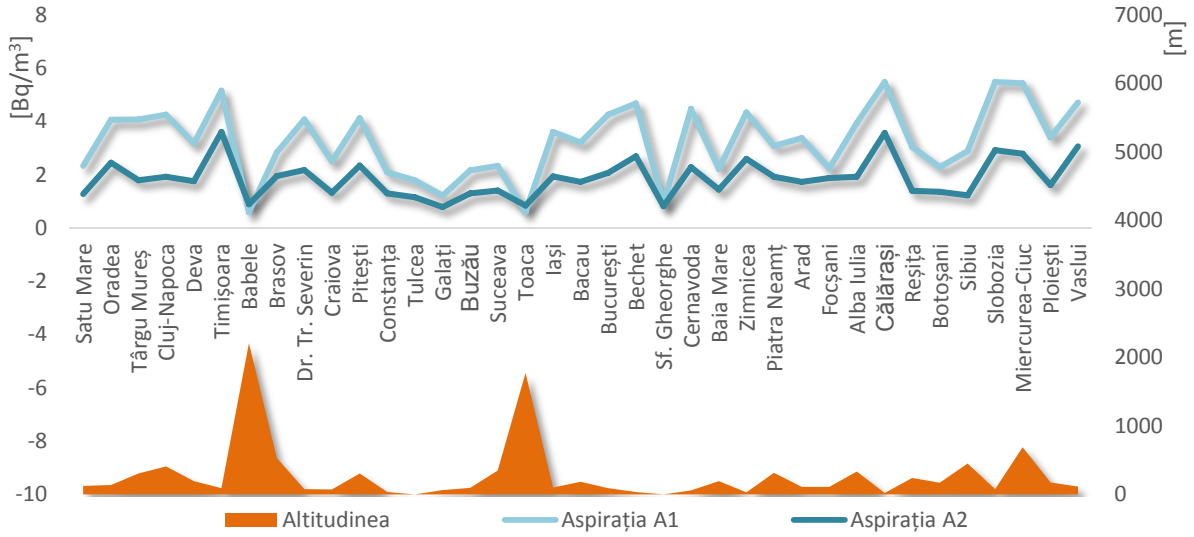
The global beta analyses on atmospheric aerosols filters were done on individual filters. Each filter was measured three times, at well-established time intervals: at 3 minutes after sampling completion, after 20 hours, respectively 24 hours (depending on the working hours of the station, in order to determine the radon and thoron from atmosphere) and 5 days after finishing the suction

The total number of global beta analyses made in 2013, on the atmospheric aerosols filters, was 95,130.

In case of immediate global beta tests of samples of atmospheric aerosols, the influence of the diurnal variation of air currents on the activity of atmospheric aerosols is observed through higher readings at filters sampled during the night, A1 (0.599 to 5.493 Bq/m^3) and A4 (0.677 - 4380 Bq/m^3) compared with those taken during the day, A2 (0.792 to 3.614 Bq/m^3) and A3 (0.820 2303 Bq/m^3). The maximum value obtained in the suction hours 02-07 (A1), due to the reduced dispersion in the atmosphere, while the minimum suction was obtained between the hours 14-19 (A4).

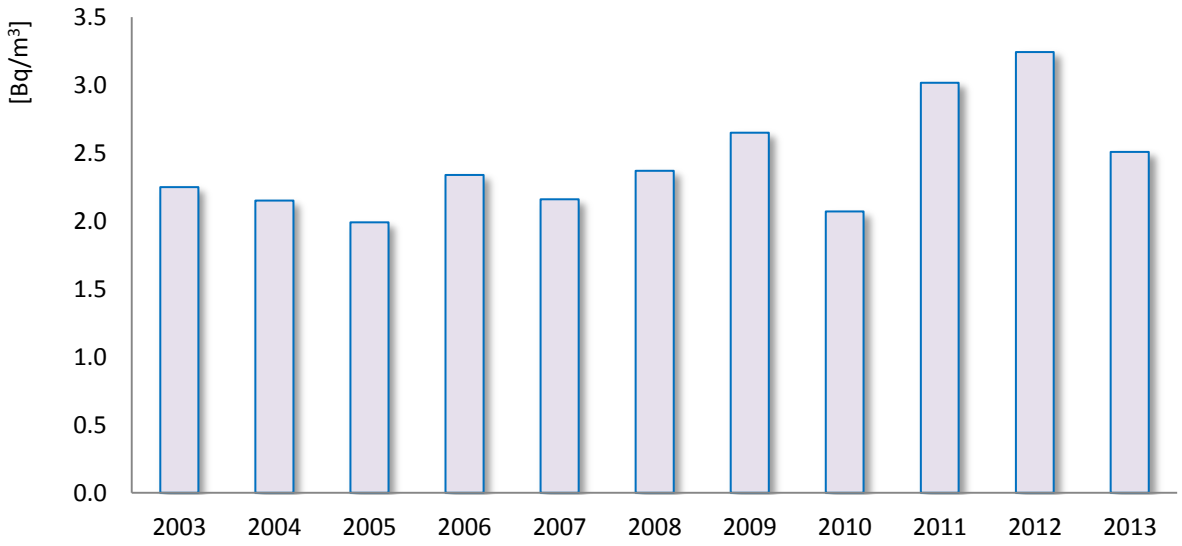
The distribution of the annual average values of the global beta activities of the atmospheric aerosols by altitude sampled in Romania is shown graphically in figure 8.6.-4. From these it can be observed that the minimum values are read at ERSS in mountain areas (Toaca ERSS and Babele ERSS), while the minimum values are read at ERSS in plain areas (Călăraşi ERSS and Slobozia ERSS).

Figure 8.6.-4. *Distribution of the beta global activity (annual average values) of the athmospheric aerosols samples, A1 and A2 suctions, according to the altitude of the sampling point, in 2013*



Note: the warning limit for the atmospheric aerosols by global beta analysis (as per O.M. no 1978/2010) is 50 Bq/m³

Figure. 8.6.-5. *Multi-annual average variation of the global beta activity of the atmospheric aerosols, across the Romanian territory – immediate measuring*



The annual average of the beta global atmospheric aerosols activity (immediate measurement) obtained in 2013 (2.51 Bq/m³) is comparable to the multi-annual average value (2.42 Bq/m³) calculated for the period 2003-2012, and falls within the variation limit thereof.

The delayed global beta analyses of the atmospheric aerosols samples are done at 20 hours, respectively 24 hours (depending on the working hours of the station, in order to determine the radon (Rn-222) and thoron (Rn-220) from atmosphere) and 5 days after finishing the suction. The specific activity of radon and thoron was determined indirectly, through global beta analysis of the filters used for atmospheric aerosols suction, the reading was highlighted by figures 8.6-6 and 8.6-7.

Radon (Rn-222) and thoron (Rn-220) are gaseous daughters of U-238 and Th-232. They reach into atmosphere following the emanation from soil and rocks, where they are subject to atmospheric dispersion phenomena. The Rn-222 and Rn-220 concentrations in atmosphere vary depending on the season, the weather condition influencing both the gas emanation speed from soil, and their dilution/dispersion into atmosphere.

Figure 8.6.-6. *Variation of specific annual average activity of the radon from atmosphere, across Romanian territory, year 2013*

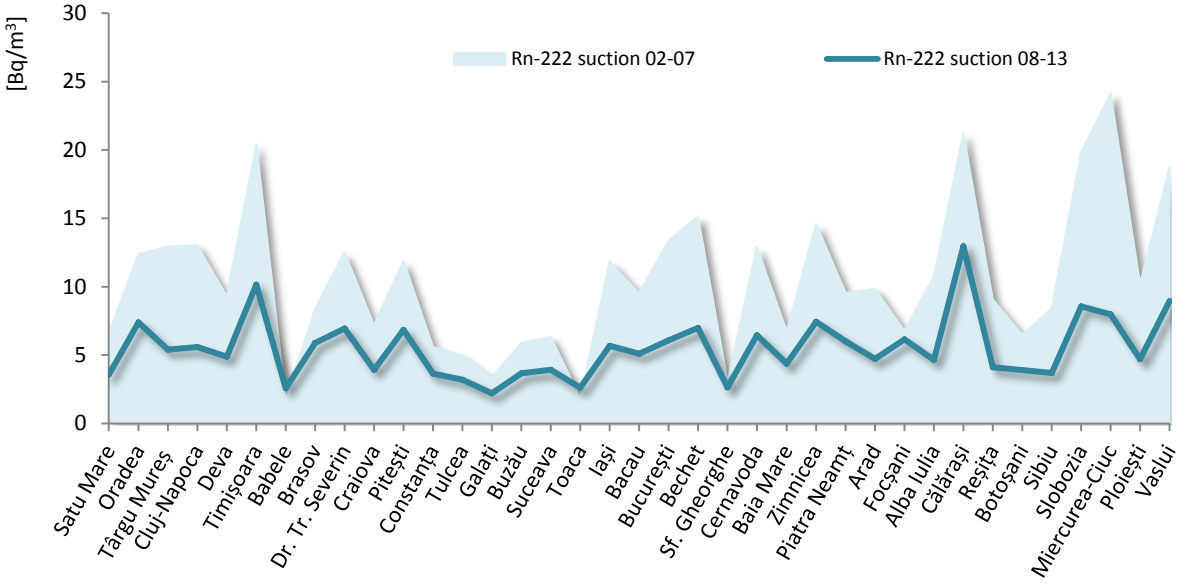
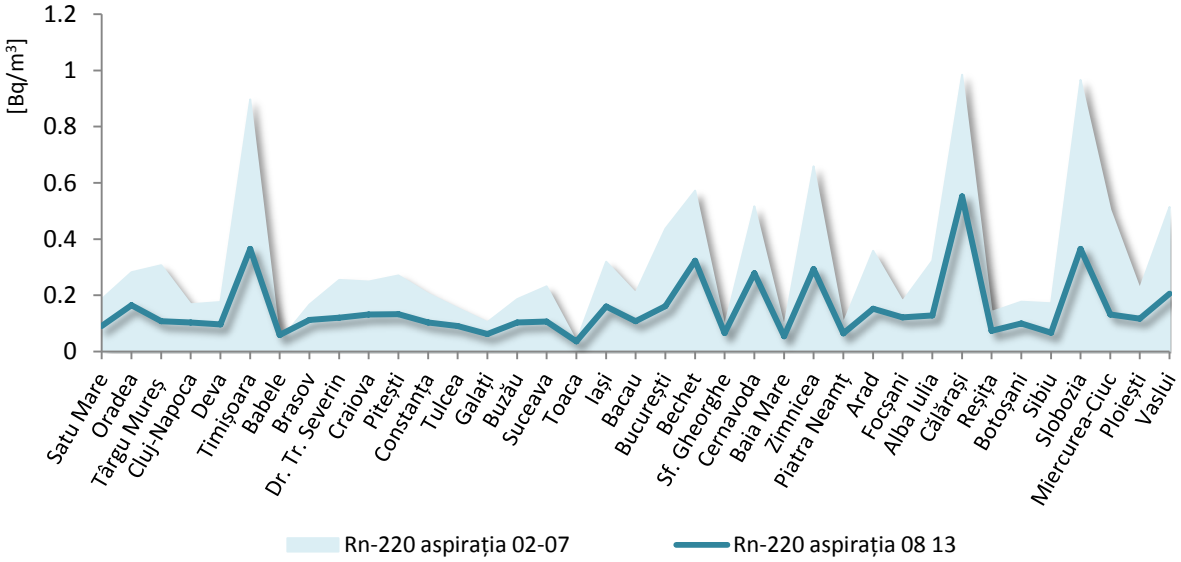


Figure 8.6.-7. *Variation of specific annual average activity of the thoron from atmosphere, across Romanian territory, in 2013*

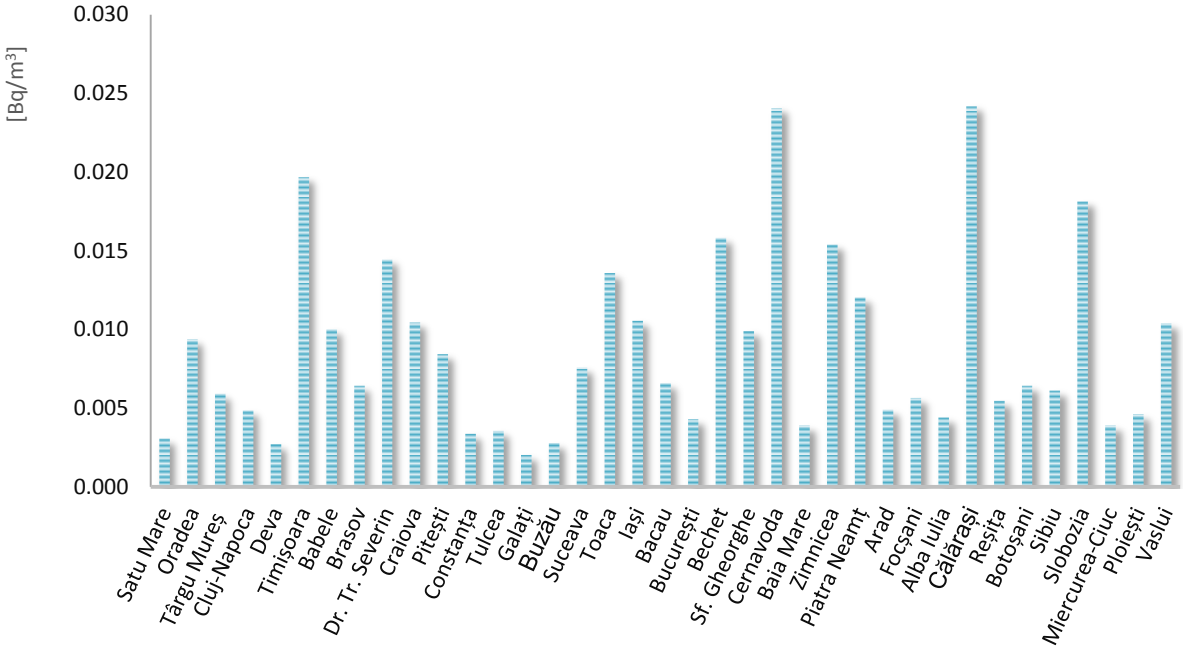


Concentration of atmospheric radon and thoron complies with the same trend as the atmospheric aerosols, both for the diurnal and seasonal variation, and the variation by altitude, being strongly influenced by the circulation of the air currents.

Variation of Rn-222 and Rn-220 concentrations countrywide is strongly influenced by the altitude of the sampling point. The annual average value, for the two suctions (from the sampling time interval 02-07 and from the sampling time interval 08-13), was 6,665 Bq/m^3 for Rn-222 and 0,185 Bq/m^3 for Rn-220.

Figure 8.6.-8 shows the annual average variation of the global beta activity of the atmospheric aerosols measured 5 days after the sampling. The variation range of the annual average values registered countrywide for atmospheric aerosols measured after 5 days is 0,002 ÷ 0,024 Bq/m^3, with an average country value of 0,009 Bq/m^3.

Figure 8.6.-8 *Annual average variation of the global beta activity of the atmospheric aerosols – measured after 5 days*

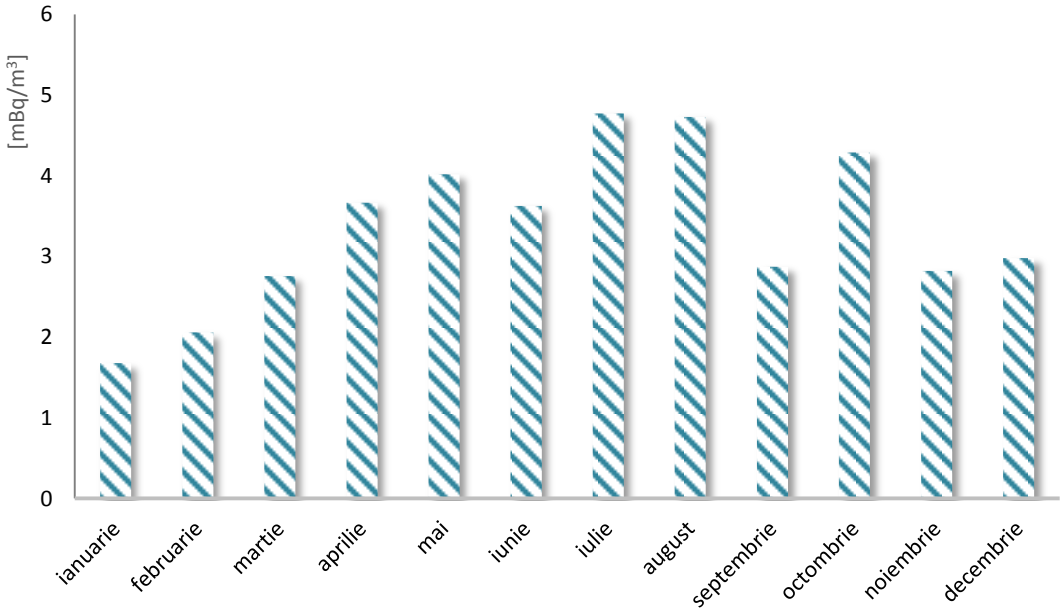


Spectrometric gamma analysis of the atmospheric aerosols samples

Under normal situations, spectrometric gamma analysis of the atmospheric aerosols samples is run on a cumulated sample, containing all samples taken from ERSS during a calendar month.

Atmospheric aerosols samples collected throughout the year highlighted the presence of natural radionuclide of cosmogenic origin, Be-7, its monthly concentration ranging from 1,610 – 4,734 mBq/m^3, with a statistical uncertainty of the determination under 30% (Chart 8.6.-9). Analysis of variation of monthly averages of Be-7 in the country showed an upward period between July to August, following a period of declining values, the lowest values being recorded in winter, in January and February.

Figure 8.6.-9. *Variation of the monthly average activity of Be-7 in atmospheric aerosols samples in Romania*



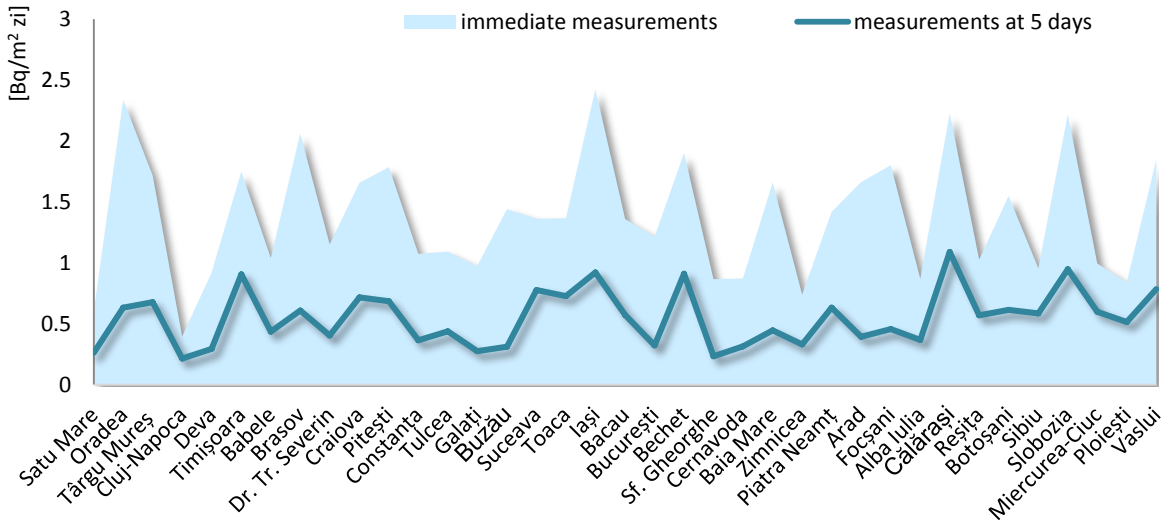
➢ Total atmospheric deposits and precipitations

The atmospheric deposits samples are obtained by daily sampling of sedimentable powders and of atmospheric precipitations from 0.3 m² area.

After sampling and processing, the total deposits samples are measured to determine the **global beta activity,** immediately and 5 days after sampling.

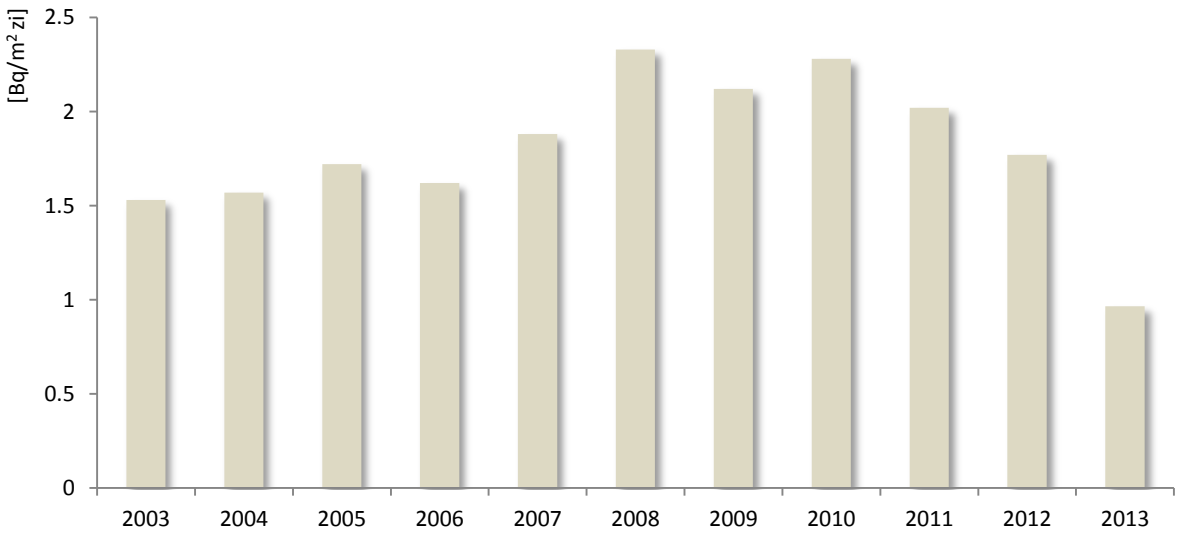
The immediate global beta analysis of the samples of total atmospheric deposits evidenced the variation of global beta activity for this type of sample, across Romanian territory, in 2013 (figure 8.6.-10). The values were obtained by calculating the average of daily values registered in 2013. Overall, there were 26496 analyses performed in 2013, in all 37 ERSSs, for atmospheric deposits. The variation of associated relative errors fall within the range 5,32-29,98%.

Figure 8.6.-10. *Annual average global beta activity of total atmospheric deposits across Romanian territory, in 2013*



Note: the warning limit for total (wet and dry) atmospheric deposits through immediate global beta analysis (as per O.M. no 1978/2010) is 1000 Bq/m²day.

Fig. 8.6.-11. *Annual average variation of the global beta activity of the total atmospheric deposits registered across Romanian territory*

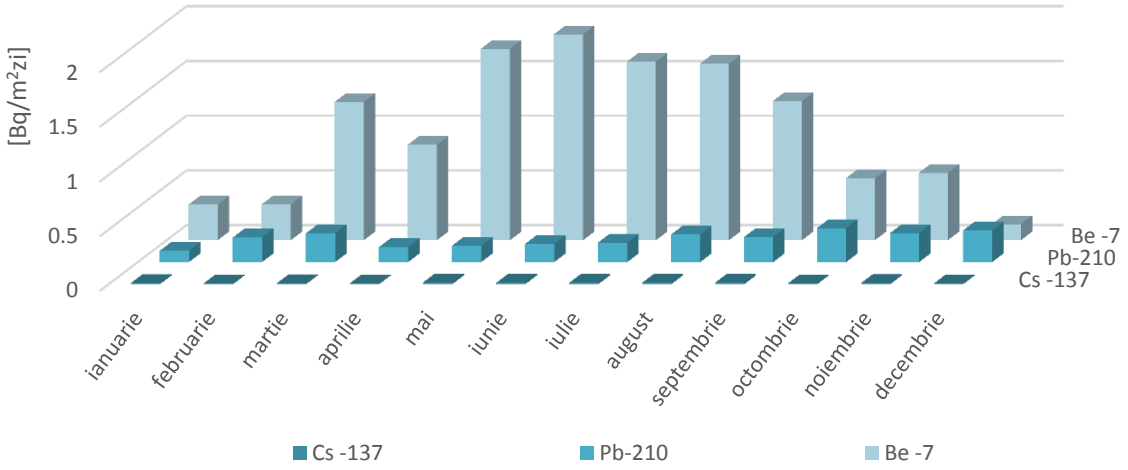


The data analysis presented in Figure 8.6.-11 underlines that since 2010 it is maintained a strong decreasing trend of the annual average values.

Spectometric gamma analysis of the samples of total atmospheric deposits

The daily samples are cumulated on a monthly basis and they are measured using spectrometric gamma. The results of the spectrometric gamma analyses, with significant values, of the samples of atmospheric deposits, for year 2013, are shown in figure 8.6.-12.

Figure 8.6.-12. *Variation of specific monthly average activity of the natural and artificial radionuclides identified in the samples of total atmospheric deposits, year 2013*



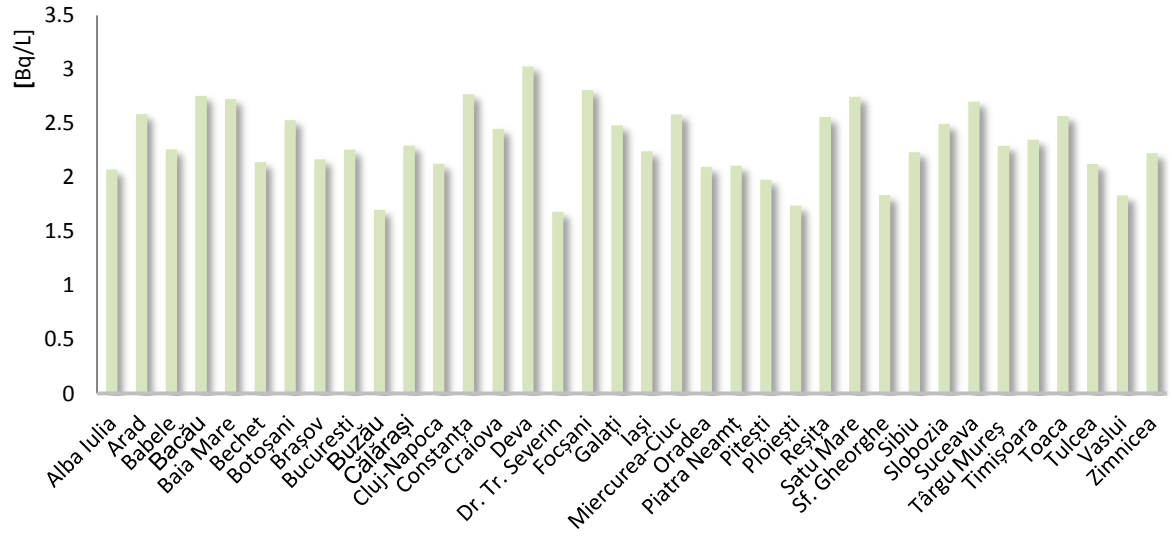
In the chart 8.6.-12, the Cs-137 fission product is present in the total atmospheric deposit samples at concentrations ranging from 0,007 – 0,015 Bq/m² daily average values. The predominant source of atmospheric contamination in 2013 was the re-suspension processes from the soil of Cs-137 from nuclear accidents.

Spectrometric beta analysis of the atmospheric precipitations samples

The precipitation samples are obtained by collecting all types of precipitations. After being collected and prepared, the samples are analysed beta spectrometric using an analyser with liquid scintillating material, in order to determine the tritium concentration.

Figure 8.6.-13. shows the tritium levels for the precipitation samples taken in 2013 by ERSS across the Romanian territory (Cernavodă exclusively). The monthly values presented were obtained by cumulating the precipitation samples taken during a month

Figure 8.6.-13. *Annual average volume activity of tritium in the atmospheric precipitations samples, year 2013*



The analysis of data string from monthly precipitations in 2013 indicates that there are no significant differences regarding the level of tritium concentration recorded by ERSS during the previous years.

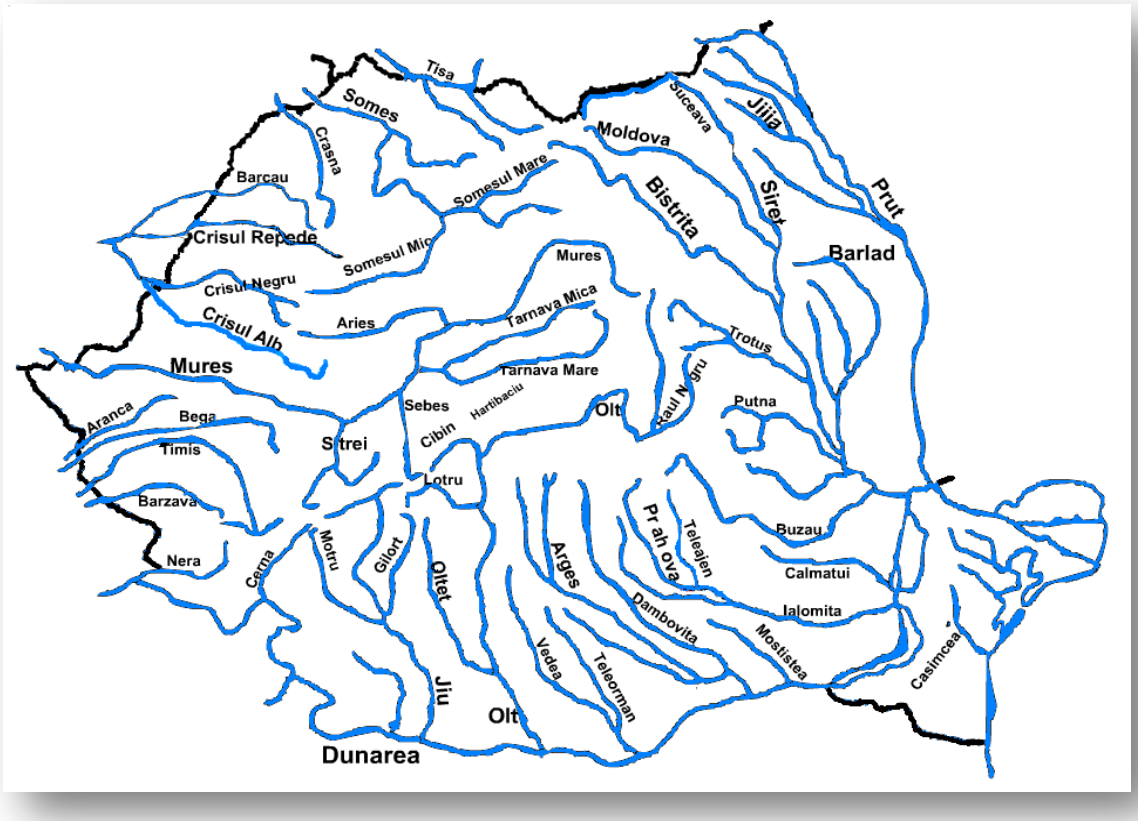
8.6.1.2. WATER RADIOACTIVITY

In order to supervise the main water courses across the country, samples are taken from the rivers nearby the ERSS, on a daily basis.

The samples are prepared for analysis and the global beta activity is measured immediately and after 5 days. The daily samples are cumulated on a monthly basis and sent for spectrometric gamma analysis.

The total number of global beta analyses (immediate and delayed) done in 2013, for the water area of all 37 ERSSs, is of 24140. The variation range of relative errors associated to surface water samples concentrations is between 1,93-29,99%.

Figure 8.6.-14. *Map of major rivers of Romania and their effluents*



➢ **Radioactivity of major rivers**

The major water courses from where daily samples of surface waters are taken are shown in table 8.6.3.

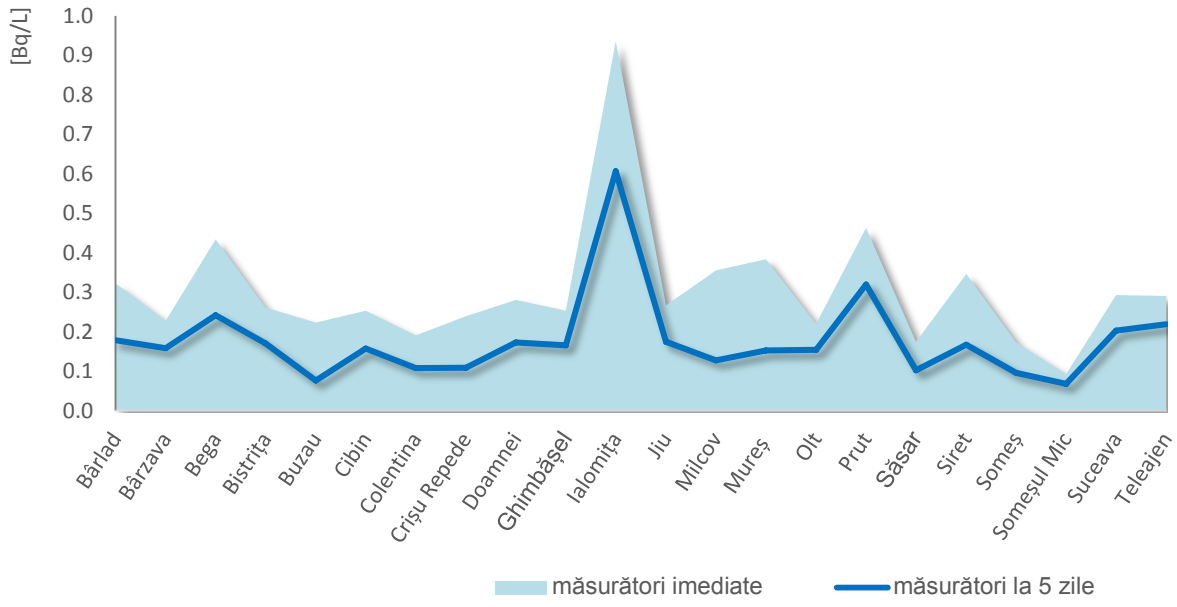
Table 8.6.3 – *Sampling points of running waters*

Locality	River	Locality	*River*
Piteşti	Doamnei	Sfântu Gheorghe	*Dunăre*
Vaslui	Bârlad	Braşov	*Ghimbăşel*
Resiţa	Bârzava	Slobozia	*Ialomiţa*
Timişoara	Bega	Craiova	*Jiu*
Piatra Neamţ	Bistriţa	Focşani	*Milcov*
Bacău	Bistriţa	Târgu Mureş	*Mureş*
Buzău	Buzău	Alba Iulia	*Mureş*
Sibiu	Cibin	Deva	*Mureş*
Bucureşti	Colentina	Arad	*Mureş*
Oradea	Crişul Repede	Miercurea Ciuc	*Olt*
Drobeta Turnu Severin	Dunăre	Iaşi	*Prut*
Bechet	Dunăre	Baia Mare	*Săsar*
Zimnicea	Dunăre	Botoşani	*Siret*
Călăraşi	Dunăre	Satu Mare	*Someş*
Cernavodă	Dunăre	Cluj Napoca	*Someşul Mic*
Galaţi	Dunăre	Suceava	*Suceava*
Tulcea	Dunăre	Ploiesti	*Teleajen*

Global beta analysis of the water samples from the major rivers

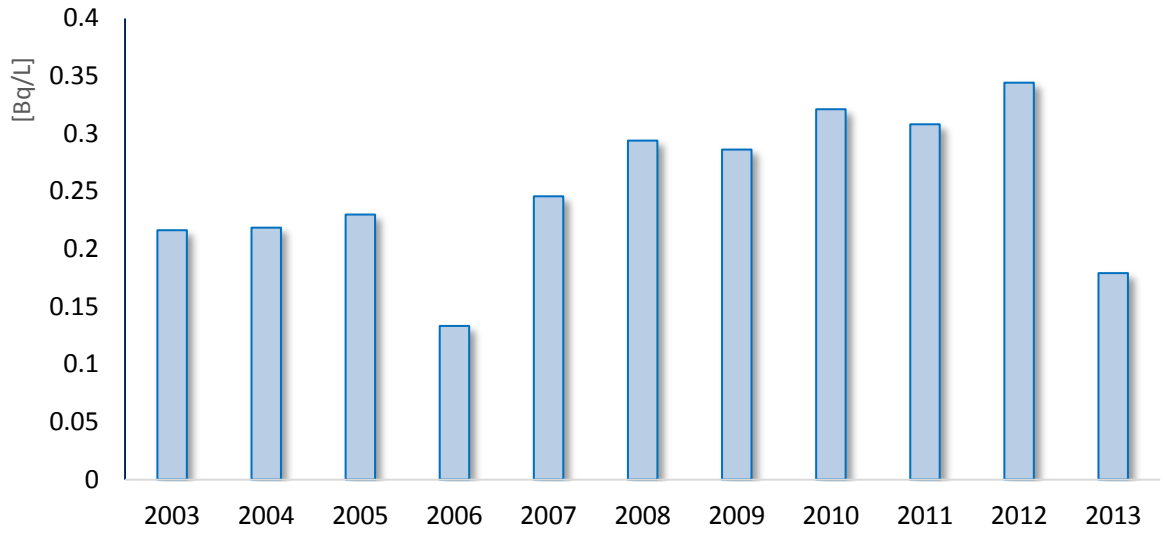
Figure 8.6.-15 shows the level of global beta radioactivity in the major rivers of the country, the annual average values, recorded for 2013, for immediate and delayed measurements. The values were obtained by making the average of daily readings of immediate measurements during 2013.

Figure 8.6.-15. *Annual average variation of the global beta activity of rivers, in 2013*



Note: the warning limit for the surface water through global beta analysis (as per O.M. no 1978/2010), is 5 Bq/L.

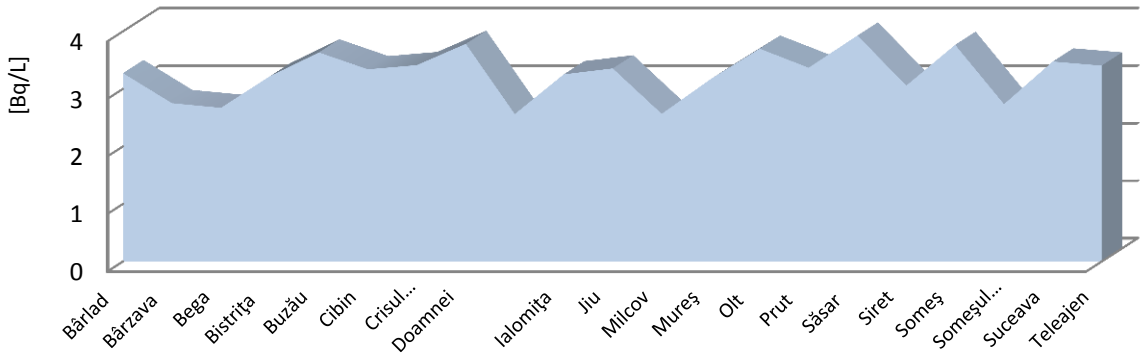
Figure 8.6.-16. *Multi-annual average variation of the global beta activity of rivers across Romanian territory*



Spectrometric beta analysis of the water samples from the major rivers

The annual average tritium concentrations (for significant values), in the surface waters sampled from the major water courses from Romania in 2013, ranged between 2,56 – 3,93 Bq/L and is shown in figure 8.6-17.

Figure 8.6.-17 *Variation of tritium specific activity in the major water courses, in 2013*



Danube Radioactivity

Figure 8.6.-18. shows the variation of the global beta activity of the surface water sampled by the Danube-river ERSSs – average and maximum readings for immediate measurements, year 2013

Figure 8.6.-18. *Variation of the global beta activity of the Danube, in various sectors across Romania, year 2013*

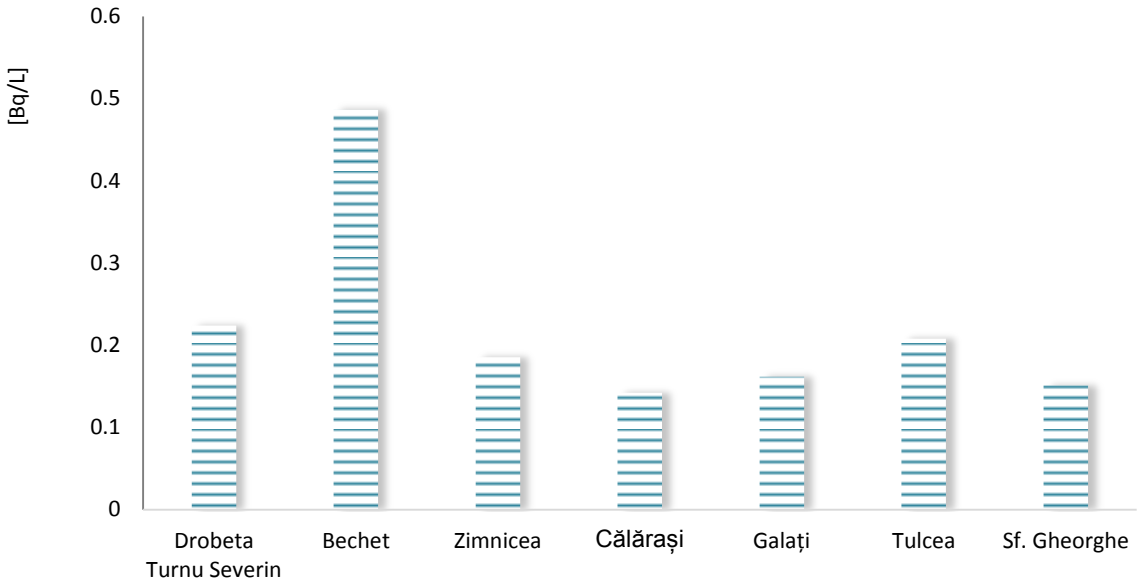
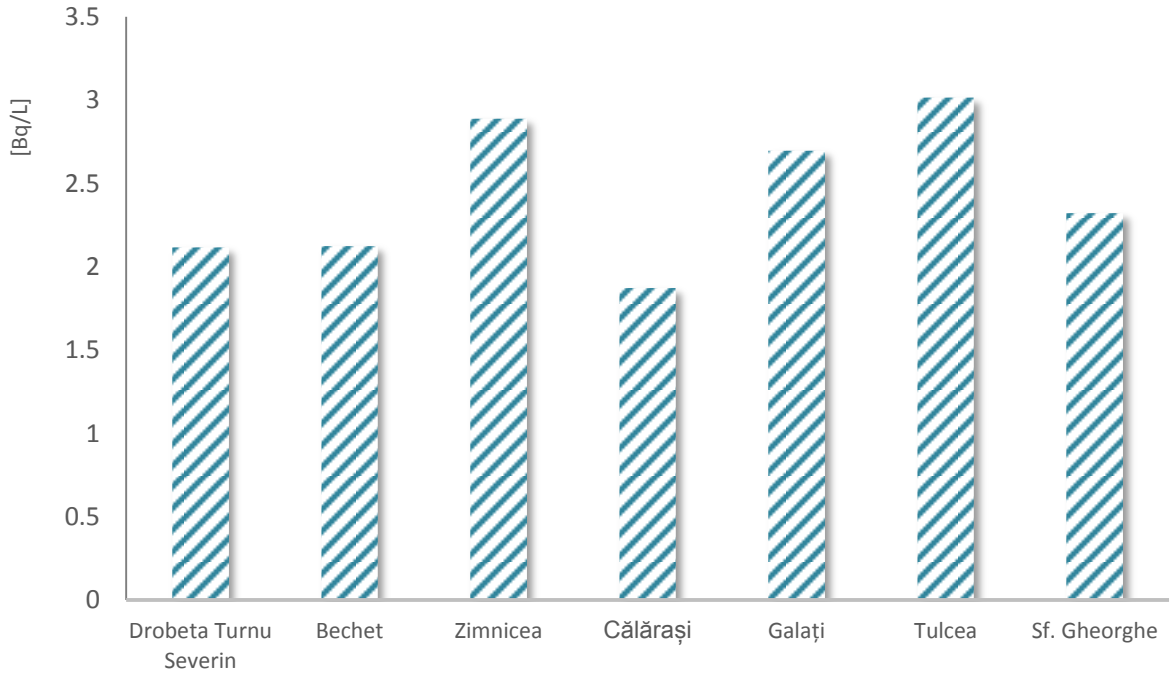


Figure 8.6.-19. *Annual average tritium concentration in the Danube, year 2013, in various sectors*



➢ Black Sea Radioactivity

The dynamics of radionuclides K-40 and Cs-137 in the sea water daily samples, taken from Constanța (Constanța County) and Sfântu Gheorghe (Tulcea County) is shown in figures 8.6.-20. and 8.6.-21. The concentrations of Cs-137 in the Black Sea water samples, sampled by ERSS Constanța and ERSS Sfântu Gheorghe, ranged from 0,005 – 0,015 Bq/L during the year 2013.

Figure 8.6.-20. *Monthly average variation of the specific activity of K-40 in the Black Sea, in 2013*

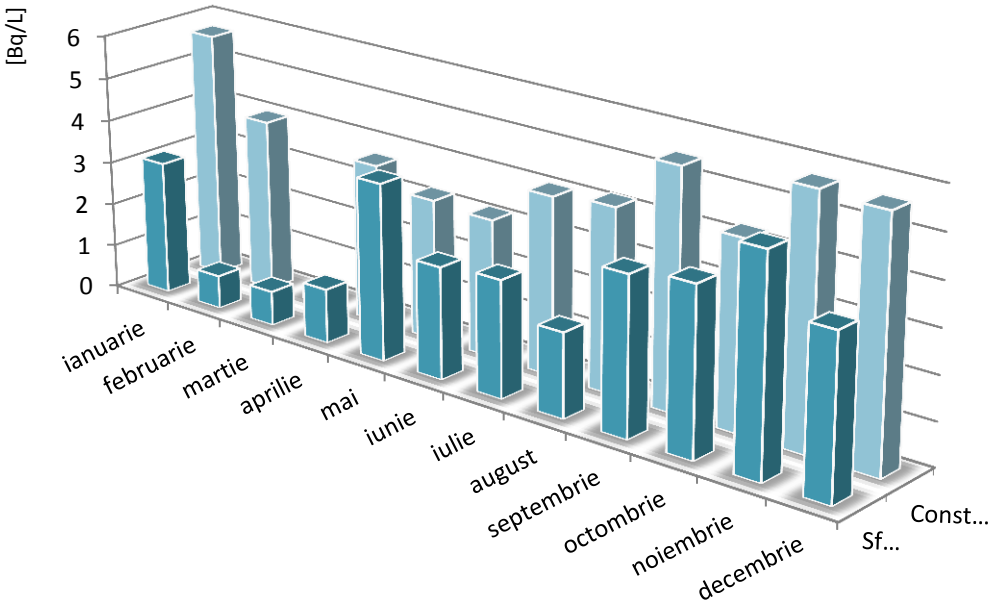
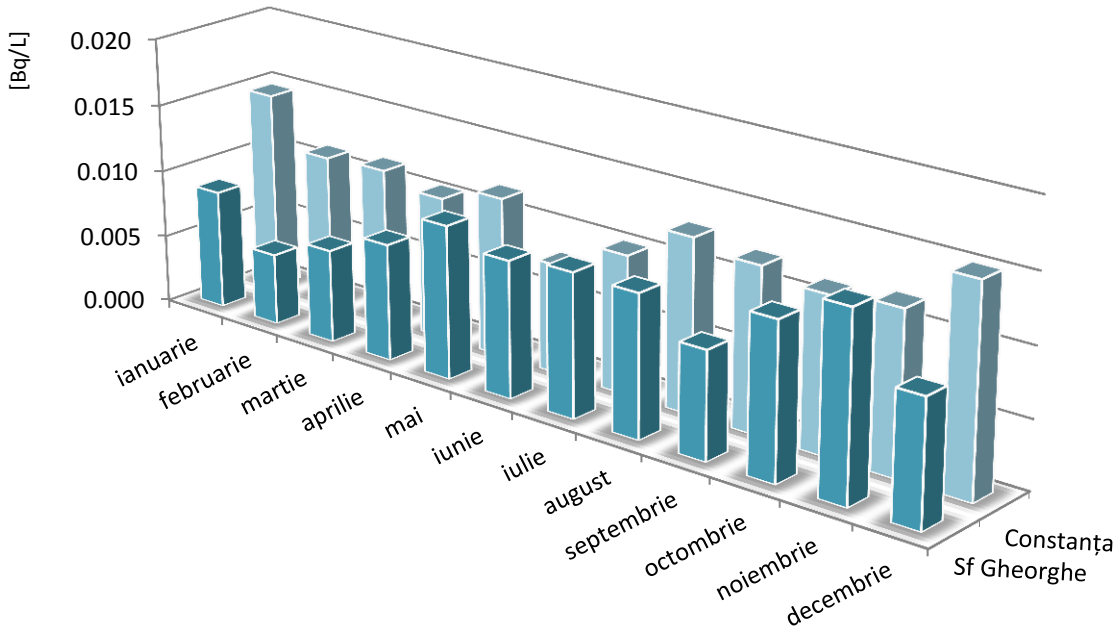


Figure 8.6.-21. *Monthly average variation of the specific activity of Cs-137 in the Black Sea, year 2013*

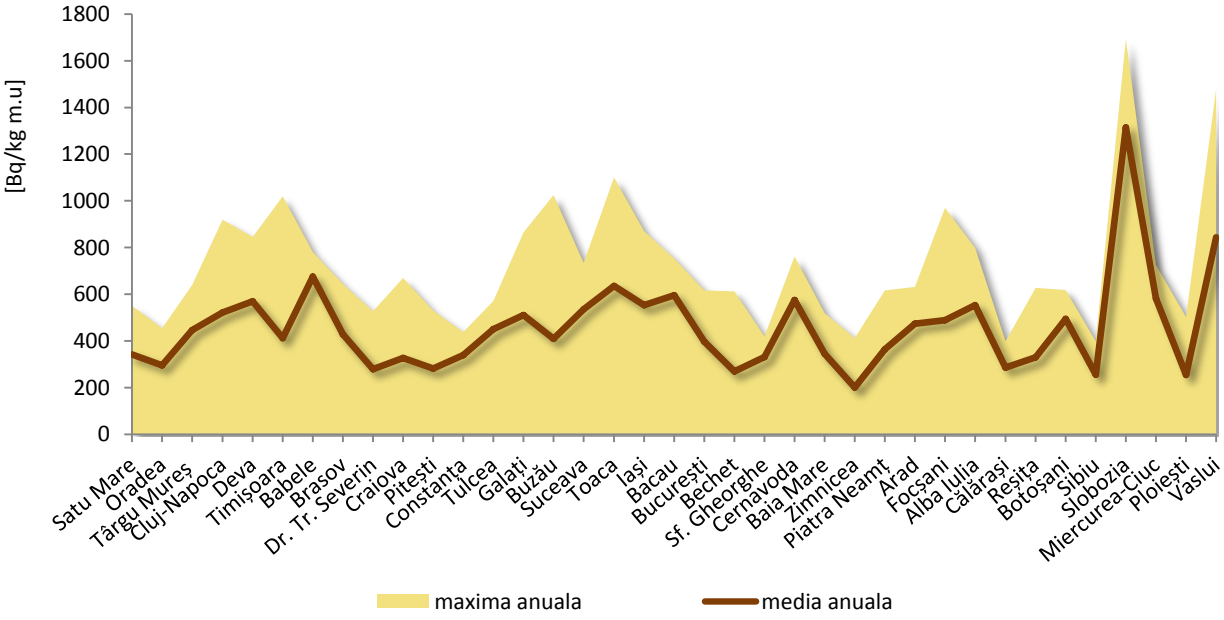


8.6.1.3. SOIL RADIOACTIVITY

The soil samples are taken from area not cultivated for at least 10 years. Soil samples are collected on a weekly basis, and the global beta measurement is done after 5 days.

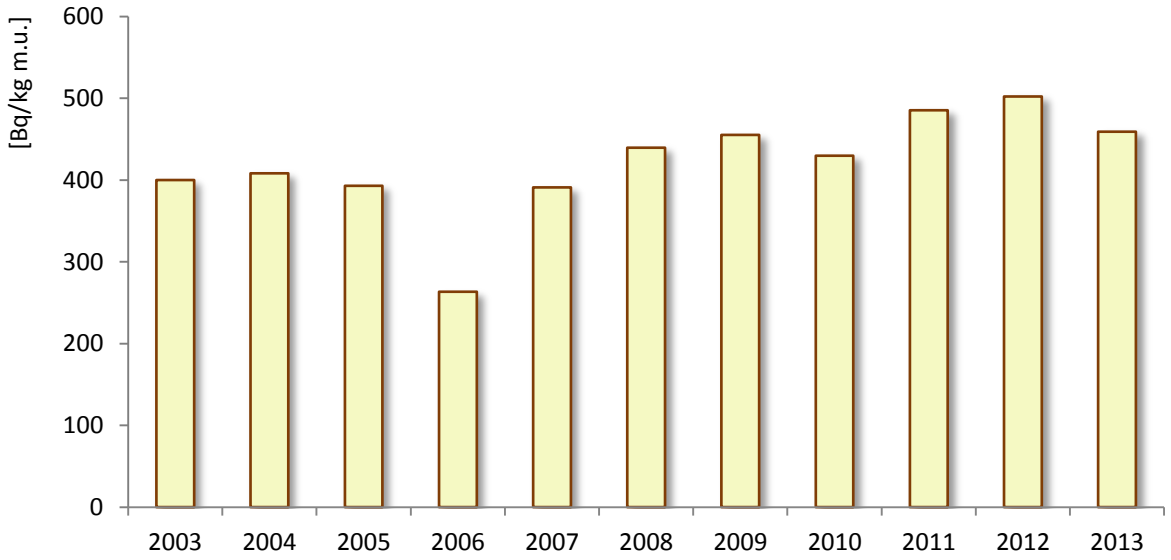
The annual average results of the **global beta analysis of the samples of not cultivated soil,** taken within NNSER in 2013, are shown in figure 8.6.-22. The chart values were obtained by calculating the average value of the weekly samples. The total number of measurements taken for all 37 ERSSs within NNSER is approximately 1924. The relative errors associated to concentrations range between 5,32-29,92%.

Figure 8.6.-22. *Annual average variation of the global beta activity for the samples of not cultivated soil samples across Romanian territory, year 2013*



The annual average variation of the global beta activity for the samples of not cultivated soil is shown in figure 8.6.-22, together with the annual maximum variation. The analysis of the data submitted for the past ten years (figura 8.6.-23) evidences a stationary trend of the average value, and an ascending trend of maximum values.

Figure 8.6.-23 *Annual average variation of the global beta activity of soil, across Romanian territory*



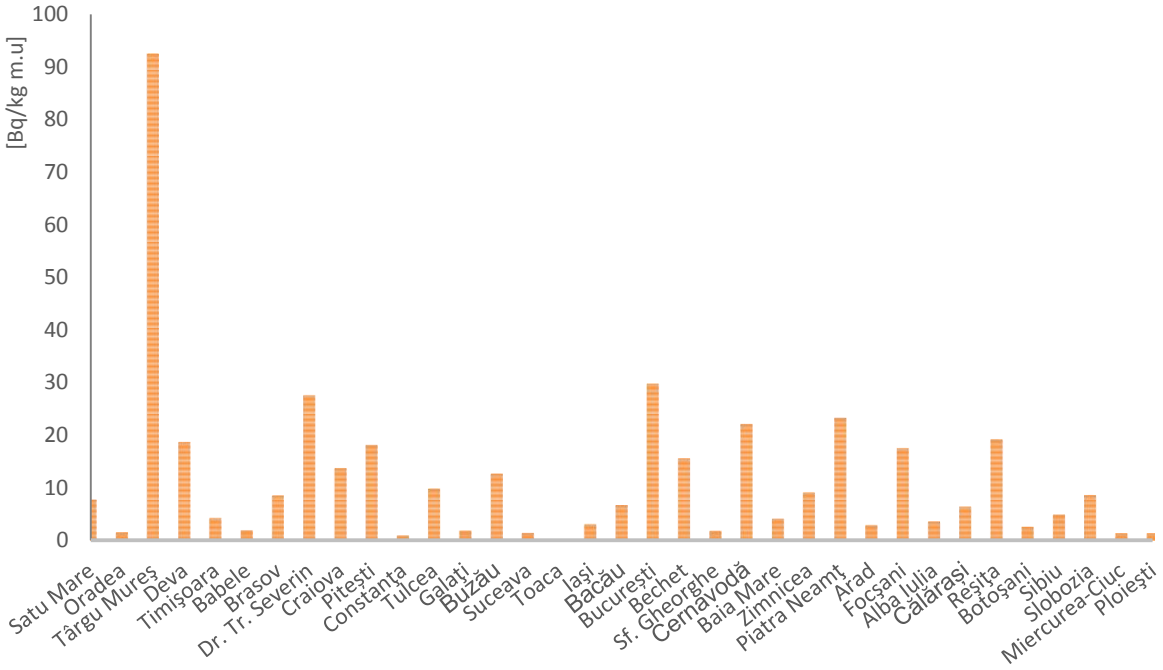
The **spectrometric gamma analysis of the soil samples,** taken annually, provided information concerning the distribution and level of radionuclides concentrations in the laboratories area within NNSER. The variation of radionuclides concentrations in the soil samples taken across Romania is given by the type of soil – for the natural radionuclides, as well as by the radioactive contamination particularities at the time of the nuclear accident from Cernobîl – for the artificial radionuclide Cs-137.

Table 8.6.4. shows the annual average concentrations per country, in Bq/kg m.u. (dry mass – m.u.) of Ra-226 (descendent of U-238), Ac-228 (descendent of Th-232) and K-40, determined in the soil samples

Table 8.6.4. *Variation of natural radionuclides concentrations*

Radionuclide	Minimum Bq/kg (m.u.)	Average Bq/kg (m.u.)	Maximum Bq/kg (m.u.)
Ra-226	11,79	31,43	87,11
Ac-228	14,09	35,54	50,26
K-40	97,78	456,06	1152,44

Figure 8.6.-24. *Variation of annual average activity of the radionuclide Cs-137 in samples of soil not cultivated, sampled across Romania*



8.6.1.4. VEGETATION RADIOACTIVITY

The samples of spontaneous vegetation are taken on a weekly basis, and the global beta measurement of the samples is done 5 days after sampling.

The chart in figure 8.6.-25 shows the level of global beta radioactivity in the spontaneous vegetation samples taken across Romania's territory, from April to October 2013. The variation range of the measuring errors was between 4,76-29,82%.

The chart values were obtained by calculating the mean of monthly average values, for year 2013.

Figure 8.6.-25. *Annual average variation of the global beta activity of the spontaneous vegetation, across Romanian territory, reported to green mass (g.m.)*

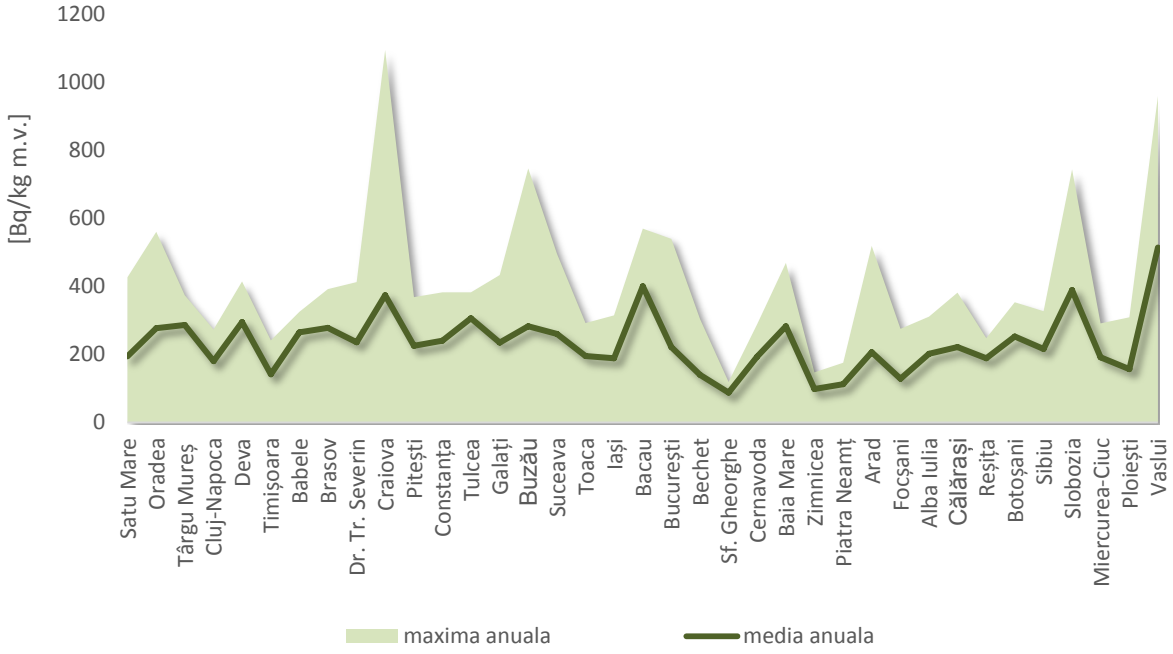
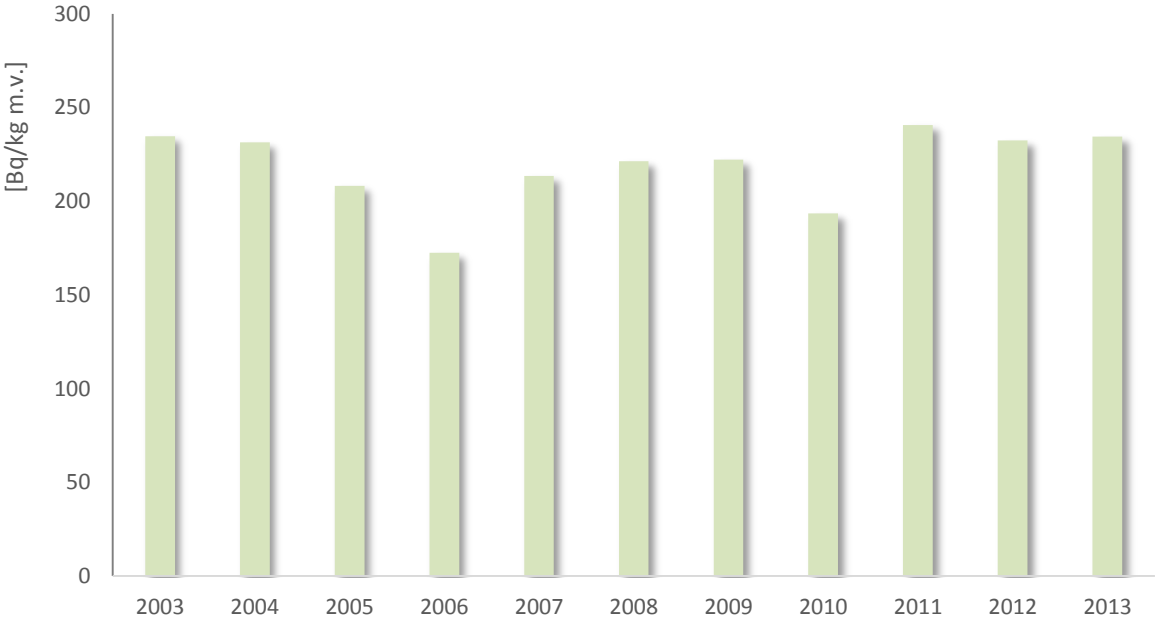


Figure 8.6.-26. *Variation of annual average of the global beta activity of the spontaneous vegetation, across Romania's territory, reported to green mass (g.m.)*



8.6.2. MONITORING PROGRAMS FOR AREAS WITH NATURAL ANTHROPICALLY MODIFIED BACKGROUND

The monitoring programs for the areas with natural anthropically modified background are specific for each area. In 2013, such programs were paralleled by the National Standard Monitoring Program of environmental factors radioactivity.

8.6.3. IMPACT OF CERNAVODA NPP OPERATION ON POPULATION AND ENVIRONMENT

The first nuclear power plant of Romania was built in the vicinity of Cernavodă City, located at 180 km east from Bucharest, at the confluence between the Danube and the Danube – Black Sea Channel. Construction works started in 1979, the initial project including 5 units, of 706.5 MW power each. Presently, only two units are being operational.

The nuclear energy technology used by Cernavodă Nuclear Power Plant is based on the concept of CANDU nuclear reactor (CANadian Deuterium Uranium), using natural uranium and heavy water (D_2O) as moderator and cooling agent.

A global scale evaluation proves that the nuclear energy is part of the solution focussed on reducing environmental pollution.

The radiological impact resulting from the operation of the Cernavodă NPP is measured in terms of dose for population. The population (not exposed professionally) dose is evaluated based on the results of the monitoring program on the liquid and gaseous effluents. The analyses results obtained through the environmental radiological monitoring program confirm the negligible impact of Cernavodă Nuclear Power Plant operation on population and environment.

The National Committee for Nuclear Activities Control approves the threshold quantities for certain radionuclides that might be released into the environment, throughout a year, by a nuclear power plant, a nuclear fuel factory, uranium mine, research reactor or other objective producing or using radiation sources. Such thresholds are known as *Derive Release Limits* (DRL). These are calculated based on the radiation dose to which a member of the „critical group" might be subject to, as a result of the transfer of radionuclides released into the environment.

The Critical Group is a hypothetical group consisting of persons from the audience that might receive the highest doses because of the operation of a nuclear objective. In this case, the persons in group would live at the edge of the exclusion area, would drink water from the Danube, milk from farms located in the neighbourhood, food from their homestead or the locale farms, fish from the Danube.

For the year 2013, the environment supervision program in the Cernavodă NPP influence area was mainly focused on identifying potential radioactive release into the environment exceeding the regulatory limits, as well as estimating the additional exposure of the population due to the operation of the nuclear objective.

The sampling points from the Cernavodă NPP influence area, included in this supervision program, were chosen at various distances from the plant, on all wind directions, at no more than 20 km away.

Sampling point	Sector	(straight line) Distance to Cernavodă NPP
Channel locl	SSV	0,5 km
ERSS Cernavodă	VNV	1,7 km
Cernavodă City	NV	3 km
Cochirleni	SV	7 km
Seimeni	N	8 km
Mircea - Vodă	ESE	10 km
Tortomanu	ENE	13 km
Rasova	SV	13 km
Medgidia	ESE	19 km
Capidava	N	20 km
Feteşti	VNV	20 km

The sampling points were established in several sectors of the Danube and the Danube – Black Sea Channel, upstream and downstream the plant, and of the Channel Lock and Seimeni Channel, for the purpose of monitoring the liquid emissions.

Sampling point	Sector	(straight line) Distance to Cernavodă NPP
Dunăre - Borcea Arm (Călăraşi)	VSV	60 km
Dunăre - Borcea Arm (Feteşti)	VNV	20 km
Dunăre - Cochirleni	SV	7 km
Channel Lock	SSV	0,5 km
Danube – Black Sea Channel (Cernavodă River Station)	VNV	2,7 km
Danube – Black Sea Channel (Medgidia)	ESE	19 km
Seimeni Channel	N	8 km
Dunăre – Seimeni	N	8 km
Dunăre – Capidava	N	20 km

The check points chosen were the cities Constanţa, Călăraşi and Slobozia. The check points were chosen according to the following criteria:

- they are located at relatively long distances, approximately 60 km to the plant, compared against the other sampling points, located within the Cernavodă NPP influence area;
- they are big urban area;
- they are located on two important watercourses: Călăraşi on Borcea Arm (upstream the plant), Slobozia on Ialomiţa River (discharging into the Danube), which allows taking samples and comparing the same types of samples;
- they are not located on predominant wind directions, reason for which they are not strongly influenced by the emissions from the plant.

In addition to the standard supervision program, the following types of samples were taken and analyzed: precipitations, surface water, phreatic water, uncultivated soil, plough soil, spontaneous vegetation.

In the analyzed samples there was no evidenced of the presence of some artificial radionuclides releasing gamma radiations, sourced by the Cernavodă NPP.

The sampling program for precipitations and waters involves the regular sampling from the locations chosen and included in the supervision program. The results are shown in the charts below. Only significant values were considered and represented graphically.

Figure 8.6.-27. *Variation of annual average concentration of tritium, found in precipitations samples, in Cernavodă area (significant values*

Figure 8.6.-28. *Variation of tritium volume activity in the samples taken from Danube, in Cernavodă area (significant values)*

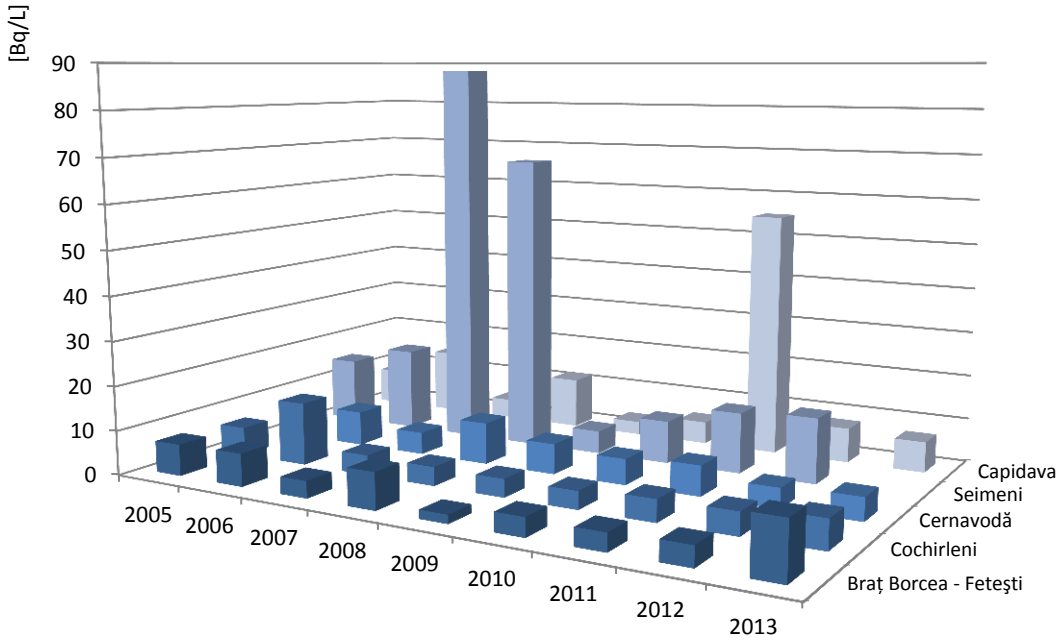


Figura 8.6.-29. *Monthly values variation of tritium volume concentration in the water samples from the Discharge Channel – Channel Lock (significant values)*

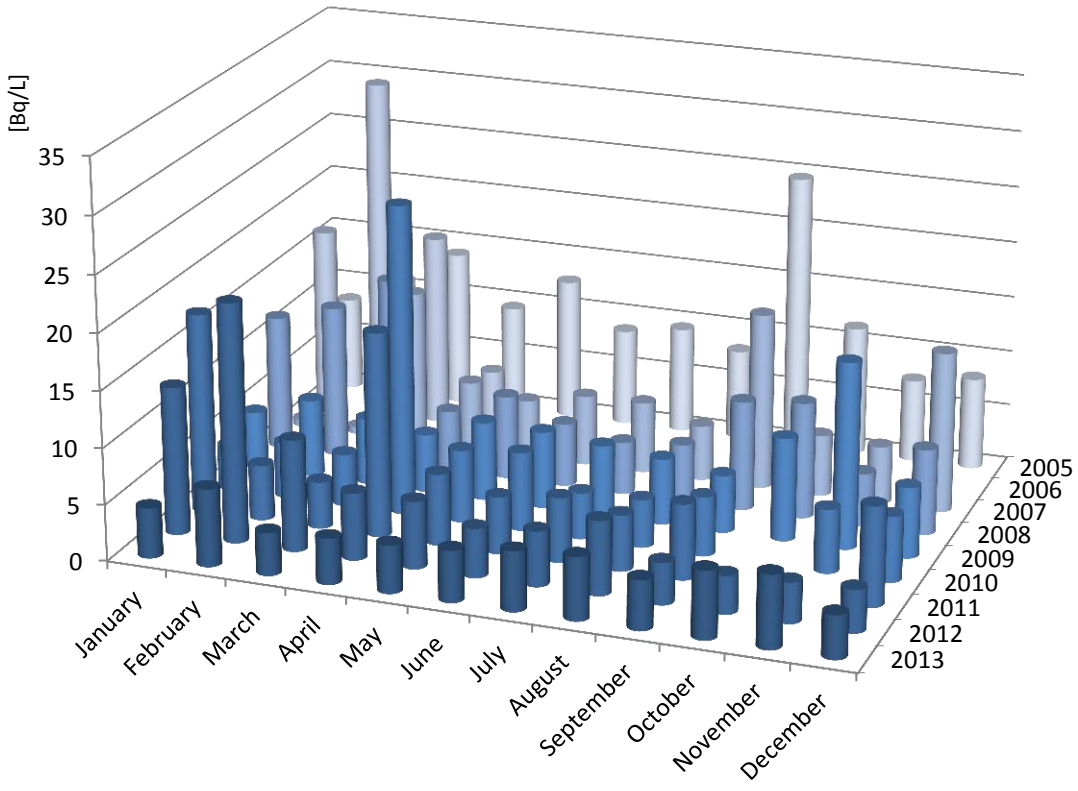


Figure 8.6.-30. *Monthly values variation of tritium volume concentration in the surface water samples from the Seimeni Channel (significant values)*

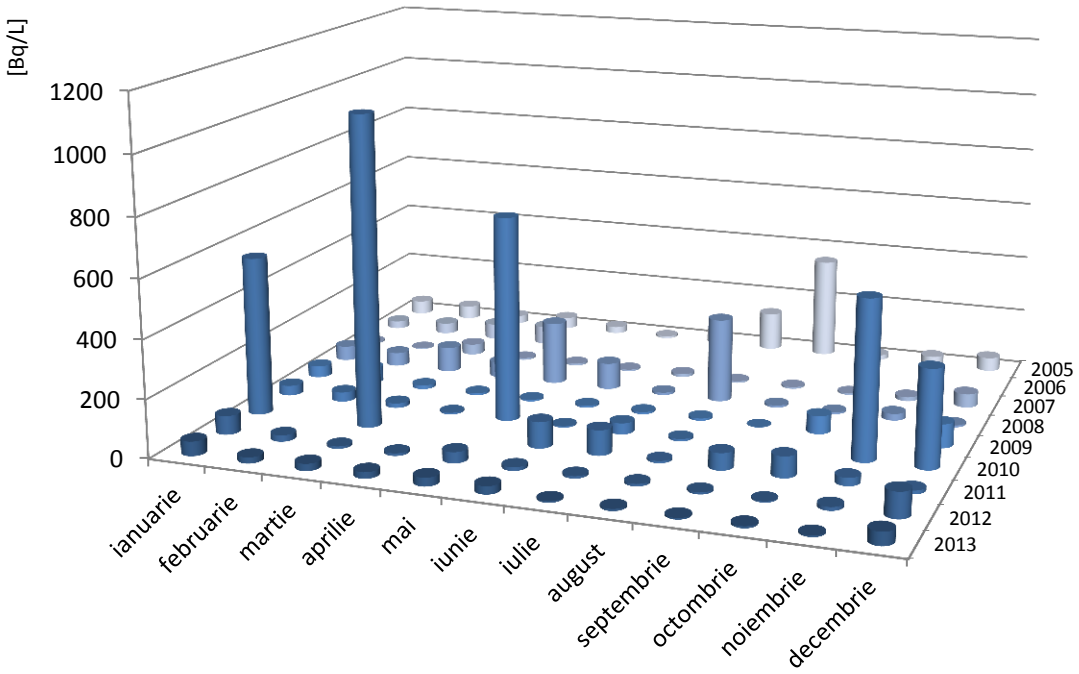
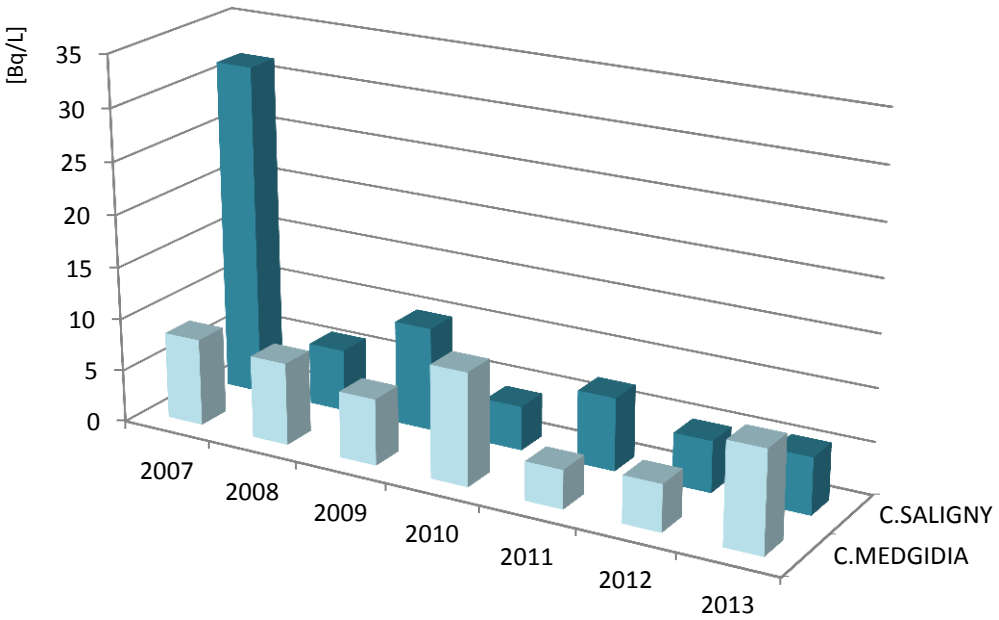


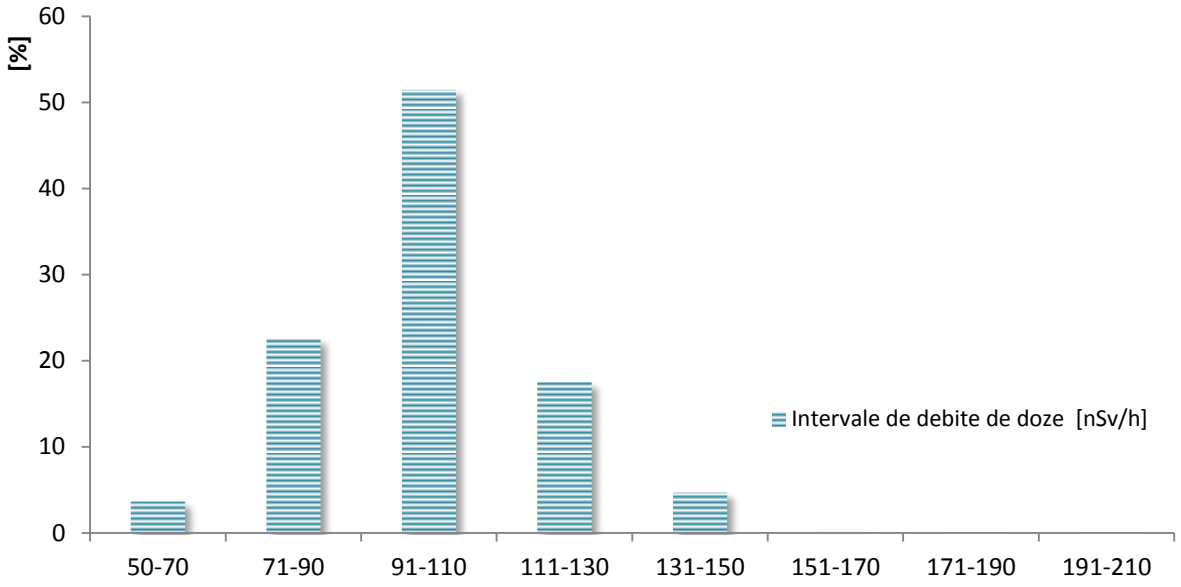
Figure 8.6.-31. *Significant Monthly values variation of tritium volume concentration in the surface water samples from Danube – Black Sea Channel, sampled in the area of Saligny and Medgidia localities*



Within CNE Cernavodă influence area, the gamma dose outlet in the air is continuously monitored, hour by hour. The values of the gamma dose outlet are issued by the National System of Warning/Alarming in case of Environmental Radioactivity (NSWAER). The automatic supervision stations for environmental radioactivity are designed to allow the continuous operation and monitoring of the variation of gamma dose outlet absorbed in air from the areas where they were installed. The stations are located inside and outside the Cernavodă NPP site.

The distribution of gamma dose outlet absorbed in the air, recorded by the automatic stations is shown in figure 8.6.-32.

Figure 8.6.32. *Distribution of gamma dose outlet values absorbed in the air recorded by the automatic stations, in the Cernavodă NPP influence area, year 2013*



Note: the warning limit for the gamma dose outlet absorbed in the air (as per O.M. no 1978/2010) is 1000 nSv/h.

The number of the doses flow values which ranged between 151-210 nSv/h, represented 0.08% of the total number of measurements reported by automatic stations.

8.6.3.1. IMPACT OF KOZLODUI NPP OPERATION ON POPULATION AND ENVIRONMENT

The supervision program in the KOZLODUI NPP area of influence was mainly focused on identifying some potential radioactive releases into the environment, throughout the year of 2013. No presence of some artificial radionuclides releasing gamma radiations sourced by the KOZLODUI NPP, was identified.

All values recorded throughout the year 2013 by the environmental radioactivity supervision stations (ERSS Bechet, ERSS Craiova, ERSS Zimnicea and ERSS Drobeta Turnu Severin), located within the area of influence of the plant, fall within the operational warning/alarm limits of the National Network for the Surveillance of Environmental Radioactivity.

Figure 8.6.-33. *Variation of Be-7 by seasons, determined on a monthly basis, in the atmospheric aerosols samples*

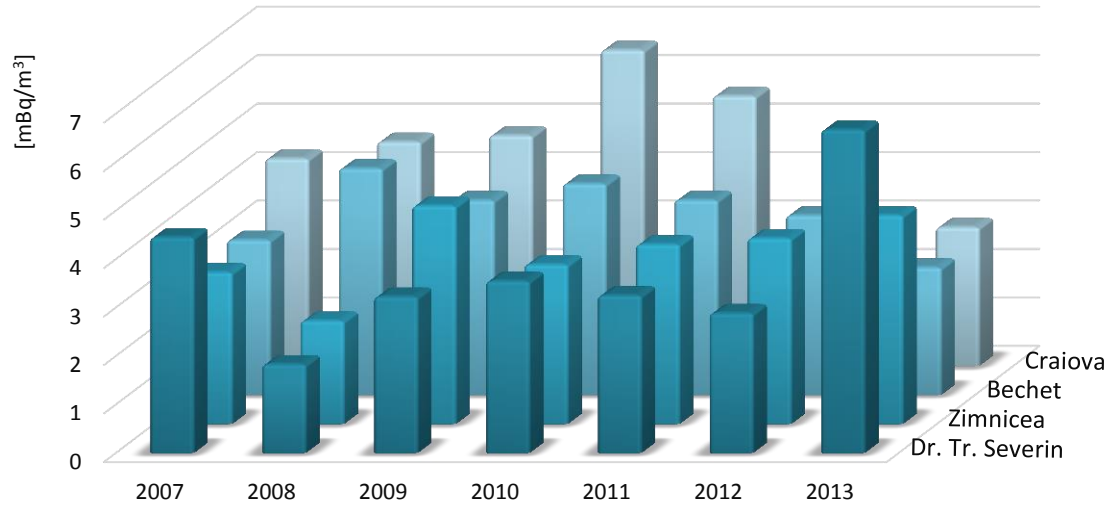


Figura 8.6.-34. *Variation of specific activity (annual average values) of the radionuclide Pb-210, identified in the samples of atmospheric deposits*

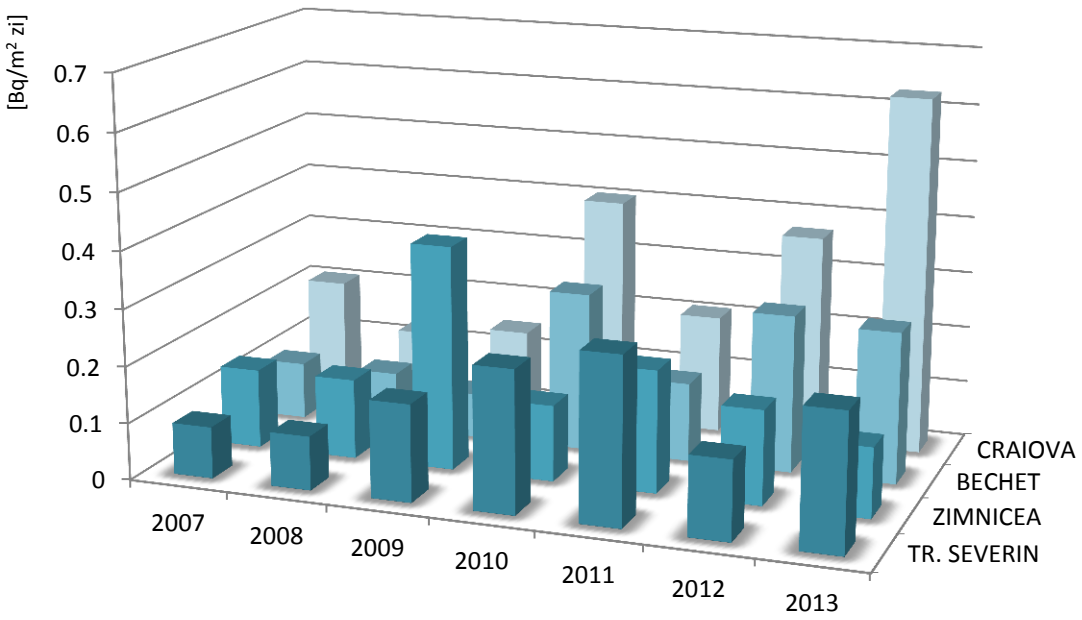
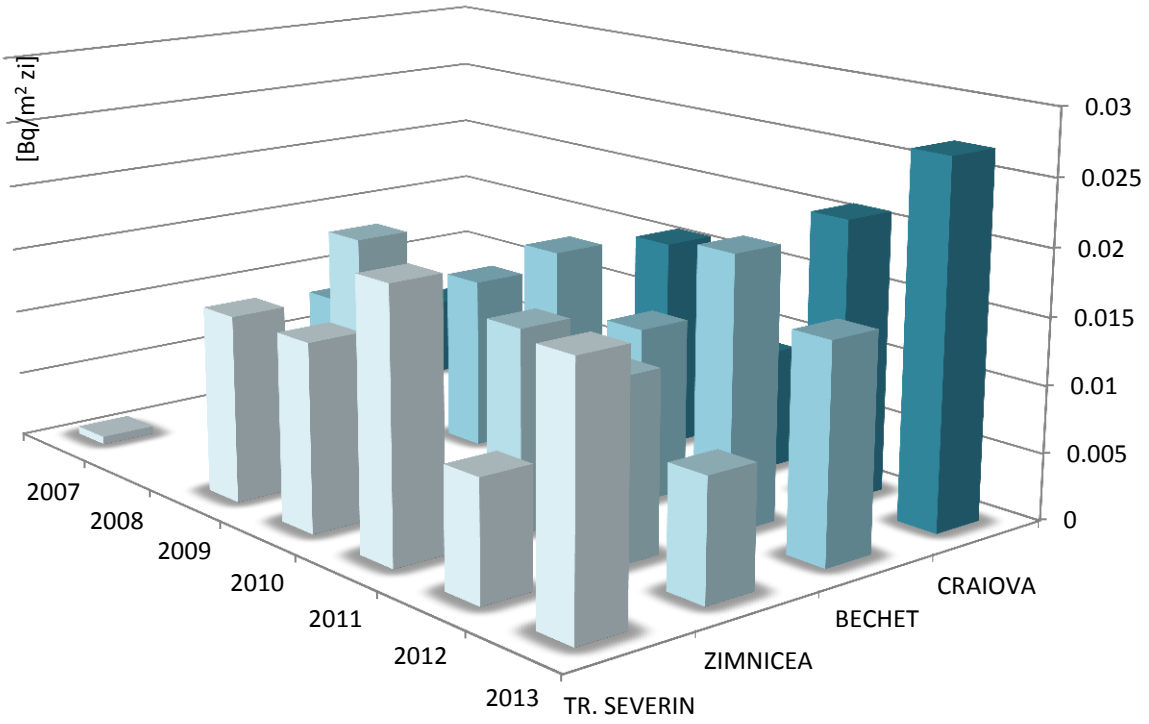
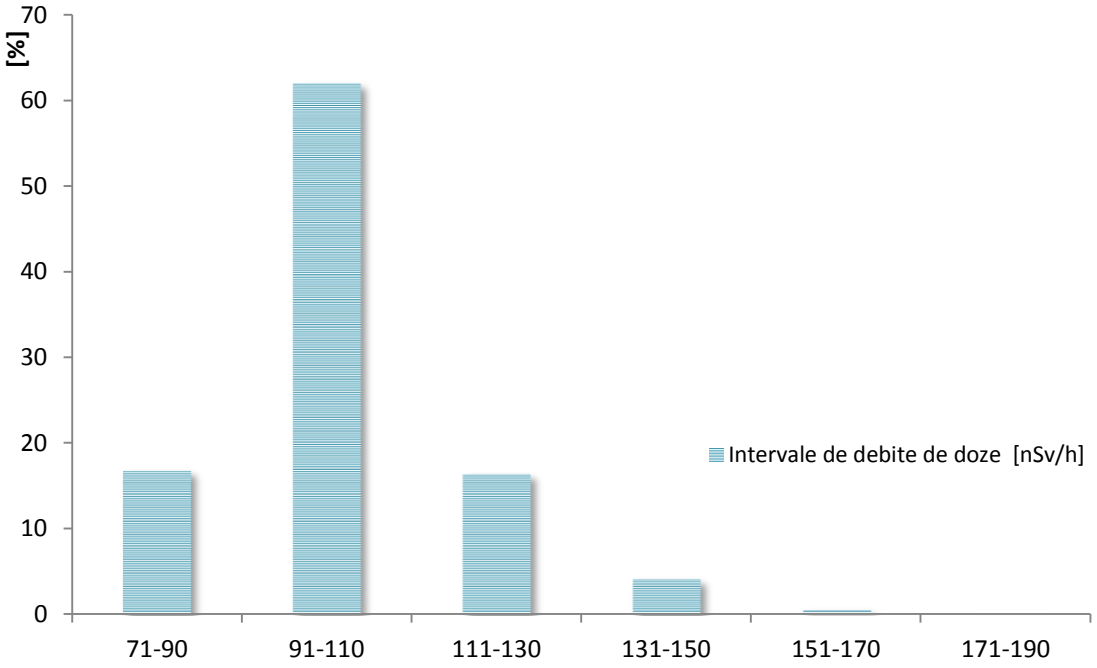


Figure 8.6.-35. *Variation of specific activity (annual average values) of the radionuclide Cs-137, identified in the samples of atmospheric deposits*



The distribution of the gamma dose outlet absorbed in the air, recorded by the automatic stations of the ale National System of Warning / Alarming in case of Environmental Radioactivity within the area of influence of the Kozlodui NPP, is shown in figure 8.6.-36.

Figure 8.6.-36. *Distribution of the gamma dose outlet values absorbed in the air, recorded by the automatic stations within the Kozlodui NPP area of influence, year 2013*



Note: the warning limit for the gamma dose outlet absorbed in the air (as per O.M. no. 1978/2010) is 1000 nSv/h.

The number of the doses flow values were in the range of 151-190 nSv / hr, was 0.3% of the total number of measurements reported by automatic stations.

Within the limits of statistical fluctuation, the gamma dose rate in the air showed a constant evolution during 2013, the values being below the operating warning / alarming limits within the National Network of Environmental Radioactivity Monitoring.

Source - National Reference Laboratory for Radioactivity (LNRR) of the National Environmental Protection Agency (NEPA).

8.7. NOISE POLLUTION AND HEALTH

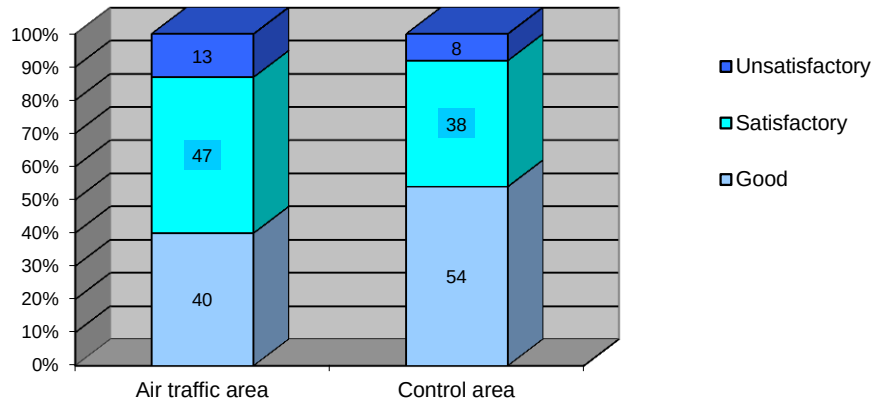
Traffic in any form, is one of the main sources of noise pollution. Noise discomfort is generated by means of public transport (buses, cars, trolleybuses, trams) from road traffic, followed by rail, air, naval traffic.

For 2013 the National Institute of Public Health - National Centre for Risk Monitoring in the Community Environment – the Ministry of Health conducted a study on air traffic noise in 14 localities from 12 counties and Bucharest Municipality, according to GD. 321/2005, on the assessment and management of environmental noise, control-case type, after the criterion of population of over 150,000 inhabitants and was followed by the protocol of a transversal investigation, case-control tye, on a representative sample, with a maximum acceptable error of 5%.

The investigated sample consisted of a number of 700 people for a number of 700 dwellings, distributed in two groups: group A, "*study group, intense air traffic area*," dwellings situated in the neighbourhood of the airport and group M, "*control group*", area without the influence of airborne noise. The groups were comparable in structure by age and gender of people responding to the questionnaire, the dominant population being between 16 and 59 years (67% group A vs 66% group M). The descriptive statistics of the dwellings show a dominant 397 of housing type apartment block. Housing The noise rehabilitation of the dwellings was achieved for 53% of the homes surveyed. The first places are: Suceava (88% area A, 80% area M), Cluj (72% A, 80% M), Iaşi (72% A, 72% M), Sibiu (64% A, 56% M), Timis (64% A, 60% M) in Bucharest the frequency of noise rehabilitation was of 46% in the airborne traffic and 44% in the control area.

The recognition of the noise as a "**source of annoyance**" is about 77% in the air traffic area, compared with only 53% in the control area. Also compared to the degree of urban noise annoyance made by the neighbouring airport (group A) there is a higher proportion (13%) of "unsatisfactory" living conditions compared with group M (8%) (Graph no.1).

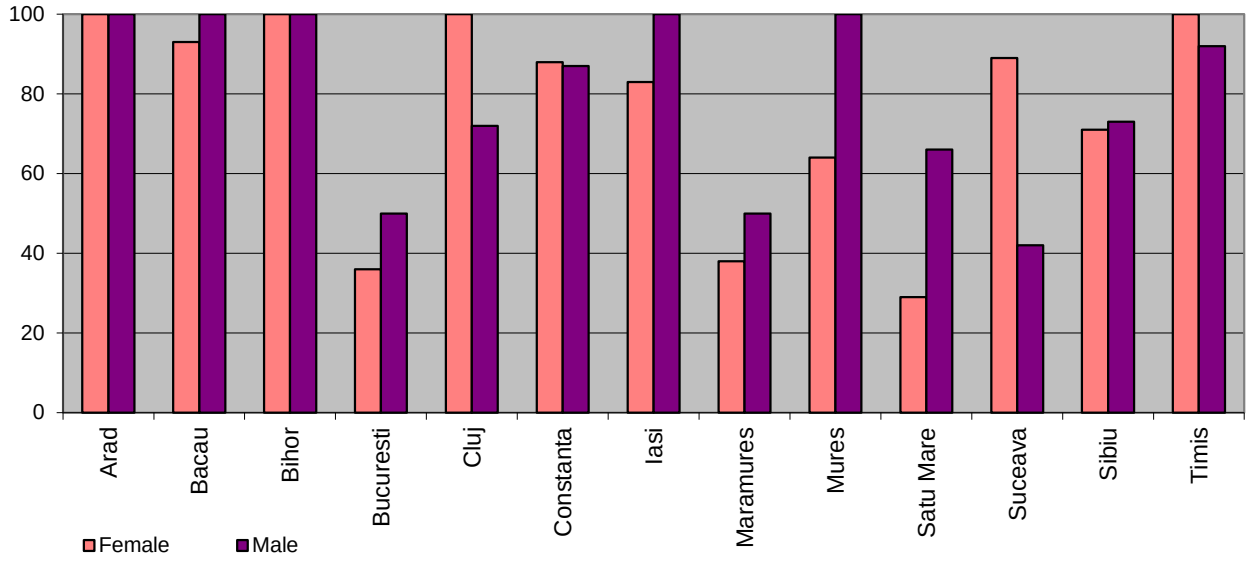
Graph no.1. *Assessment of living conditions in relation to sound insulation, for air traffic areas*



Source: National Institute of Public Health - National Center for Risk Monitoring in the Community Environment -Ministry of Health

According to this study, in descending order, the highest degree of disturbance is perceived in the following towns: Arad 100%, 100% Bihor, Cluj and Timisoara 100% for females and Bacau at 100% for males, relative to the opposite Satu - Mare, Bucharest, Maramures (Graph no.2.).

Graph no.2. *Percentage of people affected by noise in the heavy air traffic area, by counties and gender*

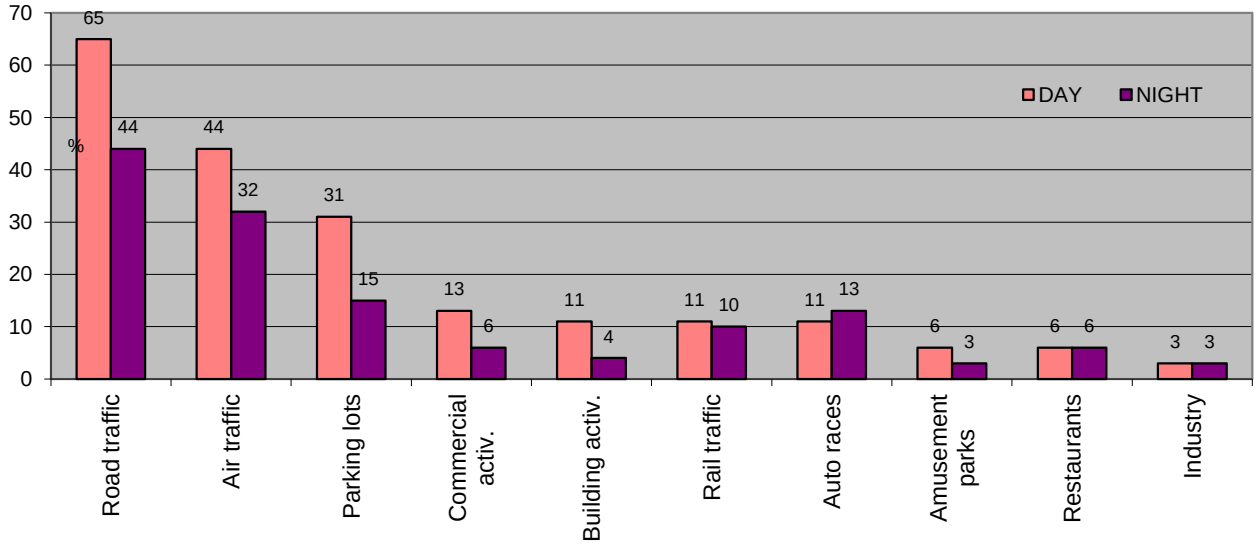


Source: NIPH - National Center for Risk Monitoring in the Community Environment -Ministry of Health

Also, trying to classify in a time chart of the moment when the disturbance is felt more strongly, recorded that the disturbance in the airport area occurs with similar frequency throughout the day (about 14%) compared to the control area, when the disturbance falls during the evenings (9%).

Inventory of various noise sources shows that 65% of respondents accuse the existence of other noise sources in the area, namely those from road traffic, parking lots, commercial activities and the building activities, rail traffic, etc. (Graph # 3.). It is noted that on the first place is ranked the road traffic and on the second place is ranked the air traffic, which is growing.

Graph no.3. *The frequency of noise pollution generated by noise sources during the day and night*



Source: National Institute of Public Health - National Center for Risk Monitoring in the Community Environment -Ministry of Health

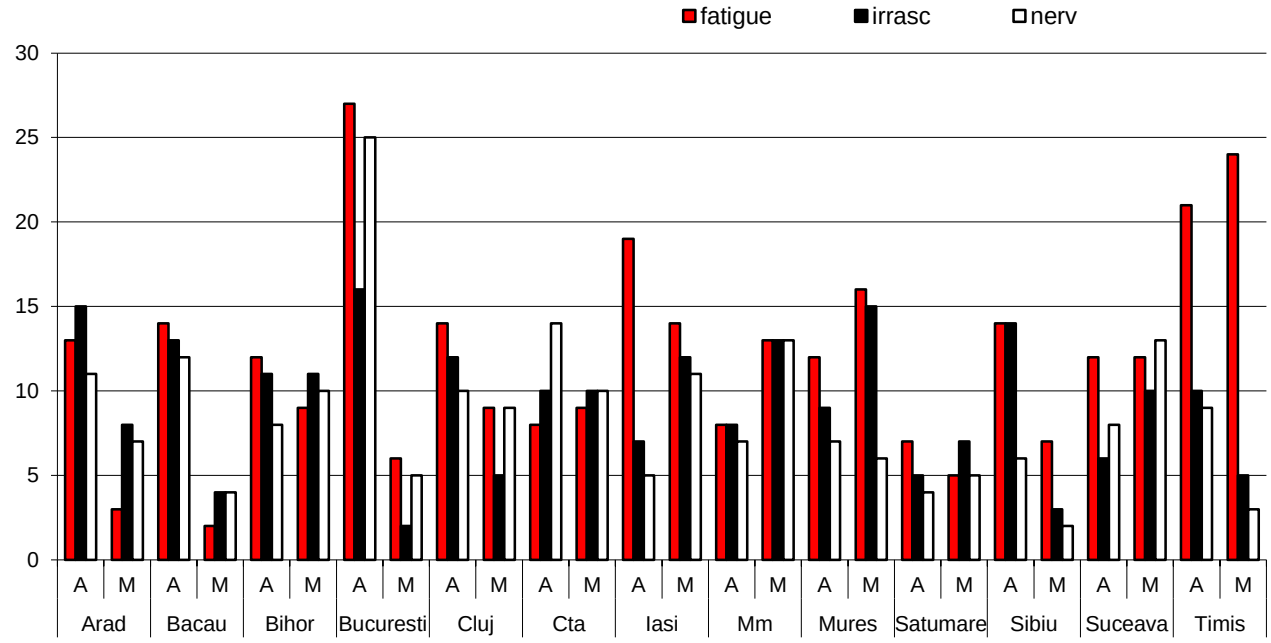
Therefore, the discomfort caused by airborne noise occurs with maximum frequency in the disturbance of recreation (77% area A and 67% in area M), watching TV (48% A, 44% M) and in the learning process (33% A, 27 % M). The counties where there is recorded the highest frequency in disturbance of recreation within the airborne traffic area, are: Cluj (96%), Bacau (88%) and Arad (84%).

From this study, the adverse effect of noise pollution was interpreted in terms of chronic diseases and symptoms reported by respondents. The results show a higher number of symptoms in the area of airborne

traffic compared to the control area. The difference was due only to the area of residence, there were no significant differences in relation to the gender of the subjects; the most common complaints are expressed as: fatigue, irritability, nervousness, followed sleep disturbances (falling asleep late, awakenings, insomnia, etc.)

The variation of the most common symptoms, by counties, in relation to exposure to air traffic noise, the localities with most complaints are, in descending order: Bucharest, Timisoara, Suceava, Iasi, and on the opposite side Satu Mare. (Graph no. 4.).

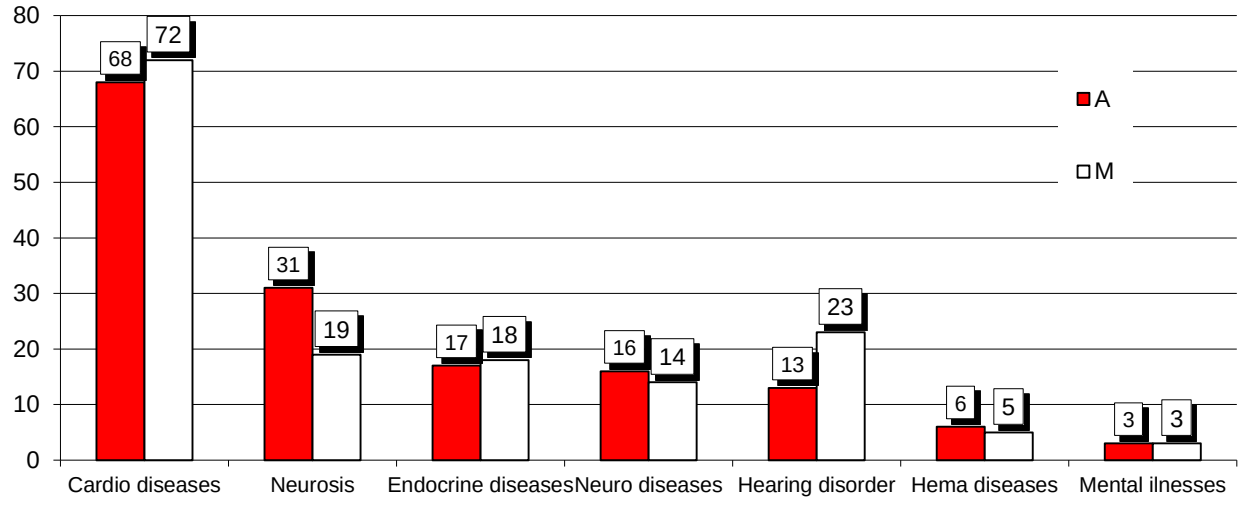
Graph no. 4. *Hierarchy by counties in realtion to the frequency of fatigue in the heavy air traffic area(number of cases)*



Source: National Institute of Public Health - National Center for Risk Monitoring in the Community Environment -Ministry of Health

The damage to health in the air traffic area, evaluated in terms of chronic diseases reported by respondants, is represented by cardiovascular diseases (23%) ranked first, followed by neuroses (13%) and hearing disorders, neurological diseases and endocrine disease (5%). Except cardiovascular diseases and hearing disorders, it results that the frequency of diseases reported by the respondants is higher in the air traffic area (heavy noise) compared to the control area (Figure No.5.).

Graph no.5. *Declared in the hierarchy of reported diseases in the air traffic area compared to the control area*



Source: National Institute of Public Health – National Center for Risk Monitoring in the Community Environment -Ministry of Health

The hierarchy of reported diseases favoured by noise is represented by neuroses (4.6%), cardiovascular diseases (3.7%) and hearing disorders (1.4%), higher frequencies being recorded in area A. Moreover, the frequency of using medication for sleep did not differ significantly between groups (10% A, 7% M).

In conclusion :

- thermal insulation of buildings also reduced noise discomfort;
- recreation and disturbed activities with the highest frequency (learning, reading) are claimed with the highest frequency in the following counties of Cluj, Arad, Bacau, Bucharest;
- the hierarchy of symptoms (fatigue, irritability, nervousness) is maintained regardless of the air traffic area, the highest frequency being present in the exposed area compared to the control area;
- the reported chronic pathology and maintained by exposure to airborne noise ranks cardiovascular disease on the first place, followed by neuroses, hearing disorders, endocrine disorders and neurological diseases.

Also, according to the information contained in the strategic noise maps elaborated to date, according to Directive 2002/49 / EC on the assessment and management of environmental noise and transposed into the national legislation by GD no. 321/2005 on the assessment and management of environmental noise, as amended and supplemented, maps that can establish conclusions on areas where the noise level is high, and by simulating the effects of different methods of reducing noise levels that can be implemented, choosing as optimal method, the comparison maps showing noise reduction, it results the fact that the noise discomfort on residents of large cities is represented, as main pollution source, by the traffic noise.

In the action plans for reducing noise are comprised noise reduction and management measures set by local public authorities and economic operators, in their area of competence, addressed mainly, to the identified situations, by overcoming any noise limit values in force and applied to the most important areas as established in this way by making strategic noise mapping.

As a general conclusion, we can say that by surveying the dynamics (2008-2013) the noise discomfort on urban population, the main source of noise is the road traffic, followed by air traffic.

(*Source – Ministry of Health, National Institute of Public Health)*

8.8. TRENDS

« Health is the most precious treasure and the most easily lost;
though the worst kept...»
E. Augier

Public health is affected by several environmental factors:

- air pollution - causes respiratory diseases, allergies, poisoning, cancer or worsen these conditions;
- unsafe environments - can cause accidents, injuries or reluctance to practice physical activities;
- other factors - chemicals, contaminated food, allergies, soil pollution, housing conditions, spatial planning, noise, water, sanitation etc.

EU is working closely with national governments and experts to promote healthy environments and to counteract health threats, including climate change.

In industrialized countries, environmental factors are at the origin of a number of diseases. Respiratory diseases and various cancers cause major concern, especially given that children are exposed to more risks than adults.

The European Commission has adopted an integrated approach involving all stakeholders.

The approach includes:

- European strategy on environment and health, with particular emphasis on the situation of children;
- Action Plan on Environment and Health, in order to implement the EU strategy;
- Advisory Group on Environment and Health, to involve the most important stakeholders.

The European Commission also works closely with WHO Europe.

The EU already has sources of information and unprecedented technology, of a culture of precaution and prevention measures that provide remedies at the source and sanction polluters. A better implementation of the environmental legislation and policies at national and local level will help to ensure a stable regulatory framework for businesses.

The new ***"Environmental Action Program"*** proposed by the European Commission, sets out a long-term environmental strategy, flexible enough to meet future challenges. It provides a comprehensive approach to the environment, establishing the foundations for a greener and more competitive economy that protects natural resources and health for present and future generations. The program insists on a limited number of priorities to protect the natural capital and ecosystems in Europe and on improving the efficiency of using resources in the economy. Better implementation at local and national level of environmental laws and policies is also a priority. Their purpose is to ensure that EU citizens can live in a safe and healthy environment, managed so as to respect the limits and to ensure ecological resilience. *(source: http://europa.eu)*

According to the **Government Programme 2013-2016** in Romania: *"Environmental policy aims to guarantee the present and future generation a clean and healthy environment, ensuring the protection of nature, quality of life, in conjunction with a green and competitive economic development, with low-carbon emissions and efficiency in terms of resource use. We aim to improve environmental infrastructure and to reduce the current gap compared to other EU Member States, preserve the biodiversity, reduce pollution and improve air quality and at the same time, to promote energy from alternative renewable and clean sources, and also to stimulate a sustainable economic growth, with emphasis on creating new* ***green jobs****. An essential tool shall be to increase the absorption of EU funds through the Sectorial Operational Programme Environment and to prepare the MFF 2014-2020. We pay special attention to improving the transparency of decision-making and awareness, information, consultation and participation of all citizens in environmental decision making*." *(source http://gov.ro)*

BIBLIOGRAPHY

- ***Air quality in Europe – 2012 report***, European Environment Agency *(http://www.eea.europa.eu/ro)*
- ***The database of The National Institute of Statistics***, - www.insse.ro
- ***Eurostat database***, - *www.ec.europa.eu/eurostat*
- ***Quality of the water supplied in the centralised system***, - Ministry of Health
- ***Meteorological description of the year 2013 in Romania*** – National Administration of Meteorology
- ***Census Preliminary Data 2011*** - National Institute of Statistics
- ***On Environment and Health***, - European Environment Agency, *(http://www.eea.europa.eu/ro/themes/human/about-environment-and-health)*
- ***Romania's Geographical Encyclopaedia,*** 1986 edition, Bucharest
- ***European bathing water quality in 2013,*** European Environment Agency *(http://www.eea.europa.eu/ro)*
- ***National Inventory of Greenhouse Gases Emissions 2013*** **(INEGES-2013) –** Ministry of Environment and Climate Changes
- ***County reports on the State of Environment in Romania in 2013*** – County agencies for environment protection
- ***Report on the State of Environment in the Danube Delta Biosphere Reserve, in 2013*** - "Danube Delta Biosphere Reservation Authority", Tulcea
- ***Report on the State of Marine and Coastal Area Environment in 2013*** – "Grigore Antipa" National Institute of Marine Research-Development, Constanţa
- ***Report on the State of Soils in Romania 2013*** – National Institute of Research – Development for Pedology, Agrochemistry and Environment Protection – I.C.P.A
- ***Health and Environment Report 2010-2011***, National Institute of Public Health, National Centre for Monitoring Risks in the Community Environment, Bucharest
- "***Health-EU***" - (The Public Health Portal of the European Union) *(http://ec.europa.eu/health-eu)*
- ***Romania's National Strategy on Climate Changes 2013-2020 –*** Ministry of Environment and Climate Changes
- ***Energy Strategy of Romania between 2000-2020*** – Ministry of Economy and Commerce
- ***National Strategy for Sustainable Development of Romania***. Horizons 2013 – 2020 - 2030 – Romanian Government – Ministry of Environment and Sustainable Development, United Nations Program for Development , National Centre for Sustainable Development

The INSTITUTIONS that supplied information for the present report:

• "ROMANIAN WATERS" NATIONAL ADMINISTRATION
Address: 6, Edgar Quinet Street, district 1, Bucharest
Phone: 312 21 74, Fax: 311 03 96,
www.rowater.ro

• ADMINISTRATION OF ENVIRONMENT FUND
Address: 294, Splaiul Independenţei, Building A, district 6, Bucharest
Phone/fax: 317 02 87, 317 02 89, 319 48 49, 319 48 50,
www.afm.ro

• NATIONAL ADMINISTRATION OF METEOROLOGY
Address: 97, Bucharest-Ploiesti Street, district 1, Bucharest
Phone: 316 28 85, 316 3143, Fax: 316 28 85, 316 31 43,
www.inmh.ro

• "DANUBE DELTA BIOSPHERE RESERVATION AUTHORITY"- TULCEA
Address: 34 A 2, Portului Street, Tulcea, Tulcea County
Phone: (0240) 518 945, Fax: (0240) 518 975,
www.ddbra.ro

• REGIONAL AGENCIES FOR ENVIRONMENT PROTECTION
http://www.anpm.ro/#

• NATIONAL ENVIRONMENTAL GUARD
Address: 78, Unirii Bvd., bl.J2, district 3, Bucharest
Phone: 326 89 70, 326 89 82, Fax: 326 89 71,
www.gnm.ro

• NATIONAL INSTITUTE OF RESEARCH – DEVELOPMENT FOR PEDOLOGY, AGROCHEMISTRY AND ENVIRONMENT PROTECTION - BUCHAREST
Address: 61, Mărăşti Bvd., Bucharest
Phone: 318 44 63, Fax: 318 43 48,
www.icpa.ro

• "DANUBE DELTA" NATIONAL INSTITUTE OF RESEARCH-DEVELOPMENT TULCEA
Address:165, Babadag Street, 820112, Tulcea, Tulcea county
Phone: (0240) 531 520, Fax: (0240) 534 547, www.ddni.ro

• "GRIGORE ANTIPA" NATIONAL INSTITUTE OF MARINE RESEARCH-DEVELOPMENT - CONSTANŢA
Address: 300, Mamaia Bvd., Constanţa, 900581, Constanţa County
Phone: (0241) 543 288, Fax: (0241) 831 274,
www.rmri.ro

• NATIONAL INSTITUTE OF PUBLIC HEALTH
Address: 1-3 Dr. Leonte Anastasievici street, District 5, Bucharest, 050463, Romania
Phone: (401) 021 318 36 20; Fax (401) 021 312 34 26
www.insp.gov.ro

• **NATIONAL INSTITUTE OF STATISTICS**
Address: 16, Libertatii Bvd., district 5, Bucharest
Fax: 021 21 312 4875 , 021 318 1851 ,021 318 1873
www.insse.ro

• **MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT**
Address: 24, Carol I Bvd., district 3, Bucharest, postcode 030163, post office 37
Phone: 307 23 00, Fax: 307 85 54,
www.maap.ro

• **MINISTRY OF ECONOMY**
Adresa: 152 Calea Victoriei, district 1, Bucharest, postcode 010096
Phone: 021 202 54 26
http://www.minind.ro

• **MINISTRY OF ENVIRONMENT AND CLIMATE CHANGES**
Address: 12, Libertatii Bvd., district 5, Bucharest
Phone: 316 02 15, Fax: 316 61 38,
www.mmediu.ro

• **MINISTRY OF TRANSPORTATION**
Address: 38, Dinicu Golescu Bvd., district 1, Bucharest
Phone: 319 61 24, Fax: 313 88 69,
www.mt.ro

• **MINISTRY OF HEALTH**
Address: 1-3, Cristian Popişteanu Entrance, district 1, postcode 010024 Bucharest
Phone: +4 021 3072 500, + 4 021 3072 600
http://www.ms.ro

• **NATIONAL COMMISSION FOR NUCLEAR ACTIVITIES CONTROL**
Address: 4, Lt. Zalic Street, District 6, Bucharest
Phone: 021 316 05 72, Fax: 021 317 38 87
http://www.cncan.ro/

• **NATIONAL CENTRE FOR RISK MONITORING IN THE COMMUNITY ENVIRONMENT (NCRMCE)**, National Institute for Public Health ,1st floor, 1-3, Dr. Leonte Anastasievici street, Bucharest , district 5, Romania,
Phone:021 318 36 19; 021 318 36 20; 021 318 36 21, Fax: 021 312 34 26
http://www.insp.gov.ro/cnmrmc/index.php

LIST OF ABBREVIATIONS AND ACRONYMS

E.F.A.	Environment Fund Administration
C.A.S.H.F.	County Association of Sportive Hunters and Fishermen
N.A.R.W.	National Administration „Romanian Waters”
N.A.M.	National Administration of Meteorology
N.A.C.P.	Natural Authority for Consumer’s Protection
N.E.P.A.	National Environmental Protection Agency
N.A.D.S.C.P.	National Agency for Dangerous Substances and Chemical Preparations
N.S.V.F.S.A.	National Sanitary Veterinary and Food Safety Authority
E.P.A.	Environmental Protection Agency
R.E.P.A.	Regional Environmental Protection Agency
W.B.A.	Waters Basins Administration
G	good (ecological state)
h.b.	hydrographical basin
BAT	Best available techniques
DBSLU	Data Base of the Soil-Land Units
EBRD	European Bank for Reconstruction and Development
Bio	biological elements
BREF	Documents of reference regarding the best available techniques
CAB	Credits Application Balance
WB	water body
AWB	artificial water body
CANE	Classification of the Activities in the National Economy
CAFE	Clean Air For Europe
HMWB	heavily modified water body
CBC	Cross Border Cooperation
CDC	Center for Disease Control
CDM	Clean Development Mechanism
EC	European Council
CEE/EEC	European Economic Community
ESC	Economical and Social Cohesion
CET	Electrical and thermal power plant
CFC	Chlorofluorocarbons
CITES	The Convention regarding International Trade with Wild Species of Flora and Fauna
MAC	Maximum Accepted Concentration
MAC	Maximum Accepted Concentration
CMR	Substances that are Carcinogenic, Mutagenic and Toxic to Reproduction
NCNAC	National Committee for Nuclear Activities Control
VOC	Volatile Organic Compounds
CFEU	Capture on fishing effort unit
CBS	Committee for Biological Security
DSWD	Dobrogea Seaside Water Directorate
CDARD	County Directorates for Agriculture and Rural Development
WFD	Water Framework Directive (2000/60/CE)
DDT	Dichlorodiphenyltrichloroethane
EEEW	Electric and Electronic Equipments Wastes
EEA	European Environment Agency
EFSA	European Food Safety Authority
EQS	*Environmental Quality Standard*
EUNIS	European Nature Information System
VG	very good (ecological state)

PB / Pb	phytobenthos
CF	Cohesion Fund
PCE	General Physical and Chemical Elements
EFRD	European Fund for Regional Development
PP	Phytoplankton
N.E.G.	National Environmental Guard
GHG	Greenhouse gasses
IGS	Informational Geographic System
G.D.	Government Decision
PAH	Poly-aromatic Hydrocarbons
HCB	Hexachlorobenzene
HCFC	Hydrochlorofluorocarbons
HCH	Hexachlorocyclohexane
HFC	Hydrofluorocarbons
HG	Government Decision
R.I.P.A	Research Institute for Pedology and Agro-chemistry
R.I.P.A	National Research-Development Institute for Pedology, Agro-chemistry and Environment Protection
I.F.I.	International Financial Institution
N.I.R.D.	National Institute of Research and Development
N.I.S.	National Institute of Statistics
IET	International Emissions Trade
SME	Small and Medium Enterprises
DDNIRD	Danube-Delta National Institute for Research and Development
NIRDEPB	National Institute of Research and Development for Environment Protection Bucharest
NGHGEI	National GHG Emissions Inventory
NIHWM	National Institute of Hydrology and Waters Management
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
PASI	Pre-Accession Structural Instrument
SISTR	State Institute for Soils Testing and Registration
IUCN	International Union for Conservation of Nature and Natural Resources
JI	Joint implementation
LCP	Large Combustion Plants
DLE	Derivate Limits of Emissions
LER	National reference laboratory for environmental radioactivity
LULUCF	Land Use, Land-Use Change and Forestry
M	moderate (ecological state)
M.A.R.D.	Ministry of Agriculture and Rural Development
M.A.F.R.D.	Ministry of Agriculture, Forests and Rural Development
M.W.E.P.	Ministry of Waters and Environment Protection
M.E.	Ministry of Environment
M.E.S.D.	Ministry of Environment and Sustainable Development
M.E.W.M.	Ministry of Environment and Water Management
M.E.C.C.	Ministry of Environment and Climate Changes
AG	average grade (arithmetic)
PMB	Programme „Man and Biosphere”
MH	Ministry of Health
MZB	Macrozoobenthos
N	nutrients
NAP	National Assignation Plans
C.P.P.A.S.	County Office for Pedological and Agricultural Studies
M.I.	Minister’s Order
E.G.O.	Emergency Governmental Ordinance
DO	diluted oxygen
ODS	Ozone Destruction Substances
NGO	non-governmental organization

OPAS	Office for Pedological and Agrochemical Studies
F	Fish
B	Bad ecological state
L.A.P.E.	Local Action Plan for Environment
R.A.P.E.	Regional Action Plan for Environment
RL	Risk Limit
PCB	Polychlorinated biphenyls
GEP	good ecological potential
MoEP	moderate ecological potential
MaxEP	maximum ecological potential
PET	Polietilentereftalats
PFC	Perfluorocarbon
PI	Information Limit
GDP	Gross Domestic Product
NAPEP	National Action Plan for Environment Protection
NDP	National Development Plan
NPWM	National Waste Management Plan
POP	Persistent Organic Pollutants
OSP	Operational Sectorial Programme
RPWM	Regional Plan of Wastes Management
SP	Specific Pollutants
SGMP	Superior genetically modified plants
DDBR	Danube Delta Biosphere Reservation
EQR	Ecological Quality Report
REACH	The System of Registration, Evaluation and Authorisation of Chemical Substances
EPER	European Pollutant Emission Register
NNSER	National Network for the Surveillance of Environmental Radioactivity
L	low (ecological state)
N.D.S.D.	National Development for Sustainable Development
SCA	Special Conservations Areas
ISCM	International Strategy for Chemicals Management
SAPARD	European Program for Agriculture and Rural Development
SCI	Site of Community Importance
SDNP	Sustainable Development Network Programme
ES	Ecological State
SEVESO	Control of major accidents involving hazardous substances
SF6	Sulphur Hexafluoride
NSWAER	National System of Warning / Alarming in case of Environmental Radioactivity
NSEAGHGE	National System for Estimating the Anthropic GHG Emissions
NSIEMAQ	National System for Integrated Evaluation and Management of Air Quality
NWMS	National Waste Management Strategy
NOC	National Oil Company
SAPA	Special Avifaunistic Protection Area
ERSS	Environmental Radioactivity Surveillance Strategy
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
LV	Limited value
OUV	Out of use vehicles

ANNEX 1

CHAPTER 3 WATER

ABBREVIATIONS

- Bio = biological elements
- G = good (ecological state)
- H.B. = hydrographic basin
- WB = water body
- AWB = artificial water body
- HMWB = heavily modified water body
- MAC = Maximum allowable concentration
- WFD = Water Framework Directive (2000/60/CE)
- EQS = (eng.) *Environmental Quality Standard*
- PB / Pb = phytobenthos
- VG = very good (ecological state)
- PCE = general physical chemical elements
- PP = phytoplancton
- G.D. = Government Decision
- DDNIRD = Danube-Delta National Institute for Research and Development
- M = moderate (ecological state)
- AG = average grade (arithmetic)
- MZB = macrozoobenthos (benthic macroinvertebrates)
- N = nutrients
- DO = diluted oxygen
- F = fish
- B = bad ecological state
- GEP = good ecological potential
- MAXEP / MaxEP = maximul ecological potential
- MOEP / MoEP = moderate ecological potential
- SP = specific pollutants
- P = poor ecological state
- ES = ecological state
- EQR = ecological quality report

3.5.1. Structure of wastewater discharged in 2013

Table 3.5.1.-1: Summary of wastewater volumes discharged in 2013 on economic activities

(Source: "Romanian Waters" National Administration)

No.	National economy activity	Volumes of wastewater discharged (thousand cubic meters)										
		Does not require treatment	% of column 12	Requires treatment								Total discharged
				Not to be treated	% of column 10	To be treated				Total volumes requiring treatment		
						Improper		Proper		Total	% of column 12	
						Total	% of column 10	Total	% of column 10			
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1	**Public administration**	1176.000	40.11	2.888	0.16	1112.702	63.36	640.540	36.47	1756.130	59.89	2932.130
2	**Catchments and processing of water for population supply**	3024.051	0.25	172232.208	14.45	275164.035	23.09	744400.390	62.46	1191796.630	99.75	1194820.681
3	**Research - development**	2.239	1.20	-	-	184.015	99.96	0.076	0.04	184.091	98.80	186.330
4	**Trade and services for population**	2698.084	42.54	622.026	17.07	1939.493	53.21	1083.492	29.73	3645.011	57.46	6343.096
5	**Communications**	-	-	-	-	5.280	100.00	-	-	5.280	100.00	5.280
6	**Constructions**	68.044	0.65	79.799	0.76	2464.081	23.56	7915.588	75.68	10459.469	99.35	10527.513
7	**Electric and thermal power**	12.379	-	202592.430	38.53	86382.714	16.43	236837.109	45.04	525812.253	100.00	525824.632
8	**Transport means industry**	-	-	-	-	1116.308	66.77	555.577	33.23	1671.885	100.00	1671.885
9	**Food industry**	410.596	4.06	1.073	0.01	5506.644	56.69	4206.253	43.30	9713.970	95.94	10124.566
10	**Mining and quarrying**	1.556	0.00	4644.461	7.55	10759.723	17.50	46087.464	74.95	61491.649	100.00	61493.205
11	**Iron and steel – machinery building industry**	2476.735	3.45	29727.285	42.93	12059.598	17.42	27453.989	39.65	69240.872	96.55	71717.607
12	**Wood processing industry**	325.871	21.42	4.160	0.35	1146.143	95.87	45.257	3.79	1195.560	78.58	1521.431
13	**Light industry**	28.981	5.57	-	-	378.087	77.01	112.887	22.99	490.974	94.43	519.955
14	**Education and health**	38.652	2.47	35.903	2.35	936.850	61.30	555.578	36.35	1528.331	97.53	1566.983
15	**Irrigations**	-	-	835.560	99.68	2.682	0.32	-	-	838.242	100.00	838.242
16	**Fine mechanics + electrotechnics + electronics**	72.638	19.35	69.871	23.08	142.518	47.07	90.389	29.85	302.778	80.65	375.416
17	**Pisciculture**	45.315	31.53	-	-	0.870	0.88	97.543	99.12	98.413	68.47	143.728
18	**Printing, publishing houses**	-	-	-	-	2.414	100.00	-	-	2.414	100.00	2.414
19	**Chemical processing**	3144.924	4.29	2995.981	4.27	29569.415	42.18	37540.420	53.55	70105.816	95.71	73250.740
20	**Production of furniture+other not classified activities**	2.745	20.25	-	-	1.408	13.02	9.405	86.98	10.813	79.75	13.558
21	**Transports**	88.249	13.23	-	-	507.888	87.77	70.748	12.23	578.636	86.77	666.885
22	**Silviculture**	0.000	0.00	0.000	0.00	0.208	100.00	0.000	0.00	0.208	100.00	0.208
23	**Animal breeding**	21.792	0.84	0.000	0.00	2503.888	97.32	68.842	2.68	2572.730	99.16	2594.522
24	**Other activities**	3213.177	30.68	105.283	1.45	1610.335	22.18	5543.453	76.37	7259.071	69.32	10472.248
	GENERAL TOTAL	**16852.027**	**0.85**	**413948.929**	**21.11**	**433497.301**	**22.11**	**1113315.000**	**56.78**	**1960761.23**	**99.15**	**1977613.258**

Note: The table does not include the volume of 2,895,028,000 m3, constituting cooling water from the energy industry that requires no treatment (according to the new EUROSTAT requirements)

3.5.2. Pollutants and indicators of wastewater pollution

Table 3.5.2.-1: Summary of loadings for chemical indicators in 2013 by economic activity (BOD5, COD, total N, total P, nitrates, nitrites, ammonium and suspended solids) *(Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)							
		BOD5 5-day Biochemical Oxygen Demand	COD Chemical Oxygen Demand	Total nitrogen (N)	Total phosphorus (P)	Nitrates (NO3)	Nitrites (NO2)	Ammonium (NH4)	Suspended solids
0	1	2	3	4	5	6	7	8	9
1	Public administration	128.585717	345.439684	18.577499	4.234675	5.070398	0.087033	32.050765	79.946495
2	Catchments and processing of water for population supply	43937.368963	122444.315152	17826.729773	2163.655	12431.532925	667.281938	14950.409480	59907.890743
3	Research - development	1.751102	5.134378	2.671260	0.284077	0.164180	0.017704	1.044916	3.219715
4	Trade and services for population	181.547615	502.420900	21.984943	3.948784	25.484930	1.205332	51.850217	227.950598
5	Communications	0.582649	1.980454	0.451607	0.042003	-	-	-	0.321630
6	Constructions	44.568994	265.854306	12.075549	1.288328	2.874789	0.061564	8.139335	2280.972797
7	Electric and thermal power	2067.702827	8711.1	44.457144	14.852910	11943.515218	113.797827	70.935221	23159.072069
8	Transport means industry	23.286096	66.662470	2.449237	0.802018	2.640970	0.033368	6.446282	31.707177
9	Food industry	825.908955	1997.528885	153.314018	13.679235	52.186200	2.556049	114.576940	453.925012
10	Mining and quarrying	499.894032	2729.405015	27.285582	0.939845	8.319333	0.265191	18.727781	5455.573160
11	Iron and steel – machinery building industry	1187.047467	5115.159469	22.658589	1.145618	738.900318	29.731326	258.627959	22661.093362
12	Wood processing industry	54.698112	139.036820	4.870452	0.756188	4.872310	0.131377	2.185816	62.015664
13	Light industry	12.192927	43.880255	2.490552	0.333856	5.103194	0.153576	0.804285	21.889077
14	Education and health	110.716443	263.591812	25.725041	3.270065	9.836528	1.289643	25.150377	154.394780
15	Irrigations	67.017181	152.752808	43.584715	4.363793	0.010165	0.001234	0.000107	42.342048
16	Fine mechanics + electrotechnics + electronics	18.659593	43.475086	1.431521	0.178638	1.221508	0.009077	0.158827	16.694998
17	Pisciculture	1.099629	6.416647	1.116932	0.075274	0.001166	-	0.006304	3.050592
18	Printing, publishing houses	0.228488	0.733411	0.061410	0.105368	-	-	-	0.197488
19	Chemical processing	2876.147626	7862.881350	516.357834	10.496100	1128.962682	21.198387	522.532323	8114.052096
20	Production of furniture+other not classified activities	0.075747	0.394412	0.143765	0.005283	0.003728	0.005493	0.006292	0.163976
21	Transports	0.008382	0.029203	0.011634	0.000971	0.000344	0.002169	0.012948	0.007904
22	Silviculture	92.392612	266.323020	1.173268	2.379967	0.829048	0.057245	26.591603	84.513987
23	Animal breeding	1010.784020	1783.862326	105.846398	18.901172	53.590734	1.561279	123.167675	547.374350
24	Other activities	224.902103	597.597019	28.480716	4.324983	16.628456	0.847214	27.787928	574.632166
GENERAL TOTAL		**53367.1672**	**153345.87**	**18863.9494**	**2250.064**	**26431.7491**	**840.2940**	**16241.2133**	**123883.0018**

Table 3.5.2.-2: Summary of loadings for chemical indicators in 2013 by economic activity (filtered residue, chlorides, sulfates, calcium, magnesium, fluoride, sulfite) *(Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)						
		Filtered residue	Chlorides (Cl)	Sulfates (SO4)	Calcium (Ca)	Magnesium (Mg)	Fluorides (F)	Sulfites (SO3)
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	Public administration	844.639068	46.029878	46.350832	0.390537	-	-	-
2	Catchments and processing of water for population supply	607015.206226	75095.138423	79592.272975	7609.911460	1194.439516	3.651594	0.002980
3	Research - development	94.756326	0.199698	0.287628	-	-	-	-
4	Trade and services for population	4581.702626	684.195140	98.780035	147.296328	38.067260	-	-
5	Communications	2.808960	-	-	-	-	-	-
6	Constructions	7005.366186	51.618502	494.947342	187.111802	-	-	-
7	Electric and thermal power	732533.293690	7243.467457	15775.466159	13568.017421	6262.528049	-	-
8	Transport means industry	2900.170201	136.661306	77.791430	5.616842	-	0.041412	
9	Food industry	9649.573761	1502.584951	169.196588	20.906989	7.540651	-	0.003805
10	Mining and quarrying	56000.994624	1762.012317	16570.165054	6166.569595	1038.347510	-	-
11	Iron and steel – machinery building industry	48490.628557	5703.881057	4560.693158	2300.814307	551.719193	7.860733	-
12	Wood processing industry	1039.295706	166.422025	105.829332	0.031945	0.010652	-	2.154035
13	Light industry	466.462996	43.951847	14.464953	2.643857	0.437118	-	-
14	Education and health	1019.184799	52.496845	31.135437	9.351568	0.219957	-	-
15	Irrigations	705.719052	-	-	-	-	-	-
16	Fine mechanics + electrotechnics + electronics	101.757908	8.986962	4.681882	-	-	-	-
17	Pisciculture	44.714207	0.023938	0.017588	-	-	-	-
18	Printing, publishing houses	0.964965	-	-	-	-	-	-
19	Chemical processing	116232.488257	159447.244852	6906.769175	51774.532254	81.251335	4.355384	7.947750
20	Production of furniture+other not classified activities	3.342539	0.080852	-	-	-	-	-
21	Transports	0.181722	-	-	-	-	-	-
22	Silviculture	371.041352	2.224197	22.550696	6.230040	0.637169	-	-
23	Animal breeding	2626.433471	294.217028	253.468086	24.348466	5.136230	-	-
24	Other activities	4841.536579	212.310585	327.865879	170.718594	50.221681	0.000710	0.033491
GENERAL TOTAL		**1596572.2637**	**252453.7478**	**125052.7342**	**81994.49200**	**9230.5563**	**15.90983**	**10.1420**

Table 3.5.2.-3: Summary of loadings for chemical indicators in 2013 by economic activity (total iron, total manganese, aluminium, total cyanides, phenols, sulphures and residual chlorine) *(Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)						
		Total iron (total concentration)	Total Manganese (total concentration)	Aluminum (total concentration)	Total cyanides (CN)	Phenols	H_2S + Sulphures (S_2)	Free residual chlorine (Cl_2)
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	**Public administration**	0.002441	-	-	0.000886	0.006704	0.568528	
2	**Catchments and processing of water for population supply**	261.376773	57.705289	108.745669	4.458457	43.338962	480.878368	0.039171
3	**Research - development**	-	-	-	-	-	0.000427	-
4	**Trade and services for population**	0.140655	0.000326	-	-	0.002689	0.240638	-
5	**Communications**	-	-	-	-	-	0.019815	-
6	**Constructions**	0.138022	0.859197	0.036542	0.000010	0.003065	0.098482	-
7	**Electric and thermal power**	30.974121	5.393411	-	-	0.001480	30.121745	-
8	**Transport means industry**	0.456085	0.017667	0.006718	0.004720	0.000645	0.001299	-
9	**Food industry**	0.446232	0.012197	-	0.028965	0.007760	2.976716	0.000226
10	**Mining and quarrying**	541.878318	143.440390	-	0.000000	3.914596	0.035568	-
11	**Iron and steel – machinery building industry**	352.614148	8.530348	0.056431	1.592305	1.617967	30.732593	-
12	**Wood processing industry**	-	-	-	-	0.004822	0.019858	-
13	**Light industry**	0.075561	-	0.012117	0.001522	0.000796	0.103885	-
14	**Education and health**	0.001862	-	0.000001		0.018284	0.454791	0.006187
15	**Irrigations**	-	-	-	-	0.000027	3.525628	-
16	**Fine mechanics + electrotechnics + electronics**	0.024179	-	-	-	-	0.008800	-
17	**Pisciculture**	-	-	-	-	-	-	-
18	**Printing, publishing houses**	-	-	-	-	-	-	-
19	**Chemical processing**	2.163847	0.010281	13.899475	0.149737	0.540370	15.924665	2.244067
20	**Production of furniture+other not classified activities**	-	-	-	-	0.000038	-	-
21	**Transports**	-	-	-	-	0.000001	0.000114	-
22	**Silviculture**	0.011974	-	-	-	0.000364	0.606418	-
23	**Animal breeding**	-	-	-	-	0.309227	1.390200	0.018444
24	**Other activities**	1.995853	0.060826	4.148413	0.000572	0.084712	1.694920	0.53541
GENERAL TOTAL		**1192.3000**	**216.0299**	**126.9053**	**6.2371**	**49.8525**	**569.4034**	**2.842267**

Table 3.5.2.-4: Summary of loadings for chemical indicators in 2013 by economic activity (detergents, extractibles, petroleum, sodium, arsenic, cadmium, total chromium) *(Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)						
		Synthetic detergents	Extractible substances	Oil products	Sodium	Arsenic and compounds	Cadmium and compounds	Total chromium
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	**Public administration**	2.509171	20.351643	0.003757	-	-	0.000002	0.492627
2	**Catchments and processing of water for population supply**	1049.928065	10259.990660	52.219844	1901.380554	-	0.298211	3.847619
3	**Research - development**	0.030189	0.830371	0.000684	-	-	-	0.000080
4	**Trade and services for population**	1.302201	40.288700	0.022669	88.203138	-	0.000001	0.000032
5	**Communications**	0.020185	0.172498	-	-	-	-	-
6	**Constructions**	0.414947	55.749922	0.052565	-	-	0.000006	0.001892
7	**Electric and thermal power**	0.948776	2526.552413	1085.795007	16.173775	0.020448	0.031348	
8	**Transport means industry**	0.273582	14.545221	3.368025	-	-	0.000229	0.001880
9	**Food industry**	1.640425	79.632973	0.031601	-	-	-	-
10	**Mining and quarrying**	0.276637	37.816235	3.942610	-	0.002669	0.098474	-
11	**Iron and steel – machinery building industry**	0.450788	499.164129	1.352531	0.000000	0.000833	0.011907	1.152739
12	**Wood processing industry**	0.086134	9.533084	0.025200	-	-	-	-
13	**Light industry**	0.286784	1.867216	-	0.784125	-	-	0.000539
14	**Education and health**	1.572105	13.421289	0.053918	14.237600	-	-	-
15	**Irrigations**	1.329393	8.369681	0.263901	-	-	-	-
16	**Fine mechanics + electrotechnics + electronics**	0.392398	2.025582	0.117958	-	-	-	0.000102
17	**Pisciculture**	0.001284	0.005367	-	-	-	-	-
18	**Printing, publishing houses**	0.001802	0.035282	-	-	-	-	-
19	**Chemical processing**	4.910956	374.590210	88.107306	31331.028253	0.038389	0.011494	0.051264
20	**Production of furniture+other not classified activities**	0.000175	0.082306	-	-	-	-	-
21	**Transports**	0.000063	0.001935	-	-	-	-	-
22	**Silviculture**	2.058749	23.725531	0.051506	-	-	-	-
23	**Animal breeding**	0.384370	83.743471	0.003757	-	-	-	-
24	**Other activities**	1.413110	68.279715	4.884310	260.080155	0.000055	0.000343	0.011909
GENERAL TOTAL		**1070.2322**	**14120.7754**	**1240.2933**	**33611.8876**	**0.06239**	**0.45201**	**5.56068**

Table 3.5.2.- 5: Summary of loadings for chemical indicators in 2013 by economic activity (copper, mercury, nickel, lead, zinc, phenanthrene)
(Source: "Romanian Waters" National Administration)

No.	National economy activity	Loading for chemical indicators in wastewater (tons)					
		Copper	Mercury and compunds	Nickel and compunds	Lead and compunds	Zinc	Phenanthrene
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1	**Public administration**	0.000217	-	0.000005	0.000116	0.023576	-
2	**Catchments and processing of water for population supply**	7.258678	-	4.023339	2.429903	62.210341	0.014131
3	**Research - development**	0.000212	-	0.000134	0.000108	0.002698	-
4	**Trade and services for population**	0.000144	-	0.000117	0.000019	0.000564	-
5	**Communications**	-	-	-	-	-	-
6	**Constructions**	0.003545	-	0.002832	0.005061	0.960789	-
7	**Electric and thermal power**	0.000027	0.002015	0.000000	0.226077	0.000520	-
8	**Transport means industry**	0.006202	-	0.016359	0.001077	0.051971	-
9	**Food industry**	-	-	-	-	0.003994	-
10	**Mining and quarrying**	27.469197	0.003948	0.097159	0.097947	66.833750	-
11	**Iron and steel – machinery building industry**	0.475589	-	0.658833	0.430550	8.365686	0.000055
12	**Wood processing industry**	-	-	-	-	-	-
13	**Light industry**	-	-	-	-	0.004195	-
14	**Education and health**	-	-	-	-	-	-
15	**Irrigations**	-	-	-	-	-	-
16	**Fine mechanics + electrotechnics + electronics**	0.012795	-	0.000006	-	0.041619	-
17	**Pisciculture**	-	-	-	-	-	-
18	**Printing, publishing houses**	-	-	-	-	-	-
19	**Chemical processing**	0.033010	0.014455	0.204371	0.083958	0.427448	0.000083
20	**Production of furniture+other not classified activities**	-	-	-	-	-	-
21	**Transports**	-	-	-	-	-	-
22	**Silviculture**	-	-	-	-	-	-
23	**Animal breeding**	-	-	-	-	-	-
24	**Other activities**	0.028603	-	0.004617	0.006815	0.278282	0.000001
GENERAL TOTAL		**35.28821**	**0.0204**	**5.00777**	**3.28163**	**139.20543**	**0.01427**

Table 3.5.2.-6: Summary of loadings for chemical indicators in 2013 by economic activity (dichloromethane, benzene, benzo [a] pyrene, chloroform, Di-(2- ethylhexyl); DEHP) *(Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)				
		Dichloromethane	Benzene	Benzo [a] pyrene	Chloroform (Trichloromethane)	Di-(2- ethylhexyl); DEHP
0	*1*	*2*	*3*	*4*	*5*	*6*
1	**Public administration**	-	-	-	-	-
2	**Catchments and processing of water for population supply**	0.196155	0.055013	0.000157	0.729781	4.773023
3	**Research - development**	-	-	-	-	-
4	**Trade and services for population**	-	-	-	-	-
5	**Communications**	-	-	-	-	-
6	**Constructions**	-	-	-	-	-
7	**Electric and thermal power**	-	-	-	-	-
8	**Transport means industry**	0.003160	-	0.000001	-	-
9	**Food industry**	-	-	-	-	-
10	**Mining and quarrying**	-	0.002406	-	-	-
11	**Iron and steel – machinery building industry**	-	-	0.000054	-	-
12	**Wood processing industry**	-	-	-	-	-
13	**Light industry**	-	-	-	-	-
14	**Education and health**	-	-	-	-	-
15	**Irrigations**	-	-	-	-	-
16	**Fine mechanics + electrotechnics + electronics**	-	-	-	-	-
17	**Pisciculture**	-	-	-	-	-
18	**Printing, publishing houses**	-	-	-	-	-
19	**Chemical processing**	0.032409	0.079395	0.000065	0.779366	0.005451
20	**Production of furniture+other not classified activities**	-	-	-	-	-
21	**Transports**	-	-	-	-	-
22	**Silviculture**	-	-	-	-	-
23	**Animal breeding**	-	-	-	-	-
24	**Other activities**	0.026787	-	0.000002	0.002349	-
GENERAL TOTAL		**0.25851**	**0.13681**	**0.00027**	**1.51149**	**4.77847**

Table 3.5.2.-7: Summary of loadings for chemical indicators in 2013 by economic activity (fluorathene, hexachlorobenzene, naphthalene, toluene, trichlorobenzene) *Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)				
		Fluorathene	Hexachlorobenzene	Naphthalene	Toluene	Trichlorobenzene
0	*1*	*2*	*3*	*4*	*5*	*6*
1	**Public administration**	-	-	-	-	-
2	**Catchments and processing of water for population supply**	0.001704	0.000039	0.025036	0.001779	0.000187
3	**Research - development**	-	-	-	-	-
4	**Trade and services for population**	-	-	-	-	-
5	**Communications**	-	-	-	-	-
6	**Constructions**	-	-	-	-	-
7	**Electric and thermal power**	-	-	-	-	0.000379
8	**Transport means industry**	-	-	-	-	0.000002
9	**Food industry**	-	-	-	-	-
10	**Mining and quarrying**	-	-	-	-	-
11	**Iron and steel – machinery building industry**	0.000067	-	0.000010	-	-
12	**Wood processing industry**	-	-	-	-	-
13	**Light industry**	-	-	-	-	-
14	**Education and health**	-	-	-	-	-
15	**Irrigations**	-	-	-	-	-
16	**Fine mechanics + electrotechnics + electronics**	-	-	-	-	-
17	**Pisciculture**	-	-	-	-	-
18	**Printing, publishing houses**	-	-	-	-	-
19	**Chemical processing**	0.000069	0.000264	0.000188	0.037851	0.003729
20	**Production of furniture+other not classified activities**	-	-	-	-	-
21	**Transports**	-	-	-	-	-
22	**Silviculture**	-	-	-	-	-
23	**Animal breeding**	-	-	-	-	-
24	**Other activities**	0.000003	0.000007	0.000001	-	0.000008
GENERAL TOTAL		**0.00184**	**0.000310**	**0.02523**	**0.039630**	**0.004305**

Table 3.5.2.- 8: Summary of loadings for chemical indicators in 2013 by economic activity (tetrachlorethylene, carbon tetrachloride, toluene, trichlorobenzene, trichlorethylene, trifluralin, xylene (sum)) *(Source: "Romanian Waters" National Administration)*

No.	National economy activity	Loading for chemical indicators in wastewater (tons)						
		Tetrachlorethylene	Carbon tetrachloride	Toluene	Trichlorobenzene	Trichlorethylene	Trifluralin	Xylene (sum)
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	**Public administration**	-	-	-	-	-	-	-
2	**Catchments and processing of water for population supply**	0.102702	0.099877	0.001779	0.000187	0.122356	-	-
3	**Research - development**	-	-	-	-	-	-	-
4	**Trade and services for population**	-	-	-	-	-	-	-
5	**Communications**	-	-	-	-	-	-	-
6	**Constructions**	-	-	-	-	-	-	-
7	**Electric and thermal power**	-	-	-	0.000379	-	-	-
8	**Transport means industry**	-	-	-	0.000002	0.001580	0.000026	-
9	**Food industry**	-	-	-	-	-	-	-
10	**Mining and quarrying**	-	-	-	-	-	-	-
11	**Iron and steel – machinery building industry**	0.000003	-	-	-	-	-	-
12	**Wood processing industry**	-	-	-	-	-	-	-
13	**Light industry**	-	-	-	-	-	-	-
14	**Education and health**	-	-	-	-	-	-	-
15	**Irrigations**	-	-	-	-	-	-	-
16	**Fine mechanics + electrotechnics + electronics**	-	-	-	-	-	-	-
17	**Pisciculture**	-	-	-	-	-	-	-
18	**Printing, publishing houses**	-	-	-	-	-	-	-
19	**Chemical processing**	0.218373	0.037468	0.037851	0.003729	0.483318	-	0.025011
20	**Production of furniture+other not classified activities**	-	-	-	-	-	-	-
21	**Transports**	-	-	-	-	-	-	-
22	**Silviculture**	-	-	-	-	-	-	-
23	**Animal breeding**	-	-	-	-	-	-	-
24	**Other activities**	0.006621	0.006621	-	0.000008	0.006621	-	-
GENERAL TOTAL		**0.32769**	**0.14396**	**0.039630**	**0.004305**	**0.61387**	**0.000026**	**0.02501**

3.5.3. TRENDS AND PRIORITIES IN REDUCING WASTEWATER POLLUTION

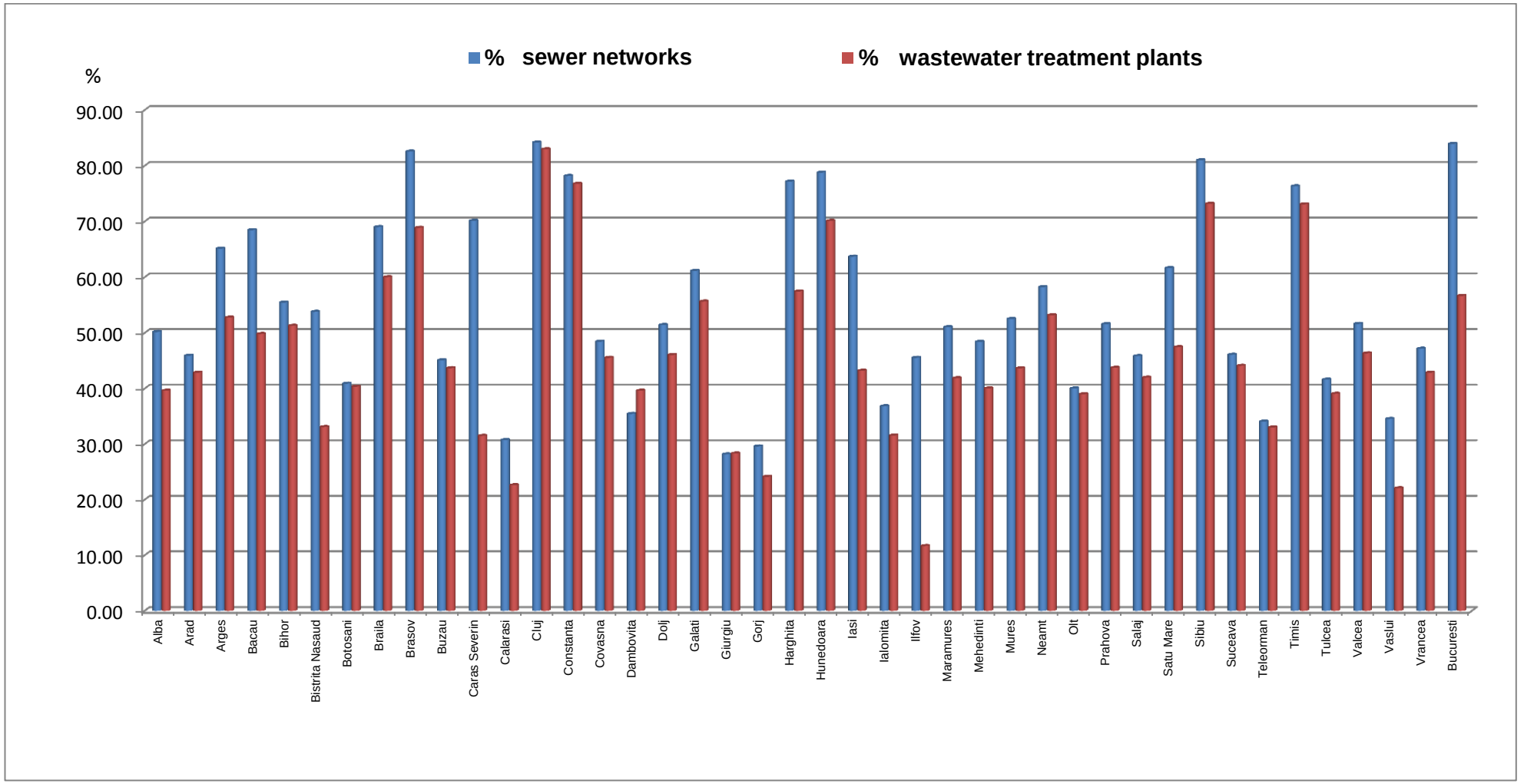


Figure 3.5.3.-1: The situation in 2013 at county level regarding the collection and treatment of biodegradable load of wastewater from population agglomerations of more than 2.000 *(Source: "Romanian Waters" National Administration)*

ACCIDENTAL POLLUTION SITUATION WATER, SOIL - 2013

Accidental pollution situation in 2013 for environmental factors:

I - Water (pp. 1-7)

II - Soil (pp. 7-22),

in alphabetical order of the 42 counties reported by GNM.

I. WATER

The events that have affected the water quality during 2013 and generated accidental pollution of the **WATER** environmental factor, are described below, and are grouped by county:

In **Arges County** there were **4 accidental pollution cases**, caused by oil activities and other household chores.

Among polluters we mention OMV Petrom SA, CONPET SA and SC NC Selmetal Rom SRL. Pollutions were recorded as follows:

- On 25.02.2013, time interval 09^{30} - 10^{27}, in Cocu village, Arges County - OMV Petrom polluter;
- On 11.10.2013, in Bascov village, Arges County - unidentified polluter;
- On 07.10.2013, in Albota village, Arges County - polluter: CONPET SA;
- On 22.10.2013 in Câmpulung - polluter: NC Selmetal Rom SRL.

The nature of pollution/s - spill water reservoir, about 1000 l of oil; wastewater discharge;

Pollution cause/s:

- Cracking in the pumping oil pipe, makeshift facility to steal oil from pipeline oil (SC Compet SA);
- discharge of wastewater (anionic surfactants) in Bascov creek;
- oil discharge in the sewage system of the Câmpulung town, resulting from the washing / cleaning of 2 tanks buried inside the property of SC NC Selmetal Rom SRL. About 2/3 of the slick surface of the lake "Saltwater" was affected, located in the southern part of the Campulung town and Târgului river for a distance of about 10 km;

Measures - stop pumping, locate point of failure, pipe remediation, retaining dams of the oil product were arranged, respectively polluting wave absorption dams. They intervened with drains for the recovery of oil accumulated by constructing dams.

Penalties - were applied by ABA Arges.

There was **1 accidental pollution** in **Bacău County**;

On 19.07.2013, 10.00 o'clock, there was recorded one pollution episode on Vâlcica stream - left tributary of the river Trotuş , from Tg. Ocna.

Pollution cause:

- a work of replacing a gasket in a wastewater flange pipe with high load transport of chloride led to a discharge of wastewater into the Vâlcica creek that led to impaired water quality and fish mortality (5 kg sapling);

Polluter: TG.OCNA SALT PIT BRANCH

A fine of 35,000 lei was applied by SGA Bacau under Law 107/1996, art. 87, pt. 26, for failure to notify water management authorities on accidental spillage into environment. Water quality has returned to normal after a few hours.

Bistriţa-Năsăud County registered **1 accidental pollution**

On 25.11.2013, at 7:40 on Valea Băilor creek , right tributary of the river Someşul Mare, upstream of the Valea Vinului wastewater treatment plant, in Rodna village, there have been leaks of mine water from conservation galleries - Gheorghiu Gallery, the share closed mining area 800 m from Valea Vinului. The entries into the mine openings were forced by unidentified persons in order to steal scrap.

Pollutant: SC CONVERSMIN SA Bucharest branch Baia Mare - Ministry of Economy.

Manifestation way : intense orange waters reached the Wine Valley were samples were taken to determine the parameters of water, APM BN and SGA BN laboratories.

There have been breaches of indicators: total iron, zinc, lead, copper on Valea Băilor creek, tributary of the river Someşul Mare.

The unit was sanctioned by written warning. SC CONVERSMIN SA, through its representatives, stopped the phenomenon at source on 27.11.2013, 17:00 by execution of temporary works.

Environmental factors from Someşul Mare were not significantly affected.

Braşov County registered **2 accidental pollutions**.

On 03.13.2013, at 07.14 the sewer network was recorded clogged / foaming due to discharge of wastewater by rainwater collector on the right bank of the river Ghimbăşel, vis-a-vis the military unit located on DN73, before the entrance to the city Râşnov, Braşov county.

Polluter: SC GOSCOM Cetatea Râşnov SA. Desilting works were carried out at the first home of the waste collector Dn 500 / The unit was sanctioned by written warning.

The fault was fixed the same day.

On 22.11.2013, at 13:00, on the left bank of the stream Zizin of the Apemin Zizin SA section (hm150) - bridge DJ 103 A, Zizin, in Tarlungeni village, there was a leak 100 l concrete liquid fraction, resulting in fish mortality - 0,2 kg. The interruption was performed immediately.

Polluter: SC KRONWERK SRL

No sanctions were applied.

Buzău County registered **1 accidental pollution**

On 14.09.2013, the oil pipeline from Parc 1 Pâcle to the Berca Village Treatment Plant, which belongs to SC OMV Petrom SA ASSET IX MOLDOVA SOUTH, presented a crash caused by a landslide, due to heavy rainfall, approx. 500 m away from the stepped header tanks located on torrent Murătoarea, at the entrance to Berca Village.

Crude oil has elapsed in Murătoarea torrent, a tributary of the river Buzău, being collected in the stepped header tanks located on torrent, from where it was emptied by the company and transported into the company's settling basin from Berca Oil Treatment Plant.

The company was sanctioned and appropriate action was imposed on troubleshooting and greening the affected area.

Caraş-Severin County registered **1 accidental pollution**.

On 13.13.2013, at 15:00, on Bârzava river, in Resita, Caraş-Severin county, there was a water pollution by petroleum products. River pollution only manifested on Bârzava river for a short period of time, iridescent on a distance of about 200 m downstream.

The exact cause of oil spills into TMK company sewerage was not identified. Municipal sewage also retrieves rainwater from TMK Rezita SA area.

There were no effects on Bârzava river wildlife. By installing floating dams and using absorbent materials, petroleum products were retained.

Caraş Severin Water Management System placed floating dams for retaining oil film at the mouth of sewage discharge into the river Bârzava and used absorbent substances to retain oil products.

TMK Reşiţa SA verified the sewage system; absorbent substances were used to retain petroleum products in the sewege and into the discharge port.

Banat Timişoara Water Basin Administration applied a contravention fine of 35,000 lei based on Law No. 107/1996.

Constanţa County registered **6 accidental pollutions**.

On 18.01.2013, at 17.30, on Lake Neptune were recorded iridescent oil traces on the water surface.

The cause of pollution is the discharge of rainwater filled with oil.

The polluter was unknown.

Measures were imposed to Mangalia Hall for remediation of the affected area, with deadlines.

On 03.02.2013, at 16.05, iridescent oil was recorded on Cernavodă sluice-gate, in the area of reed and under the mobile bridge viaduct.

Pollution was recorded on the Danube - Black Sea Channel, in the locality of Cernavodă.

The cause: a possible leak bilge of a transiting ship.

The affected environmental factor was the channel water, for 200 m in length and approx. 1m width through the reeds along the bank.

Remediation measures of the affected area were imposed CN ACN SA.

On 30.05.2013, at 19.17, a spot of oil was seen on the water surface of Tomis Constanţa Marina.

The cause of the accidental pollution was emptying the contents of a 5 litres fuel bottle from the brig EOL 77, abandoned in port.

The affected environmental factor was an area of approx.50 sqm. water.

Remediation measures were required.

On 17.08.2013, at 22.30, in Vama Veche, there has been a discharge of sewage wastewater into the Black Sea

Causes of pollution: ENEL power network failure stopped the pumps in the pumping station serving the town.

Affected environmental factors were water and soil. The sewage went through a stretch of beach, open channel width 20-30 cm over a distance of about 50 m.

On 08.28.2013, at 16:00, in Mamaia, spherical pieces of degraded oil were found.

The phenomenon was announced by ABADL, the bathing area did not show iridescent oil. Samples from the bathing area were collected by ABADL.

Possible pollution cause was the storm that helped bringing offshore degraded oil. The polluter was unknown.

Affected environmental factors were water and beach. This phenomenon occurred over a length of approx. 200 m from the water thread.

On 03.11.2013, at 6:30, CDMN Km 50 + 300 oil pollution was recorded. Pollution occurred in the CDMN area Km 50 + 300 at 15m from the shore. Pusher Mercury 207, belonging to CNFR Navrom Galaţi sank as a result of damage (cracks) in the engine room.

CNFR Navrom Galaţi was the polluter, being sanctioned according to OUG 195/2005 alin1 article 96, point 1.

Covasna County recorded **1 accidental pollution**.

On 29.07.2013, at 14.00, fishing mortality phenomenon was registered, 2-3 cm seedlings, abt. 20 pcs, likely caused by a decreased flow of Buzau river and lack of oxygen.

The polluter has not been identified. Sita Buzăului Police investigated the case as possible poaching.

The phenomenon was located on Buzău River at the base of the Crasna Mare Bridge.

Dâmboviţa County registered **4 accidental pollutions**.

On 11.04.2013, at 17:30, there was an accidental pollution, located in Valea Mare countryside Saru village due to an attempted theft of an oil transmission pipeline (oil + reservoir water) Park 35 Leordeni - Saru oil deposit, 6 inches, belonging to OMV Petrom - ASSET VI Muntenia Central.

Affected environmental factor - water, approx. 300 l oil on approx. 200 m Saru riverbed.

Sanctioned with warning.

This phenomenon was stopped by the recovery of spilled oil with a discharger; five absorbent material dams were built for retaining oil product, conveying the polluted product to the Bioremediation Station I.L. Caragiale. Saru riverbed was cleaned.

On 14.05.2013, at 13:20, there was an accidental pollution, located in the Schela Mare sector Moreni, Dâmboviţa County, on approx. 2 Km, right of the DJ Târgovişte - Moreni due to attempted theft of a 3 inches petroleum product pipeline (abandoned) from probe 679MP - Reception Park, belonging to OMV Petrom - ASSET VI Central Muntenia.

Affected environmental factor was water, approx. 1500 l oil, on about 3 Km on the Pascovici riverbed.

Sanctioned with warning.

This phenomenon was stopped by the recovery of spilled oil with a discharger, three absorbent material dams were built in for retaining oil product, conveying the polluted product to the Bioremediation Station I.L. Caragiale. Pascovici riverbed was cleaned.

On 23.05.2013, at 18:00, there was an accidental pollution, located on Ialomiţa River, downstream from the Mihai Bravu bridge Târgovişte, Dâmboviţa County, due to insufficiently treated wastewater discharge from the Pucioasa WWTP into Ialomiţa River.

Sanction applied amounting to 25 000 lei, according to OUG 195/2005, art. 96, paragraph 1, pt. 1.

SGA Dâmboviţa representatives monitored upstream and downstream Ialomiţa river station.

On 27.05.2013, at 14:30, there was an accidental pollution, located in Gura Ocniţei village, about 50 m from Slănic stream, on the left bank, due to corrosion of the 4 inches oil transmission pipeline (oil and reservoir water) from 143 Unirea Park - Warehouse 10 mesh pumps in an amount of approx. 650 l oil by OMV Petrom - ASSET VI Muntenia Central.

Affected environmental factors were soil and water, approx. 50 sqm meadows and approx. 150 m Slănic water stream.

Sanction applied in the amount of 40000 lei, according to OUG 195/2005, art. 96, paragraph 1, pt. 1.

This phenomenon was stopped, pumping was stopped, hinge joint was applied, 4 absorbent material retaining dams were mounted, and emptying and cleaning oil works were executed on stream banks.

In **Galati County** there were **2 accidental pollutions**

On 15.11.2013, at 07.45, on the Danube River, upstream of Galaţi county , iridescent hydrocarbon oil was recorded in the 4th berth of SC Romportmet SA Galaţi, on an area of 30 square meters, the polluter being unidentified.

Water samples were collected by SGA Galaţi Galaţi and APM Galaţi from Berth 4 zone, which had exceeded the hydrocarbon indicator.

SC Arcelor Mittal Galaţi SA and SC Apa Canal SA Galaţi were announced in order to take all necessary measures to prevent affecting water quality from Danube source outlet.

SC Romportmet SA Galaţi representatives took intervention measures to decontaminate berth 4 area, with floating absorbent dams of approx. 36 linear m in length and absorbent SpillSorb type (approx. 50 kg).

No sanction was imposed.

On 07.06.2013, at 22:00, in Fundeni village, Hanu Conachi town, DN 25, following a car accident, there has been leaking into the well of a quantity of 16 t diesel on an area of 260 sqm.

Pollutants: SC SINDBAD SRL, Moldova.

Measures taken:

- foam intervention to limit the affected area;
- tank emptying and re-position;
- oil and water mixture from the well was collected and transferred to another tank to be removed by an authorized operator;
- scraping of 20 t soil and decontamination by a certified operator;
- greening the affected area;
- soil and water samplings were conducted as well as monitoring wells from the affected area;

A sanction was imposed in the amount of 15,000 lei as per OUG 195 art. 94/1/g.

In **Gorj County** there was **1 accidental pollution**.

On 29.07.2013, at 20:30, there was a physical pollution on River Jiu - downstream of the water cooling point of discharge at CE Oltenia - Electrocentrale Rovinari Branch (at a distance of about 1 km downstream of the power plant there were dead fish). In the presence of CE Oltenia Electrocentrale Rovinari Branch representatives determinations of the water temperature were performed with a device provided by the laboratory unit.

Guideline values measured at the control date were as follows:

- at the point of cooling water discharge, before discharge into the receiver, the hot water collector had a temperature of 42 degrees C;
- downstream about 50 m from the cooling water outlet, a temperature of 38 ° C was recorded ;
- upstream of the power plant, at the sealing plug Rovinari, a temperature of 24 degrees C was recorded.

Gorj SGA representatives were asked to take water samples for a correct determination of the water temperatures.

The high temperature of those days (yellow code setting heat and thermal discomfort from 28.07.2013) accelerated the degradation of organic substances in water, causing the development of a large number of aerobic microorganisms, which led to decreased oxygen in the water, which explained the existence of dead juvenile fish.

Also, daily monitoring of water flows by SGA Gorj showed a decrease in Jiu river flow, Rovinari section, reaching an average of about 9 m/s.

No sanctions were applied and CE Oltenia - Electrocentrale Rovinari Branch notified GNM Gorj County Council to fulfill all necessary measures impose by the control dated 29.07.2013.

On **Harghita County** there were **2 accidental pollutions**

On 09.04.2013, at 13:30 was recorded in Balan town a discharge into the river Olt of an amount of about 30 cubic meters of sludge decanted from decanters, respectively mine waters, which lasted about 15 minutes and then stopped.

The cause of pollution was the theft of a pipe which connects the two compartments of the passive treatment plant, the polluter being Kedves Csaba. He was sanctioned.

On 09.08.2013, at 8:30, in Remetea commune, there was a fault in the level electrical transducer of the Harghita Industrialization Milk - Remetea milk powder factory, which led to the discharge of potentially contaminated water, through the overflow of the industrial wastewater pumping station directly into the river Mureş. There was no fish mortality recorded.

It was changed the electromagnetic transducer which is operating the pumps.

In **Mehedinti County** were recorded **3 accidental pollutions**

On 17.01.2013, on the Danube River, upstream of the Porţile de Fier Dam on the fairway, in the are of 8.9 and 10 dams, on the Romanian side, km 926 -943, was found a black liquid with iridescences on the water surface over a length about 150-200 m (oil), the polluter was unknown. No affected flora and fauna.

Measures taken: SGA scattered biodegradable substances in the PFI dam area.

On 13.05.2013, in Halânga locality, at the Romag-Termo ash and slag warehouse and surrounding areas were recorded ash particles and material which is used to subdivide the slag warehouse, which were shattered due to adverse weather phenomena (strong wind), the polluter being RAAN ROMAG TERMO Branch.

On 24.12.2013, at 10.15, at km 934 of the Danube river - the mooring quay S.C. CARGILL AGRICULTURĂ S.R.L. Drobeta Turnu Severin, Mehedinti County, there was an oil spill from a barge belonging to Navrom Galati, which was loading grains.

Representatives from APDF Giurgiu Border Police, County Environmental Protection Agency and ISU Drobeta worked together and took action with absorbent material at km 931-934 with two boats from the endowment of S.G.A. Mehedinţi. In order to neutralize the pollutant substance it has been fitted an absorbant dam from APDF Giurgiu to prevent any oil leaks downstream.

On 29.12.2013, at 15:15, on the Danube River, around Km 934, there was a leakage of oil from the sewage of SC FORSEV SA.

There was carried out an intervention with absorbent substances downstream on a distance of about 500 m and the sewage was cleaned.

In **Maramures County** were recorded **2 accidental pollutions**

In April, on 01.04.201, on an area of 6 km of the Baita stream, Baita village, Tăuţii Măgherăuş town, Maramures County, was recorded the sudden, uncontrolled evacuation of underground mine water, having an immediate effect on Baita stream, the modification of colour and loading with metal ions, with insignificant influence on the Lapus River and Somes River.

The issuer of the warning was SGA Maramureş, the polluter being the mine waters coming from the Campurile gallery, mining sector 9 May - 11 June.

The measure taken was starting the treatment plant and identifying the possible accumulation bags found on the surface.

In August, in Poiana Botizii, Maramures County, on 11.08.2013, 21.30, the Lapus River was affected; the issuer of the warning was SGA Maramureş. The cause of this pollution was the pouring rain occurred on 11.08.2013, the polluter, uncontrolled phenomenon of sudden evacuation of mine water from the mine, gallery Cizma, horizon XII, +680 mdM quota.

The measure taken was to monitor the Lapus River by SGA Maramureş.

It is mentioned that there was recorded no fish mortality.

In **Olt County** were recorded **2 accidental pollutions**

On 18.02.2013, at 17:10 in the town of Piatra-Olt, Olt County., at about 800 m upstream from the CF bridge on Oltişor Creek, left DN 64 Drăgăşani - Caracal, near the village of Enosesti, was detected a damage to the diesel transmission pipeline, diameter 12 inches Pitesti - Craiova, by making a crack with a sharp object by unidentified persons, in an area where the pipeline over-crosses the Oltişor creek.

The polluter was SC PETROTRANS SA Ploiesti (former operator of the pipeline), the pollutant being diesel mixed with water.

To stop the phenomenon of accidental pollution, on 18.02.2013, at 19:00, the following measures were taken:

- remediation of the damaged pipe by welding a nut and a bolt, carried out by the intervention team of SC CONPET SA, Ghercești office, Dolj;
- SGA Olt team mounted, at a distance of about 800 m downstream of the pipe and about 30 m upstream of the CF bridge Craiova - Slatina (village Enosesti), 2 dams of absorbent material rolls (3 rolls x 10 m) at a distance of 5 m from each other;
- scattered absorbent material (4 bags x 20 kg / bag from SGA Olt and 5 bags x 10 kg / bag from SC CONPET SA Ploiesti).

On 19.02.2013, at 7:00, because of iridescences occurred on the Oltişor irrigation channel, absorbent material was scattered over a length of about 350 m, by the SGA Olt.

Were collected two water samples, one at 1 m downstream from the pipe, one at 1 m downstream of the bridge CF Craiova - Slatina (village Enosesti), on 18.02.2013 and three water samples on the day of 19.02.2013, two on the Oltişor irrigation channel and 1 m downstream from the pipe. According to test reports carried out by the SGA Olt laboratory was found that the value determined for pollutants (oil product) is less than the LOQ (limit of quantification of the method) respectively 10 mg / l.

On 13.04.2013, at 15:11, there were recorded high levels of fluoride in the water of the Milcov stream (12.05 mg / l) which led to the presence on the water surface of several fish of rudd and carp, with dimensions of 10-15 cm, in an amount of about 2-3 kg.

The place where the pollution episode was recorded: CHE Slătioara dam, Olt river left bank, CF bridge, Olt County, the pollutant was unidentified.

SGA Olt took water samples from:

- Milcov stream - the CFR bridge area and industrial facilities which discharge processed waters in Urlătoarea Valley;

- SC ALRO SA, SC ELECTROCARBON SA. DSVSA Olt took water and fish samples on 13.04.2013 in the Milcov stream channel. Test reports issued by SGA Olt - Slatina Water Quality Laboratory - revealed no exceedances of the maximum admissible concentration for the analysed indicators, including fluoride.

The high values recorded for nitrite and ammonium indicators may be due to nitrogen fertilizers, human or animal waste.

On 13.10.2013 / 09: 50, on the Danube River, between Km 625 + 000 - Km 624 + 000 there was recorded an event due to accidental pollution, its cause being the existing substance on the surface of the river. It comes most likely from bilge water discharge from ships transiting this area of the river. The existence of a transparent oil film on the water surface, of light colour, with bluish reflections, is transported downstream of the Danube River, at a flow rate of about 4-5km / h.

The polluter remained unidentified, the pollutant substance consisting of bilge water (condensation water, infiltration, etc. bilge ships) that contained oil. The Danube River was negatively affected between km.fl.635 - km.fl.624.

As of 10.12.2013, 18:00 and ending on the date of 13.10.2013, 9:20, on this sector of the Danube no ships passed through. Also, from 9:20 until 11:50, on this sector of the Danube passed 4 vessels whose identity could not be determined by the Ship Border Police workers due to weather conditions. The Ship Port Captaincy representative says that ships traveling on the Danube on the corresponding port are not registered with the "Captaincy". For these reasons could not be identified the ship that unloaded bilge waters in the Danube River, for which no sanctions were applied.

To assess the impact of the pollution on the water quality of the Danube River, the Olt Water Management System took 4 samples from these points, between Corabia Port, km 629 (left bank of the Danube, downstream of Corabia town, at km 628, corresponding to the Danube waterway, at km 624 and on the left bank of the Danube in Gârcov village, km 619.

According to test reports issued by the River Water Basin Administration, petroleum hydrocarbon indicator value was below the method quantification limit.

In 2013, on the **ARBDD territory were recorded no major pollutions**. Instead, there were **5 accidental pollutions**

Thus, there were recorded accidental pollutions by oil products.

On 12.01.2013, between 12 -17.30, in the Sulina arm area, close to Crisan locality, occurred an oily waste pollution from ships. The quantity discharged is unknown, and the polluter is SC Reinhold Meister Wasserbau GmbH. It was imposed a fine pursuant to the Water Act No. 107/1996 as amended art.87paragraph 24, in the amount of 40,000 lei.

On 28.08.2013, at around 6.45, on the maritime Danube mm 47.5 - Mm 48, were recorded oily wastes from ships. The quantity discharged and the polluter are unknown.

The phenomenon manifested by an accidental discharge of oily wastes in the form of a thin, discontinuous, grey - white film, with blue iridescences in places, having a length of about 800-1000 m and width max. 100m. The film was monitored, and dispersed without the need for intervention with absorbent material. At 14.40 all iridescences were gone.

There were applied no sanctions, the polluter is unknown.

On 12.09.2013, at 17, on Corbu Beach, Constanta County, was discovered a certain pollutant type, possibly heavy oil product that had the shape of small, black cakes, 1-2mm thickness, size 1 -2 cm to about 10 cm mixed with sand and shells found at approximately 1-2 meters of the current limit of the beach water, the polluter is not identified.

The environmental factors affected were the Black Sea and the beach.

There were applied no sanctions, the polluter is unknown.

The administrator of the area was notified to clean the beach area.

On 09.10.2013, at 17 pm, on Channel Ring Dunavăţul de Jos, Tulcea county, were recorded diesel oil leaks from an overturned tractor, the polluter being the owner of the equipment, and the environmental factor affected was water.

Immediately after the incident, the spot was located using local materials, subsequently intervened with absorbent material and tractor was removed from the water tractor. The event was recorded by ARBDD representatives and the Border Police, who identified the driver of the tractor. GNM participated in the remediation operations.

The tractor driver was applied a sanction, issued by the ARBDD staff.

On 10.03.2013, on the Black Sea, Starostambulski arm of the Danube in Ukraine, there were recorded diesel and oil spills from the Nicolay Bauman ship, flag of Moldova, sunk in the Black Sea, in the area of the Starostambulski arm of the Danube in Ukraine.

The information regarding this oil pollution has been notified to Ukraine - 1888 m in length and 927 m width. The Romanian coastal zone monitoring was done by the Border Police. During 12.03-27.03.2013 no oil

patches were observed. Weather conditions did not allow the access of GNM representatives at sea, with the provided equipment. Romanian pilots did not notice patches of oil in the Romanian waters.

In **Suceava County** was recorded **1 accidental pollution**

On 25.04.2013, at 09.15, in Rădăuți Municipality, Suceava County, there was recorded a fault in a level sensor from the mixing tank of the treated waters, before discharge into the Suceava River, the polluter being S.C. EGGER Romania S.R.L. Therefore, due to failure of the level sensor from the homogenization tank, was discharged wastewater through the overflow installation in Suceava River, action that affected the water quality, which caused a fish mortality of about 0.5-1 kg.

The company was sanctioned with a fine of 25,000 lei.

The pollution was stopped by stopping the discharge of waste water into the Saha creek, around 10.00.

In **Teleorman County** was recorded **1 accidental pollution**

On 21.02.2013, at 09:00, in 26 Cosmesti Park, on the route of the crude oil transmission pipeline from the wells 2186 and 2135, towards the 26 Cosmesti Park was recorded a crack in the oil pumping pipe - possible attempted theft. It was assumed that the pollutant substance is an extraction fluid that affected the Sericu stream on an area of cca.500 sqm - iridescences and 3-4 sqm pasture - approx. 50 litres.

The polluter was OMV Petrom, pumping on the pipe was stopped, the pipe was welded on section of 5 cm, where it was cut, and on the stream were mounted 3 floating dams.

No sanctions were applied.

II. SOIL

The events that affected the soil quality during 2013 and that generated accidental pollutions of the environmental factor **SOIL** are described below, and are grouped by county:

In **Arges County** were recorded **5 accidental pollutions** caused by oil activities, as follows:

- Polluters – OMV Petrom SA; CONPET SA;
- Exact date and time of the pollution localization / occurrence period / place:

a. 25.02.2013, at 10^{27}/25.02.2013, at 09^{30}/ Cocu commune, Argeş County; (OMV Petrom);
b. 06.03.2013, at 18^{00}/06.03.2013, at 09^{00}/ Priboieni commune, Argeş County;(OMV Petrom);
c. 29.04.2013, at 11^{11}/29.04.2013, at 09^{00}/ Ştefan cel Mare commune, Argeş County;(OMV **Petrom);**
d. 17.05.2013, at 07^{15}/17.05.2013, at 06^{20}/ Bârla commune, Argeş County; (OMV Petrom);
e. 07.10.2013, at 16^{30}/07.10.2013, at 13^{00}/ Albota commune, Argeş County; (CONPET SA);

- Nature of pollution / s - the total amount of oil and salt water discharged (approximately 2122 l);
- Cause of pollution / s - crack pipe pumping oil; makeshift facility to steal oil from pipeline (SC Compet SA) is affecting a total area of 950 square meters of agricultural land;
- Measures - stop pumping, pipeline remediation / s and spreading of absorbent material to collect oil product clean absorbent material and affected soil decontamination and bringing the land to its original condition;
- Sanctions - three sanctions / fines totalling 152,000 lei, applied to OMV Petrom SA, of which 2 sanctions were applied in accordance with the provisions of GEO no.195 / 2005 on environmental protection (100,000 lei, 50,000 lei) and a sanction under Land Fund Law no.18 / 1991 (2,000 lei).

In **Bacău County** were recorded **2 accidental pollutions**

On 16.10.2013, at 11, in Urecheşti commune, Bacau county, there was recorded a crash at the 20 inch pipeline for crude oil transmission towards RAFO SA Onesti, on the Onesti - Mărtineşti – Bărăgan route. As a result of the cracking of the pipe in 4 points, 35 cm of oil spilled on the ground, the polluter being CONPET SA Ploiesti.

The environmental factor affected was the soil, on an area of 1450 square meters, bringing damage also to the dwellings, but without human casualties;

The phenomenon manifested by a pipeline explosion in 4 points due to the emptying works, with a 35 cm crude oil discharge on the soil.

A fine of 50,000 lei was applied for the violation of GEO 195/2005, as amended, art. 96, paragraph 3, point 1.

CONPET SA intervention teams cleaned up the polluted area.

On 11.11.2013, at 12:25, was recorded another episode of pollution in the Taşbuga – Moineşti area, 200 meters downstream of the Park 3 Taşbuga, Bacau County.

The pollution cause was a fire of dry vegetation that affected the thermoflex pipe with a diameter of 4 inches through which crude oil was pumped, and resulted in a spill of 100 litres of crude oil on the ground.

The polluter identified was SC CIS GAZ SA. The company was sanctioned with a fine of 50,000 lei for violation of GEO 195/2005, as amended, art. 96, paragraph 1, pt. 3.

The employees of the polluter isolated the pipeline, extinguished the fire and collected the spilled oil up to 16:30 hours.

A sanction was applied also by the ISUJ Bacau for smoking in illegal places (because of the fire).

In **Brăila County** were recorded **17 accidental pollutions**

On 10.04.2013, at 15.00, approx. 500 m from the boundary with the Ialomita county, on the left side of the running direction in the Bărăganu – Ţăndărei area, was recorded a crude oil pollution due to the moving of the current quantity of crude oil in the old pipe located in the Bărăganu area towards Ţăndărei area; the amount of spilled oil was of 900 litres and the identified polluter was Conpet SA Ploiesti. The soil was affected on an area of 300 square meters;

Measures taken:

- digging of a landfill to collect the amount of crude oil spilled;
- formation of a barrage of petro-absorbent product;
- collecting, loading and transporting of the crude oil with the auto-cesspool at the Bărăganu work site Calarasi County;
- filling the crack by applying a welded metal patch.

No sanctions were applied.

On 12.04.2013, at 8.00, was recorded a crude oil pollution due to the moving of the current quantity of crude oil in the old pipe located in the Bărăganu area towards Ţăndărei area; advanced corrosion of the pipeline due to both excess moisture and the fact that it has not been exploited in the past 5 years; the quantity of oil spilled was 700 litres and was recorded in the Bărăganu locality area, approx. 1.5 km from DN 21 A, the pollutes was identified as being SC CONPET SA.

The environmental factor affected was the soil, originally on an area of 200 square meters, then expanded to 20,000 square meters.

Measures taken:

- were executed works to reduce pollution by installing absorbent dams;
- spreading petro-absorbante products;
- collecting, loading and transporting of the crude oil with the auto-cesspool at the Bărăganu work site Calarasi County;
- a sanction was applied in the amount of 50,000 lei in accordance with art. 96, paragraph 3, pt. 9 of GEO 195 of 2005, as amended, for breach of art. 94 ali.1, letter g.

On 17.04.2013, at 15.00 was recorded on Bărăganu - T 7 pasture, at approx. 600 m from DN 21 A an advanced corrosion of the pipeline; the expected mixture of water and oil was about 10 tonnes, the polluter was SC CONPET SA Ploiesti.

The environmental factor affected was the soil on an area of 1600 square meters;

Measures taken:

- on the affected land were dug 6 drainage holes to collect the leaked oil from the pipeline;
- petro-absorbent product was applied;

No sanctions were applied.

On 16.05.2013, at 7.10, in the Perişoru village started the oil transfer operation from 20" pipe in the 6" pipe, which leads to Cireşu ramp; the amount of oil spilled was of 400 litres, the polluter was SC CONPET SA Ploiesti and the environmental factor affected was the soil on an area of 35 sqm.

Measures taken:

- scraping the soil in the affected area;
- mechanical application with a clamp of a patch over the active pore;
- emptying the oil and transportation of said quantity to the Cireşu ramp.

No sanctions were applied.

On 16.05.2013, at 8.50, in Zavoaia locality, at approx. 150m from the pipe crossing over the Insuratei irrigation channel, was found an advanced corrosion of the crude oil transmission pipeline; the discharged amount was of 600 litres, the polluter was SC CONPET SA Ploiesti and the soil was affected in an area of 140 sqm.

Measures taken:

- scraping the soil in the affected area;

- mechanical application with a clamp of a patch over the active pore;;
- emptying the oil and transportation of said quantity to the Cireşu ramp;

No sanctions were applied.

On 25.06.2013, at 9.00 in Perişoru village, about 300 meters from the village road Perişoru -Tărlele Filiu in the communal pasture area, , was recorded a pollution caused by the cracking of a pipeline carrying crude oil from Oprisenesti storage to the Cireşu ramp, due to its corrosion. At the bottom of the pipe, with a diameter of approx. 1mm, the amount of spilled oil was of 400 litres, the polluter was SC CONPET SA Ploiesti and the environmental factor affected was the soil (communal pasture), approx. 120mp.

Measures taken:

- spreading petro-absorbent product on the soil;
- application by welding of a metal piece in the affected area;
- execution of landfills for oil collection;
- oil discharge and transport to the Cireşu ramp;
- handing the polluted soil to a qualified greening company;

No sanctions were applied.

On 06.08.2013, at 8.40, outside Grădiştea locality, towards Ibrianu locality, about 400 meters from the urban limit of Grădiştea locality, was recorded a pollution case, caused by the recovery of the crude oil dowry existing in the 20 " pipeline Bărăganu - Onesti; the amount of oil spilled was of 200 litres, the polluter was SC CONPET SA Ploiesti and the environmental factor affected was soil - cca.100mp.

Actions taken:

- execution of a landfill for oil collection;
- leaked oil collection and suction in the tank of the sewage truck - type;
- filling the identified pores;
- transport of the crude oil recovered to the Cireşu ramp;
- loading the polluted soil and its treatment, actions carried out by SC ENVIROTECH SRL Constanta in accordance with the signed agreement.

No sanctions were applied.

On 22.08.2013, at 9.00, on the Bărăganu – Onesti section, at the exit from Grădiştea locality, towards the Ibrianu locality, about 400 meters from the urban limit of Grădiştea locality was recorded a pollution caused by the advanced corrosion of the pipeline during the displacement process of the oil dowry existing in pipeline 20" Bărăganu-Onesti to be delivered to the crude oil loading ramp Cireşu; the amount of crude oil recovered was of 250 mc, the polluter was SC CONPET SA Ploiesti and the environmental factor affected was the soil - cca.450 sqm.

Measures Taken:

- closing the sectioning valves upstream and downstream from the damage;
- execution of a landfill for oil collection;
- leaked oil collection and suction in the tank of the sewage truck - type;
- transport of recovered crude oil to the Cireşu ramp;
- scraping of the polluted soil;
- lifting the polluted soil and its treatment, actions carried out by SC ENVIROTECH SRL Constanta in accordance with the signed agreement.;
- repairing the pipe.

No sanctions were applied.

On 03.09.2013, at 19:00, in the vicinity of CF Ianca-Faur, on an agricultural land belonging to SC RADIALL SERVICE SRL, was recorded the perforation of the pipe at the bottom. The soil was affected by the appearance of a crude oil stain on a surface of approx. 40sqm, agricultural land, the polluter was SC CONPET SA Ploiesti.

Measures Taken:

- closing the valves;
- application of a metallic patch;
- leaked oil collection and suction in the tank of the sewage truck - type;
- transport of recovered crude oil to the Cireşu ramp;
- scraping of the polluted soil;
- lifting the polluted soil and its treatment, actions carried out by SC ENVIROTECH SRL Constanta in accordance with the signed agreement;

A sanction was applied of 1000 lei in accordance with art. 113, letter b and according to the Land Fund Law no. 18/1991 as amended, in violation of art. 111, letter h.

On 05.09.2013, at 10.15, about 200 m from the railway Ianca-Făurei, on the land owned by Mr. Predesel Marin, was recorded a pollution event on the 20" Bărăganu-Onesti pipeline.

The pollution was caused by the perforation of the bottom of the pipe, the polluter identified was SC CONPET SA Ploiesti and the environmental factor affected was the soil by the appearance of a crude oil stain on a surface of approx. 50sqm, agricultural land.

Measures Taken:

- execution of a landfill for oil collection;

- isolation by closing the sectioning valves at CF Ianca and UM Ianca;
- mechanical application of a metallic patch;
- contacting SC Envirotech SRL, to carry out decontamination works;
- notifying the owner in order to establish the compensation procedure and reinstatement in the agricultural circuit;

No sanctions were applied.

On 05.09.2013, at 10.15, on the land owned by Mr. Burlacu Nicolae, was recorded a pollution event on the 20" Bărăganu-Onesti pipeline, about 50 m from the undercrossing of Ianca-Făurei railway. The pollution was caused by the perforation of the bottom of the pipe, the amount recovered - 200 l of oil, the polluter was SC CONPET SA Ploiesti. The soil was affected by the appearance of a crude oil stain on a surface of approx. 10 sqm of agricultural land;

Measures Taken:

- execution of a landfill for oil collection;
- isolation by closing the sectioning valves at CF Ianca and UM Ianca;
- application of a welded metal patch;
- contacting SC Envirotech SRL, to carry out decontamination works;
- notifying the owner in order to establish the compensation procedure and reinstatement in the agricultural circuit.

No sanctions were applied.

On 15.10.2013, at 10.15, was recorded a pollution episode on the 20" Bărăganu-Onesti pipeline, outside the city limits of Zavoaia locality, at about 2 km from the main irrigation channel towards Tataru forest.

The pollution was caused by the existence on the 20" Bărăganu-Onesti pipeline, of a not welded improvised installation, that was displaced by the go-devil. The amount of crude oil spilled was of 150 litres, the polluter was SC CONPET SA Ploiesti and the affected area was about 200m^2 of agricultural land.

Measures Taken:

- execution of a landfill for oil collection;
- filling with wooden plug and applying a metallic patch;
- collection and transport of the crude oil quantity by cesspool, at the Bărăganu worksite drains;
- spreading petro-absorbent product on the affected area;
- contacting SC Envirotech SRL, to carry out decontamination works;

No sanctions were applied.

On 27.10.2013, at 9.30, was recorded a pollution event on the route of the 20" Bărăganu-Onesti oil pipeline, Ibrianu area, Braila County, the cause was the corrosion of the oil pipeline. The polluter was SC CONPET SA Ploiesti and the environmental factor affected was the soil on an area of approx. 30sqm, land planted with grape-vine.

Measures taken:

- execution of a landfill for oil collection;
- the pore was filled by installing a patch and a hinge;
- contacting SC Envirotech SRL, to carry out decontamination works;
- notifying the owner, Mr. Rosioru Chirita, in order to establish the compensation procedure and reinstatement in the agricultural circuit;

No sanctions were applied.

On 28.10.2013, at 12.50 pm, was recorded another pollution event on the route of the 20" Bărăganu-Onesti oil pipeline, Ibrianu area. The pollution was caused by the excavation carried out in order to check the status of the oil transmission pipeline, due to the pollution dated 27.10.2013, which revealed the existence of a pore. The amount of spilled oil was of 150 litres, on the soil appeared a spot of oil on a surface of approx. 15sqm, agricultural land, and the polluter was SC CONPET SA Ploiesti.

Measures Taken:

- execution of a landfill for oil collection;
- mechanical application with a clamp of a metallic patch;
- contacting SC Envirotech SRL, to carry out decontamination works;
- notifying the owner, Mr. Tanase Fanel, in order to establish the compensation procedure and reinstatement in the agricultural circuit.

A sanction was applied of 1000 lei in accordance with art. 113, letter b and according to the Fund Land Law no. 18/1991 as amended, in violation of art. 111, letter h.

On 30.10.2013, at 11.40, on the route of the 20" Bărăganu-Onesti oil pipeline, outside the city limits of Ianca locality, at approx.220 m from the Ianca-Făurei railway, was identified a cracking due to the corrosion of the pipe between the pumping stations Bărăganu-Mărtinești, during the discharge process of crude oil, the spilled quantity being 400 litres and the polluter was SC CONPET SA Ploiesti. The soil was affected by the appearance of a crude oil spot on a surface of approx. 32mp, agricultural land.

Measures Taken:

- execution of a landfill for oil collection to collect the amount of 400l oil that was transported with the cesspool to the Cireşu ramp;
- was applied a welded metal patch;
- contacting SC Envirotech SRL, to carry out decontamination works;

A sanction was applied of 1000 lei in accordance with art. 113, letter b and according to the Fund Land Law no. 18/1991 as amended, in violation of art. 111, letter h.

On 11.11.2013, at 11.35, on the route of the 20" Bărăganu-Onesti oil pipeline, outside the city limits of Ianca locality, at approx.300 m away from the undercrossing road UM Ianca was recorded a quantity of 150 litres of oil, the polluter was SC CONPET SA Ploiesti . The environmental factor affected was: soil, on an area of approx. 20 sqm of pasture, belonging to Ianca UAT.

Measures Taken:

- execution of a landfill for oil collection;
- the pipe was stripped on a surface of approx. 20 sqm, where there were found two corrosions;
- filling with a wooden plug and applying a metallic patch;
- contacting SC Envirotech SRL, to carry out decontamination works;

A sanction was applied of 1000 lei in accordance with art. 113, letter b and according to the Fund Land Law no. 18/1991 as amended, in violation of art. 111, letter h.

On 22.12.2013, at 9.00, on the route of the Oprisenesti-Cireşu pipeline, approx. 5km from Oprisenesti was recorded a pollution caused by the cracking of the pipeline carrying crude oil on the route of 6 "+ 8" Oprisenesti-Cireşu pipeline, Perişoru - Tărlele Filiu area.

The amount of oil leaked was of 500 litres, the polluter was SC CONPET SA Ploiesti and the environmental factor affected was the soil on an area of approx. 9 square meters.

Measures Taken:

- scraping of the polluted soil;
- applying of a metal hinge;
- collection of oil and water quantity;
- spreading of petro-absorbent product;

No sanctions were applied.

In **Buzău County** were recorded **5 accidental pollutions**

On 25.05.2013, stored waste of animal origin in the commune Poşta Câlnău, near a farm, being affected the environmental factors soil and air due to the unpleasant smell.

The company was sanctioned for unauthorized disposal of animal waste on site, has been imposed the urgent cleaning of the affected area and taking of necessary measures to avoid discomfort in residential areas related to the farm, on the Poşta Câlnău commune area.

On 06.08.2013, the main pipeline for crude oil transmission Bărăganu-Onesti, belonging to SC CONPET SA Ploiesti, presented a failure caused by an improvised installation for stealing oil product from the pipeline. This crosses an agricultural road located at the boundary between Vâlcelele commune and Balta-Albă commune, Buzau County, being affected discontinuously, over an area of about 20 square meters of non-agricultural land.

A sanction was applied and the company was imposed to take measures in fixing the problems and cleaning the affected area.

On 17.08.2013, the main pipeline for crude oil transmission Bărăganu-Onesti, belonging to SC CONPET SA Ploiesti, cracked due to corrosion, on a cornfield belonging to the " October 1 Agricultural Association" Nicoleşti, on the area of Puiesti commune, Buzau County . Was affected, discontinuously, an area of about 1000 square meters of agricultural land.

A sanction was applied and the company was imposed to take measures in fixing the problems and cleaning the affected area.

On 20.08.2013, the main pipeline for crude oil transmission Bărăganu-Onesti, belonging to SC CONPET SA Ploiesti, presented a failure caused by an improvised installation for stealing oil product from the pipeline, on the agricultural land side (uncultivated land) located at the boundary between Vâlcelele commune and Balta-Albă commune, Buzau County. Was affected, discontinuously, an area of approx. 40 sqm uncultivated land.

A sanction was applied and the company was imposed to take urgent measures in fixing the problems and cleaning the affected area.

On 04.11.2013 there was a traffic accident on DN 2 B km 7, in the running direction Buzau-Braila, which led to the overthrow of a tank that belonged to SC ROMSTYL SRL Targoviste. The tank was transporting about 30306 litres of diesel fuel, divided into 6 pools. Following the traffic accident, there were leaked about 1,500 litres of diesel fuel from 4 compartments (1,2,5, and 6) through the inlet lids, spilling directly on the green area on the right side of the national road. There was affected an area of about 20 square meters.

Measures were taken to reduce the affected surface by creating sand cords and after placing the tank on wheels, to carry the diesel fuel in the intervention tank, belonging to the company and to intervene in order to eliminate the fuel leakage.

Following verification carried out by Commissioners on site, on 11.11.2013, it was found that the affected area was rehabilitated by scraping the entire affected area by replacing the soil.

The company was sanctioned for destroying green areas by oil pollution;

In **Caraş-Severin County** was recorded **1 accidental pollution**

On 01.08.2013, at 08.00, the Semenic Inspectorate for Emergency Situations of Caras-Severin County announced that in the National Park Domogled-Valea-Cernei, Caras-Severin County in UP VI Domogled ua 108, 109, 107, 113, 114, 119, 121, 122 burst a large-scale fire.

The fire was produced by litter, canopy with development direction north-south. The trigger and expansion area was the full protection area, mountain area, difficult to reach.

The cause was the open fire from a lightning strike.

The affected area was about 100 ha and is represented as follows: 25 ha Banat black pine plantation during 2006-2007; 75 ha dispersed pine, trees and existing flora specific to the area. The value of the damages was assessed by the Caras-Severin Forestry Department at 221 337 lei, and the value of the saved goods at 747.528 lei. Several measures were established for monitoring and firefighting and written notice sent to the Scientific Council of the Park and seeking agreement for the carrying out, where appropriate, of interventions in the park by creating protective strips.

As a result, on 05.08.2013 was issued the Scientific Council Decision No.7 / 05.08.2013, through which was agreed to extinguish the fire in the entire protection area of the park and to create protective strips by cutting down trees in some areas, where appropriate. The opinion has been sent to the General Inspectorate for Emergency Situations by notification no. 78 / 08.05.2013.

A fine was given of 25,000 lei to the PNDVC Administration, by GEO no. 195/2005, art. 96,. 1 pt. 1.

In **Constanţa County** were recorded **24 accidental pollutions**

On 11.01.2013, at 18.20, in the Saligny Railway Station area, were recorded diesel fuel spills at the central valve of a wagon.

The cause of pollution was the formation of an ice plug within the valve, the pollutant being the diesel fuel. The polluter was SC Grup Feroviar Român SA. The environmental factor affected was the soil by diesel fuel leakage on the railway embankment, over an area of 8.7 sqm.

A sanction was applied according to GEO 195/2005 article 96, paragraph 3, point 1 and decontamination measures were required to be taken in the affected area, within a deadline.

On 02.03.2013, at 15:30, on Aurel Vlaicu Boulevard, under the bridge, on a distance of 4-5 km, was recorded an accidental pollution whose cause was a pore on the surface of the fuel oil pipeline 1, between SC Oil Terminal SP North and SP Port, as a result of pumping oil product through the pipe and then blowing it.

The polluter was SC Oil Terminal SA and the pollutant was fuel oil. The environmental factor affected was the soil on an area of approx. 1-1,5mp.

On 22.03.2013, at 14.30, a fire burst out at some unorganized waste deposits, mostly manure.

Was recorded a pollution in the auto service Bavaria Motors area, on the left side of the road from Constanta to Ovidiu.

The cause of the fire was unknown, the main environmental factor affected, in addition to air, was the soil, being affected on an area of approx. 500 sqm. The polluter was unknown.

On 13.04.2013, at 15.45, between the towns Mircea Voda and Saligny was recorded a crude oil leakage on farmland and pasture.

The pollution cause was the cracking of an oil pipeline during the assembly of a crafted installation.

The environmental factor affected was soil - farmland and pasture in an area of approx. 650 square meters and a distance of approx. 1km.

Conpet SA had to take remediation measures in the affected area.

On 05.06.2013, at 05.40 in Nisipari was recorded an oil product spray and leakage at the 46 milestone on the main crude oil transmission pipeline Constanta - Bărăganu.

The pollution cause was a possible criminal attack by perforating the pipe. The polluter was SC Conpet SA, the pollutant was crude oil.

The environmental factor affected was the soil on an area of approx. 6000mp – agricultural land. There were required remediation measures on the affected area.

On 15.06.2013, at 20:00, in Albeşti commune, Comana village, a fire burst out in the barley field.

The cause of the fire was a spark or ember and the polluter remained unknown.

The environmental factors affected: air and soil on an area of 100ha.

On 15.06.2013, at 20:00, in the town of Ovidiu, a fire affected the culture of barley, near the former ecological ramp, in the A 360 field.

The cause of the fire was a mechanical spark during harvest.

The polluter was unknown.

The environmental factors affected: air and soil on an area of 2800 square meters.

On 21.06.2013, at 21:00, at the intersection DN Constanta - Hârşova and DN Constanţa – Tulcea, near SC Avicola SA Lumina, was registered a fire that affected a stubble. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 5 ha.

On 22.06.2013, at 8:00 in Pestera locality, at approx. 3km from the bridge crossing the A2 motorway, was recorded a fire that affected a stubble. The pollution was recorded on the area of Pestera locality. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 10ha.

On 22.06.2013, at 13:00, in the Tannery Park Constanta, a fire burst out that affected an area of dry vegetation. Both the polluter and the cause of the fire were unknown. Environmental factors affected: air and soil on an area of 100sqm.

On 22.06.2013, at 17.30, in Medgidia, Dacilor Valley area, approx. 1km from the exit of the Medgidia locality was recorded a fire in a barley crop. The pollution was recorded on DJ 381 Medgidia - Dacilor Valley. The polluter was unknown. The cause of the fire - unknown. Environmental factors affected: air and soil on an area of 500sqm.

On 22.06.2013, at 20.30, on the road Constanta - Negru Voda, next to the road of Chirnogeni locality – a fire burst out in a wheat crop. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 700sqm.

On 24.06.2013, at 10.30, in Năvodari towards the Peninsula, across from the Romsilva nursery was recorded a fire in a wheat crop. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 1ha.

On 24.06.2013, at 14.30, in Cerchezu, out of Olteni village, a fire was registered in the wheat stubble. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 30ha.

On 26.06.2013, at 21:00, between Lazu locality and DN 39, a fire burst out in the stubble. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 500sqm.

On 26.06.2014, at 21:00, in the Lazu locality, approx. 2km out in the field towards Cumpăna commune was recorded a fire in the stubble. Both the polluter and the cause of the fire were unknown.

Environmental factors affected: air and soil on an area of 5 ha.

On 30.06.2013, at 5.00, was recorded an accidental pollution at 1km South of Nisipari locality. The cause of the pollution was a crack in the crude oil transmission pipeline.

The polluter was SC Conpet SA, the pollutant was crude oil. The duration of pollution was of 2-3 hours. There were spilled approx. 200 litres oil. The environmental factor affected was the soil on an area of approx.100mp – agricultural land. There were required remediation measures in the affected area.

On 03.07.2013, at 9.00, on Farului Street, in Tuzla, a fire burst out on a stubble and a wheat crop. The cause of the fire – ember or spark.

Environmental factors affected: air and soil on an area of 70sqm of which 30sqm of stubble and 40sqm of wheat crop.

On 08.07.2013, at 20.40, in Poarta Albă, was recorded a discharge on the traffic road and soil of a quantity of hazardous waste - oil sludge.

The cause of the pollution was a car accident in which it was involved a means of transport belonging to SC Oil Depol SRL.

The polluters were SC Oil Depol SRL, the pollutant being waste oil - sludge.

The environmental factor affected was the soil on a 100m length.

On 09.07.2013, at 15.30, between the towns Mircea Voda and Saligny was recorded a crude oil pollution.

The cause of the pollution was a criminal attack on the 20-inch crude oil pipeline Constanta-Bărăganu between 83-84 milestones in Nemtilor Valley.

The polluter was SC Conpet SA and the evironment factor affected was the soil - approx.10mp of agricultural land.

On 10.07.2013, at 18.22, in Traian's Valley locality, was registered a fire that affected a wheat crop.

The cause of the fire - mechanical ignition from an agricultural machine.

Environmental factors affected: air and soil on an area of 30 ha wheat crop of which 25 ha 1017 physical block and 5ha and 1009 physical block.

On 11.07.2013, at 9:30, out of Ovidiu town towards Mihail Kogălniceanu commune a fire burst out in the stubble.

The environmental factors affected were air and soil on an area of 1ha.

On 08.04.2013, at 22:00, in Tuzla, a fire was registered on the wheat stubble.

The environmental factors affected were air and soil on an area of 2ha of wheat stubble.

On 04.08.2013, at 20:00, in Negru Voda, a fire burst out on the wheat stubble.

The environmental factors affected were air and soil on an area of 56ha of wheat stubble.

On 04.08.2013,, at 20.30, in Negru Voda, a fire was recorded on a wheat stubble.

The environmental factors affected were air and soil on an area of 4ha of wheat stubble.

On 31.08.2013, at 11:45, in Poarta Alba locality was found a spot of oil.

The pollution occurred around the main oil transmission pipeline Constance-Bărăganu operated by SC Conpet SA, milestone 41. The event was announced by SC Conpet SA.

The causes of pollution were corrosion of the pipe at the top in a portion of approx. 5 mm. The polluter was SC Conpet SA. The pollutant was crude oil. The environmental factor affected was the soil on an area of 15 sqm.

On 17.09.2013, at 16:00, on the Danube-Black Sea Canal, on the right bank, at km 7 + 200, was recorded a polluted area with oil product - sludge mixed with waste oil cloths.

The pollution occurred in the warehouse area belonging to CN ACN SA, at 300 m CDMN right bank km 7 + 200.

The environmental factor affected was the soil on a surface of approx. 150 sqm. There were required remediation measures in the affected area.

In **Dâmboviţa County** were recorded **23 accidental pollutions**

In 2013, on the territory of Dâmboviţa County were recorded a total of 23 accidental pollutions as follows:

On 14.02.2013, at 08:00, there was an accidental pollution recorded in Cobia commune, Căpşuna village, Dâmboviţa County, due to the corrosion of an oil product transmission pipeline (crude oil) of 6 inches from Parc 4 Cobia to the Cobia Deposit, in an amount of approx. 150 l of crude oil by OMV Petrom - ASSET VI Muntenia Central.

The environmental factors affected were - soil and water, approx. 180 square meters of forest land and approx. 3250 m of water (Cobia stream).

Were performed analyses for the environmental factor soil, the results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied a sanction amounting to 40 000 lei, in accordance with GEO 195/2005, art. 96, paragraph 1, pt. 1.

The phenomenon was stopped by stopping the pumping, a hinge was mounted, there were executed oil product discharge works and were built 4 dams made of straw and absorbent materials on the Cobia creek, for the purpose of restoring the affected land.

On 06.03.2013, at 11:30, an accidental pollution was recorded in Crevedia commune, Cocani Village of Dâmboviţa County due to the corrosion of an oil product transmission pipeline (crude oil) of 20 inches. by S.C. Conpet S.A. Ploiesti, Constanta Regional Operations Directorate, Călăreţi Sector.

The environmental factor affected - soil, approx. 12 square meters of cultivated land with wheat in the unincorporated village of Cocani.

Were violated the provisions of Law 18/1991, art. 111, letter h - Land Fund Law and was applied a sanction amounting to 2000 lei, according to L 18/1991, Article 113, letter b.

The phenomenon was stopped by stopping the pumping, a welded metallic patch was applied and the area was decontaminated by an authorized company.

On 07.03.2013, at 11:30, there was an accidental pollution, located in Moreni locality, at about 60 m Dry Right Bank UnderCrossing Seaca creek, Dâmboviţa County due to an attempted theft of an oil product transmission pipeline (crude oil) Moreni - Ploiesti 6 inch., belonging to SC Conpet S.A. Ploieşti, Ploieşti Regional Operations Directorate, Moreni Sector.

Environmental factors affected - soil and water, approx. 120 m forest land and 700 m of the Seaca creek water.

Were performed analyses for the environmental factor soil, results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and warning sanctions were applied, according to GEO 195/2005, art. 96, para 1 pt. 1 and GO 2/2001, on misdemeanours.

The phenomenon was stopped by stopping the pumping, a welded metallic patch was applied, were carried out oil product discharge works, two dams were installed downstream made of absorbent material and the area was decontaminated by an authorized company.

On 15.03.2013, at 12:30, was recorded an accidental pollution in Gura Ocniţei commune, on the communal road, upstream of the City Hall, due to corrosion of an oil product transmission pipeline (crude oil and formation water) of 4 inch from the Dealu Batran-Parc 40 RA Satellite , in an amount of approx. 800 l oil product, by OMV Petrom - ASSET VI Muntenia Central.

The environmental factor affected - soil, approx. 180 sqm of soil – ditch, communal road Gura Ocniţei.

Were violated the provisions of the Law 18/1991, art. 111, lit. h - Land Law and applied sanction amounting to 2000 lei, conf. L 18/1991, Article 113, lit.b.

The phenomenon was stopped by stopping the pumping, a hinge was mounted, there were executed oil product discharge works and were built 2 dams made of straw and absorbent materials on the ditch.

The pumping line was cut over a length of 100m.

On 05.04.2013, at 07:30, was recorded an accidental pollution located in Valea Mare commune, Valea Caselor locality, due to flushing a disused section of the pumping pipeline Parc 17 Srambu - Saru Deposit, in the amount of about 50 l oil product belonging to OMV Petrom - ASSET VI Muntenia Central.

The environmental factor affected - soil / meadow, approx. 500 sqm.

Were performed analyses for the environmental factor soil NPA Dâmboviţa, the results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of the Law 18/1991, art. 111, letter h - Land Fund Law and was applied a sanction amounting to 2000 lei, according to L 18/1991, Article 113, letter b.

The phenomenon was stopped, were applied absorption materials and the area was decontaminated by an authorized company.

On 08.04.2013, at 19:00, was recorded an accidental pollution located in the municipality of Moreni, rainwater drainage ditch, DJ Moreni - Caragiale, due to the corrosion of the oil product transmission pipeline (crude oil and formation water) of 6 inch from Park 34 Filipeşti South Deposit 3 Moreni, in an amount of approx. 22 l oil product belonging to OMV Petrom - ASSET VI Muntenia Central.

The environmental factor affected - soil, approx. 10 square meters rainwater drain trench, DJ Moreni-Caragiale.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied a sanction amounting to 30 000 lei, according to GEO 195/2005, art. 96, paragraph 1, pt. 1.

This phenomenon was stopped by recovering the spilled oil with a cesspool, and by transporting the polluted material to the I.L.Caragiale Bioremediation Station. The pumping line was cut over a length of 20m.

On 01.08.2013, at 1:15, was recorded an accidental pollution located in Gura Ocniţei commune, about 500 m from Park 143 Gura Ocniţei due to corrosion of an oil product transmission pipeline (oil and formation water) of 5¾ inches from the Park 27-Park 143 Unirea, in the amount of about 900 liters oil product, by OMV Petrom - ASSET VI Muntenia Central.

The environmental factor affected - soil, approx. 150 sqm of soil - rainwater trench DJ Targoviste - Ocniţa.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied sanction amounting to 25 000 lei, according to GEO 195/2005, art. 96, paragraph 1, pt. 1.

This phenomenon was stopped, a hinge was mounted, were carried out oil product discharge works, were dug two position pits for retaining the oil product, were applied absorbent materials on the affected area - DJ Targoviste – Ocniţa, actions were taken to recover the oil product and to clean the DJ Targoviste – Ocniţa area.

On 07.08.2013, at 12:30, there was accidental pollution located in Com. Bucşani, about 1.5 Km N Park Bucşani treatment, due to the emergence of a pore in the welded oil product transmission pipeline (crude) of 5¾ inches. SC CONPET SA Ploiesti Regional BUCHAREST, sector Moreni operation.

The environmental factor affected - soil, approx. 250 sqm ground - private property corn crop com. Bucşani.

Were violated GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and apply sanctions warning, according to GEO 195/2005, art. 96, para 1, pt. 1 and Go 2/2001 on misdemeanours.

This phenomenon was stopped, the pumping was stopped.

On 06.09.2013, at 10:00, was recorded an accidental pollution located in Cobia commune, about 700 m downstream of the Park 4 Cobia, due to corrosion (burst at the exploitation column) at the 2873 Cobia well.

The environmental factor affected - soil, approx. 150 sqm of forestry (spontaneous vegetation), 700 m downstream of the Cobia riverbed (dried up riverbed) and approx.900 of reservoir water.

Were performed analyses for the environmental factor soil, results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of Law 18/1991, art. 111, lit. h - Land Fund Law and was applied a sanction amounting to 2000 lei, according to L 18/1991, Article 113, letter b.

The well was isolated and closed, were dug position pits to recover the reservoir water through discharge, the affected land was greened and were performed soil analyses.

On 25.09.2013, at 6:30, was recorded an accidental pollution located in Gura Ocniţei commune, Deal area, road well, Dâmboviţa County, due to an attempted theft of the components of the pumping head of 64 SDR well belonging to OMV Petrom - ASSET VI Muntenia Central.

The environmental factor affected - soil, approx. 60 sqm land area around the well and pasture, about 200 litres of crude oil.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied a WARNING sanction, according to GEO 195/2005, art. 96, para 1 pt. 1 and GO 2/2001 on misdemeanours.

Were mounted the stolen items from the pump head, were applied absorbent materials to the affected area, actions were taken the recover the oil product and measures were taken to restore the affected land, the contaminated material was transported to the I.L. Caragiale Bioremediation Station.

On 25.09.2013, at 8:00, was recorded an accidental pollution in Moreni, Tuicari Sector, due to the corrosion of an oil product transportation pipeline of 6 inches - Teisa – Moreni, in the amount of approx. 100 l oil by C CONPET SA PLOIEŞTI, PLOIEŞTI Regional, Moreni operation sector.

The environmental factor affected - soil, approx. 70 sqm of well access road.

Were performed analyses for the environmental factor soil, results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied a sanction amounting to 30 000 lei, according to GEO 195/2005, art. 96, paragraph 1, pt. 1.

The section of pipe was isolated by closing the sectioning valves, to fix the damage was applied a welded patch, were applied absorbent materials to the affected area, actions were taken to recover the oil product by a vacuum truck and the affected land was decontaminated.

On 27.09.2013, at 9:30, was recorded an accidental pollution in Nisipuri, at about 200 m upstream of the CF on DJ Nisipuri - Gura Ocniţei, due to corrosion of a crude oil transmission pipeline of 6 inches - Teisa – Moreni, in the amount of approx. 15 l oil by SC CONPET SA PLOIEŞTI, Ploieşti Regional, Moreni operation sector.

The environmental factor affected - soil, approx. 2 sqm of private farmland.

Were performed analyses for soil environmental factor, results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of Law 18/1991, art. 111, lit. h - Land Fund Law and was applied a sanction amounting to 2000 lei, according to L 18/1991, Article 113, letter b.

The section of pipe was isolated by closing the sectioning valves, to fix the damage was applied a welded patch, were applied absorbent materials to the affected area, the section of the pipe was replaced by undercrossing the DJ road and the land was decontaminated.

On 14.11.2013, at 10:10, was recorded an accidental pollution located in Bucşani commune, due to the corrosion of the crude oil transmission pipeline of 10¾ inches Bărbăteşti – Ploieşti, in an amount of approx. 500 l crude oil by SC CONPET SA PLOIEŞTI, Ploieşti Regional, Moreni operation sector.

The environmental factor affected - soil, approx. 60 sqm of private farmland.

Were performed analyses for the environmental factor soil, results falling below the alert threshold for sensitive types of use according to the MAPPM Order no.756 / 1997 approving the regulation on the assessment of environmental pollution.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied a WARNING sanction, according to GEO 195/2005, art. 96, para 1 pt. 1 and GO 2/2001 on misdemeanours.

The pumping was stopped, were closed the safety valves, to fix the damage the polluted area was decontaminated.

On 17.11.2013, at 15:00, was recorded an accidental pollution located in Cobia commune, due to the corrosion of the oil product (oil and formation water) transmission pipeline of 6 inches from the Park 4 Cobia - Cobia Oil Deposit, in the amount of approx. 800 l oil product, by OMV Petrom - ASSET VI Muntenia Central.

Environmental factors affected were water and soil, approx. 600 m rainwater collection trench (forestry land with spontaneous vegetation) and approx. 100m of the Cobia riverbed.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and was applied a WARNING sanction, according to GEO 195/2005, art. 96, para 1 pt. 1 and GO 2/2001 on misdemeanours.

The pumping was stopped, were closed the sectioning valves, were built two position pits to recover the crude and were also built three dams made of absorbent materials on the Cobia creek downstream, the affected area and the Cobia riverbed were remedied.

On 09.12.2013, at 13:00, was recorded an accidental pollution located in Glodeni commune, Livezi village, due to the interception of a gas layer in conjunction with crossing a fault during the drilling operation at well 650 Aninoasa.

There were formed 7 craters in the ground (30-40 cm in diameter) which led to the involvement of a natural fluid consisting of water and clay and sand, releasing approx.500Nmc of gas into the atmosphere and about 500 kg. of mixed fluid, affecting approx. 400 sqm of soil and the Slănic riverbed on a length of 1000 m by OMV Petrom - ASSET VI Muntenia Central.

Environmental factors affected were water, soil and air.

Were violated the provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter j and a sanction was applied, amounting to 50 000 lei, according to GEO 195/2005, art. 96, paragraph 1, pt. 1.

Were violated provisions of GEO 195/2005 as amended and supplemented, Article 94, paragraph 1, letter a and was applied a WARNING sanction, according to GEO 195/2005, art. 96, paragraph 2 pt. 1 and GO 2/2001 on misdemeanours.

The 650 Aninoasa well was placed in safety, the areas affected by leakage of sand and clay were remedied and were ended the drilling works carried out to commission the production at the 650 bis Aninoasa well.

On 10.12.2013, at 10:30, was recorded an accidental pollution located in Şelaru commune, due to the corrosion of the oil product transmission pipeline (oil and formation water) by 5½ inches from The Park 16 Glavacioc - Poieni 9 Deposit, in an amount of approx. 100 l oil product by OMV Petrom - ASSET V MOESIA NORD.

The environmental factor affected - soil, approx. 150 sqm of private agricultural land, planted with wheat.

The pumping stopped, the affected area was delimitated, were built to fluid catchment pits, the liquid was emptied, the failure was fixed by applying a hinge, the affected area was remedied.

In **Dolj County** were recorded **2 accidental pollutions**

On 07.04.2014, at 12:00, in Almaj commune, in the Veterinary Dispensary area, was recorded a crack in the crude oil pumping collector Brădeşti - Ghercești (Almaj area).

The pollutant was crude oil in an amount of 148 cubic meters, and the polluter is SC OMV PETROM SA, PRODUCTION AREA Oltenia II.

Environmental factors affected: soil, land area of 100 sqm, ALMĂJ commune, DOLJ County.

Causes: pipe corrosion, soil pollution with crude oil, pipe bushing, stripping contaminated soil, temporary storage at the Bioremediation Station TS Ţicleni, Gorj County, filling with clean soil.

Sanction according to GEO 195/2005, article / 96, para 3, letter 14, fine from 50,000 to 100,000 RON.

On 19.06.2014, at 09.15, in Almaj commune, was recorded a crack in the crude oil pumping collector Brădeşti - Ghercești (Almaj area).

Pollutant: crude oil and salt water, in the amount of cubic 91 cubic metres and the polluter was SC OMV PETROM SA, PRODUCTION AREA Oltenia II.

Environmental factors affected: soil, land area of 60 sqm, ALMĂJ commune, DOLJ County.

Causes: pipe corrosion, soil pollution with crude oil, pipe bushing, stripping contaminated soil, temporary storage at the Bioremediation Station TS Ţicleni, Gorj County, filling with clean soil.

Sanction according to GEO 195/2005, art / 96, para 3, letter 14, fine from 50,000 to 100,000 RON.

In **Gorj County** were recorded **3 accidental pollutions**

On 22.11.2013, at 0.30, SC PETROFAC SOLUTIONS AND FACILITIES SUPPORT SRL ROMANIA was communicated, through the permanent telephone the collector damage, a discharge that occurred after an eruption at the Balteni No.28 well, from Bâlteni sector.

Following the verifications done in the field was found that the eruption of the No.28 Bâlteni well, within the 6 Bâlteni sector, occurred at around 0.30, on 22.11.2013. From the discussions with representatives of OMV Petrom SA and SC PETROFAC SOLUTIONS AND FACILITIES SUPPORT SRL ROMANIA, resulted that this was an abandoned well since 1963. Was discharged a quantity of approx. 3000 l of well mud and water - some of it discharged in the Romanatu creek, unsteady stream flow creek, and part was discharged on the ground around the well, affecting an area of approx. 200 sqm, land whose legal situation is unknown at this time. In this regard business operators intervened by building two dams on the creek stream in order to stop the product spills and the spills were blocked at the end of the well column (probe shielding); the water and mud flow was redirected flow in the vicinity of the well.

SGA Gorj took three (3) samples of water downstream and upstream from the drainage point in the river.

There were also taken samples from the mixture spilled on the ground in order to carry out laboratory analyses. According to test reports issued by JIU -SGA Gorj NARW ABA there were recorded no exceedances of the limit values.

No sanctions were applied and SC PETROFAC SOLUTIONS AND FACILITIES SUPPORT SRL ROMANIA notified GNM Gorj County Council that all control measures imposed on 22.11.2013 were achieved.

On 27.06.2013, at 12:00, SC PETROFAC SOLUTIONS AND FACILITIES SUPPORT SRL ROMANIA reported damage at the crude oil pump connector that connects the Colibaşi and the Great Park Ţicleni sectors, in Tunşi area, which led to a crude oil-salt water mixture to be spilled on a private area of agricultural land of aprox.100mp cutivated with corn, near the CIOIANA watercourse.

In Tunşi area was found a crack in the collector pumping oil-salt water mixture (5 and 3/4 inch) from Park 1 Colibasi to Grand Park Ţicleni. The incident occurred due to the corrosion of the collector.

It has been estimated the leak of a quantity of 300 l crude oil + salt water mixture, being observed crude oil iridescences over a length of approx.400 m on the Cioiana watercourse and on about 100 sqm of soil.

In order to carry out laboratory analyses, were taken three (3) samples of water downstream from the crack and downstream from the last dam.

SC PETROFAC SOLUTIONS AND FACILITIES SUPPORT SRL ROMANIA took the following measures:

- Pumping was stopped at the Colibaşi sector;
- The collector was put in draining in the Great Park;
- Were made two pits to contain the oil-salt water mixture;
- On the creek were preventively built (due to the weather instability) 10 dams made of absorbent material and were scattered absorbent flakes and biodegradable absorbent materials;
- Was collected an amount of about 600 l oil-salt water mix salt and the water coming from precipitation in the cesspool and two plastic containers with a capacity of 1 mc, which shall be transported to the Central Park Ţicleni decanters;
- It was uncovered the contaminated soil surface, to transport it to the temporary storage platform Great Park Ţicleni;
- Was obtained the verbal consent of the affected arable land owners, and once the intervention is completed, depending on the total area affected, they are to be compensated according to the standard contracts.

According to test reports issued by JIU -SGA Gorj NARW ABA were recorded no exceedances of the limit values.

No sanctions were applied and SC PETROFAC SOLUTIONS AND FACILITIES SUPPORT SRL ROMANIA notified GNM Gorj County Council that all control measures imposed on 27.06.2013 were achieved.

In **Giurgiu County** was recorded **1 accidental pollution**, as follows:

On 16.03.2013, at 08.15, in the village of Sfântul Gheorghe, Crevedia Mare commune, Giurgiu County, because of the breakage of the main crude oil transmission pipeline Ø123 / 4" Cartojani-Ploiesti, were polluted by crude oil spill, approx.500 sqm of agricultural land (ccs 60mx8m), a farm road on a length of about 650 m and width ranging between 0.5 m and approx. 4 m, a portion of the crude oil reaching the rainwater capturing channel from the village of Sfântul Gheorghe, on a length of approx. 150 m.

The polluter was SC Conpet SA and the environmental factors affected were approx.500 sqm of agricultural land (ccs 60mx8m), a farm road on a length of about 650 m and width ranging between 0.5 m and approx. 4 m, a portion of the oil reaching the rainwater capturing channel from the village of Sfântul Gheorghe, on a length of approx. 150 m.

Crude oil pumping was stopped and were taken actions to limit the effects of pollution, the crude oil was recovered by arranging collection pits, followed by discharge of the crude oil (was discharged a volume of approx. 25 cubic meters) and was applied absorbent material in the areas affected (part of the rainwater channel and part of the affected land).

A sanction was applied in the amount of 50,000 lei, according to GEO 195/2005. article 96, paragraph 1, point 7.

The crack was remedied since the evening of 16.03.2013.

In **Hunedoara County** was recorded **1 accidental pollution**, as follows:

On 12.09.2013, at 12:15, at the entrance in Hunedoara County from Alba, in the adjacent parking area to DN7 at km 352 + 200 / Geoagiu city - Aurel Vlaicu village, there were found metal particles (possibly mercury) in the amount of grams, spread over an area of approx. 5 square meters.

The area was fenced and guarded by a crew from the Romanian Gendarmerie.

No sanctions were applied.

Representatives of SC PRO AIR CLEAN SA Timisoara carried out operations to mechanically remove the metal particles identified, the surface was treated with a mixture of absorbent algae, the waste was packed (including mercury metal particles) in a sealed plastic container and was labelled with the words "wastes containing mercury code: 06 04 04* " (the amount collected was estimated at approx. 100 grams of metallic mercury dispersed in approx. 10 litres of mixture of absorbent and water), the pack was handed in the custody of the Geoagiu city police, in order to be collected by SC PRO AIR CLEAN SA Timisoara, in the shortest time possible, in compliance with GD 1061/2008 and informing the authorities involved.

In **Ialomiţa County** were recorded **4 accidental pollutions**, as follows:

On 07.02.2013 was recorded an accidental pollution in the Grindu locality, Ialomita County, on an agricultural land, physical block 20, due to the corrosion of the reservoir water pumping pipeline from the Park 28 Bragareasa to Park 5 GrinduGrindu .

The polluter was MV PETROM –SECTOR 35 GRINDU and the environment factor affected was the soil.

A sanction was applied according to Law no. 18/1991, as amended, in the amount of 2,000 lei. A land remediation plan was drawn up, with deadlines negotiated with the landowner.

On 04.03.2013, was recorded an accidental pollution produced in the Gârbovi locality, Ialomita County, on the communal pasture, due to the corrosion of the crude oil transmission pipeline Grindu-Urziceni.

The polluter was SC CONPET SA Ploiesti, Urlaţi-Berca sector and the environment factor affected was the soil.

A sanction was applied according to the Law no.18 / 1991, as amended, in the amount of 2,000 lei.

On 12.04.2013, was recorded an accidental pollution produced outside the city limits of Ţăndărei, Ialomita County, on the communal pasture, due to the corrosion of the crude oil transmission pipeline Bărăganu Onesti-Urziceni.

The polluter was SC CONPET SA, Bărăganu Sector and the environment factor affected was the soil.

On 23.06.2013, was recorded an accidental pollution produced in the Grindu locality, Ialomita County, on an agricultural land, physical block 20, due to the corrosion of the reservoir water pumping pipeline from the Park 28 Bragareasa to Park 5 GrinduGrindu .

The polluter was MV PETROM –SECTOR 35 GRINDU and the environment factor affected was the soil.

A sanction was applied according to Law no. 18/1991, as amended, in the amount of 2,000 lei.

In **Ilfov County** were recorded **3 accidental pollutions**, as follows:

On 12.05.2013, at 11.20, on 07.06.2013, at 14.40 and 16.07.2013, at 14:50, in the nearby village Sitaru, Grădiştea commune, Afumaţi – Petrăchioaia and Dimieni, about 1.2 km from the highway A3, crude oil has been identified as a pollutant substance due to a failure (carrying out underground fibre cable laying works), the polluter was CONPET.

The environmental factor affected was soil on a surface of about 1 sqm, 25 sqm and 30 sqm.

Measures taken:

- Delimitation of the affected area to avoid pollution expansion; putting the pipe in draining; closing the valves for insulation; special intervention team;
- Delimitation of the affected area to avoid pollution expansion; putting the pipe in draining; closing the valves for insulation; special intervention team;
- Closing of the transmission valves; delimitation of the affected area; intervention for remediation and decontamination.
- The degree of closure of the accidental pollution phenomenon
- The area where the failure occurred was continuously monitored and was applied preventive absorbent material to the affected area of pollution; the land was brought to its original state by performing on site treatment works.
- After announcing the failure, were taken actions to close the sectioning valves and to commission the drain pipe, at the Călăreţi station, for limiting expansion on the affected area and securing the pipe. After stripping the soil, a crack was identified in the pipe caused by the digging equipment. The crack was corrected by applying a welded metallic patch in the affected area; works were carried aut to recover the spilled crude oil, by digging position pits from which were emptied 12 cm and the soil was treated with biodegradable absorbent material. Finally the pipe was covered with soil, on site treatment of the affected area with biodegradable absorbent material;
- The area where the failure occurred was continuously monitored and was applied preventive absorbent material to the affected area of pollution; the land was brought to its original state by performing on site treatment works.

In **Mehedinţi County** was recorded **1 accidental pollution**, as follows:

On 19.11.2013, at 22:37, on Balota Hill - DN6 (E70) took place a road traffic accident. A tank was overturned off the roadway. The tank belonged to SC RAD-TRANS SRL and transported chemicals - sodium hydroxide (21.960 l with a concentration of 48-50%) - from Oltchim Rm. Vâlcea to RAAN- ROMAG PROD BRANCH.

No sanctions were applied.

The remaining residues were neutralized by the representatives of the carrier company according to the data sheet, were collected in special containers and were disposed at an authorised operator. The affected area was fully decontaminated.

In **Olt County** were recorded **2 accidental pollutions**, as follows:

On 13.02.2013, at 19:31, in the Bals locality, Olt County, about 500 m east of the river Olteţ, 500 m west of the railway station Bals and 25 m downstream of the railway line Bals - Craiova. Coordinates: N: 44020,402’ and E: 24006,558’ was recorded the damage (corrosion) of the crude oil transmission pipeline, 10 ¾ inches in

diameter Gherceşti - Icon belonging to SC CONPET S.A. Ploieşti. 100 m2 - about 500 kg accidental spillage of crude oil.

The environmental factor affected was the soil and the polluting substance was crude oil.

Measures taken:

- immediately stopping crude oil pumping (at 17:22);
- isolating the damaged pipe section by closing the valves located upstream (Bals Abattoir) and downstream (CF Bals Station) from the affected area;
- scattering of about 150 kg (15 bags of 10 kg) of absorbing material on the surface of the soil affected by crude oil;
- digging of a borrow pit with a volume of about 5 cm, to accumulate the crude oil;
- applying two metal seal hinges on the pipe in the corrosion area;
- collecting a quantity of crude oil of 300 litres from the affected area;
- cleaning the soil affected by crude oil spills, on which was previously scattered absorbing substance (an amount of about 300 kg of infested soil with crude oil and absorbent substance was transported to Orleşti Section);
- levelling the ground in the affected area;
- replanting of 15 poplar saplings, which were taken out the precious day in order to finish the intervention at the pipeline

On 16.04.2013, at 6:00, in the Park no. 8 Icoana, near the wells 1005 and 335, on a communal pasture was identified the cracking, in three-points, of the mixing line column of wells 1005 and 355 Ciuresti-South, which led to the leakage of about 50 litres of crude oil and reservoir water on an area of 50 sqm of Icoana communal pasture icon.

The polluter was OMV Petrom SA - Production Zone 3 Muntenia - West - Sector 7 Ciuresti, Bacea area, Park 8.

Measures taken:

- Dispatch ASSET III West Muntenia was informed by telephone;
- Isolation of the line by closing the wells and valves from Park 8 Icoana;
- Were dug position pits to collect the accidental spills;
- It was applied absorbent material - a quantity of 70 kg for limiting expansion of petroleum products in the affected area;
- Were emptied the position pits that contained salt water mixed with crude oil;
- It was repaired the pipe in the three-points where the crack occurred by applying hinges;
- The infested land was stripped with specific equipment.

SC OMV Petrom S.A. - Production Zone III Muntenia - West was sanctioned with a fine of 25,000 lei, according to Art. 96, para. 1 pt. 1 of the GEO no. 195/2005 on the protection of the environment, as amended and supplemented.

On 22.12.2013, at 13:00, in the Corbu commune, Olt County, at about 400 m from the Vedea river undercrossing, on the route of the crude oil pipeline Icoana-Câtojani, unknown persons operated the valves, loosening the bolts from the valve flange with a diameter of 6 ", which led to the accumulation and leakage of crude oil. The crude oil leaked from the pipeline affected the soil on an area of 300 sqm of arable land and 700 sqm of underbrush.

The polluter was SC CONPET SA and the polluting substance was crude oil.

The soil was affected on an area of 300 sqm of arable land and 700 sqm of underbrush (over a length of about 120 m).

Measures taken:

- The crude oil pipeline was isolated by closing the sectioning valve upstream;
- Action was taken by mounting bolts and tightening them;
- Were made earth dams to limit the pollution. The crude oil was emptied from the position pits and the valves.

In **Prahova County** were recorded **15 accidental pollutions**, as follows:

On 04.01.2013, at 11.00, in the Băneşti commune, on the left bank of the river Doftana, was found a crack due to the corrosion of the crude oil transmission pipeline from the Slobozia Park, Băicoi Deposit, which belongs to SC CONPET SA. This incident caused the pollution of 800 litre crude oil-hazardous substance; the polluter was SC CONPET SA. Were affected 50 sqm, soil, land outside the city, unproductive.

No analyses were performed and no sanctions were applied.

On 03.04.2013, at 8:00, in Berceni commune, was noticed a crack, by breaking and entering, of the crude oil transmission pipeline Urlaţi, through which was leaked crude oil- hazardous substance.

The polluter was SC CONPET SA and the environment factor affected was the soil - 70 sqm fallow land, private property.

No analyses were performed, the crack was remedied by replacing the stolen item, were recovered approx. 500 litres, absorbent material was scattered on the ground and no sanctions were applied.

On 22.05.2013, at 9.00, in the city of Campina, around the Kaufland supermarket area, was found that at the well abandoned in 1925, the plug that secured the column was deteriorated, which favoured the discharge of a mixture of oil and salt water - 25 litres.

The polluter was SC OMV PETROM SA – ASSET VII Muntenia East, no analyses were performed, the area was isolated , was dug a position pit, the mixture collected was emptied, the well was secured and no sanctions were applied.

On 15.09.2013, at 7:30, Băicoi Town, neighborhood Ţintea, was found a crack in the crude oil transmission pipeline from Park 425 to Deposit 2 Forest, which led to the appearance of a spot of crude oil on the ground.

The polluter was SC OMV PETROM SA – ASSET VII Muntenia East, no analyses were performed, the pumping was stopped, a hinge was mounted, the spilled crude oil was recovered, was spread absorbent material and no sanctions were applied.

On 16.09.2013, at 16.20, in Bărcăneşti commune, at the entrance on Highway A3, there was a car accident, which led to the soil pollution with gasoline - about 908 kg.

The polluter was ANDEZIT SRL from the Republic of Moldova, no analyses were performed, the vehicle was restored on the road, to gasoline was moved into the tank, was administered absorbent material, were collected soil samples and ANDEZIT SRL was sanctioned with 50 000 lei failure to comply with provisions of GEO 195/2005, art. 94, para. 1 letter i.

On 18.09.2013, at 18:30, in the Predeal Sărari commune, was found a crack at the pipeline of wells 180 and 181, at Park 2 Predeal Sărari, which led to the discharge of 100 litres of crude oil.

The polluter was SC OMV PETROM SA – ASSET VII Muntenia East, no analyses were performed, the pumping was stopped, was mounted a hinge, the spilled oil was recovered, was spread absorbent material and no sanctions were applied.

On 19.09.2013, at 7:30, in Băicoi city, was found a crack at the crude oil transmission pipeline from Park 425 at Deposit 2 Forest, which led to the discharge of 40 litres of crude oil.

The polluter was SC OMV PETROM SA – ASSET VII Muntenia East, were affected 3sqm of marshy ground, no analyzes were performed, the pumping was stopped, was mounted a hinge, was spread absorbent material and no sanctions were applied.

On 13.11.2013, at 15:20, in Ciorani commune, was found a crack due to the corrosion of the crude oil transmission pipeline Urziceni - Albeşti Paleologu, which led to a 30 litre oil spill.

The polluter was SC CONPET SA, were affected 10 sqm of land, no analyses were performed, the crack was remedied, was spread absorbent material and no sanctions were applied.

On 25.11.2013, at 13.15, in Drăgăneşti commune, Meadow Plopilor point, was found a crack due to the corrosion of the crude oil transmission pipeline Urziceni - Albeşti Paleologu, which led to a 30 litre oil spill.

The polluter was SC CONPET SA were affected 60 sqm cultivated land (private property), no analyses were performed, were mounted three metal hinges, was spread absorbent material and no sanctions were applied.

On 02.12.2013, at 13.15, in Băicoi City, Ţintea neighbourhood was found a crack due to the corrosion of the oil and salt water transmission pipeline from 122SRP well at Park 2 Forest, which led to the discharge of an amount of oil and salt water mixture - about 200 liters.

The polluter was SC OMV PETROM SA – ASSET VII Muntenia East, were affected 70 sqm of forest, no analyses were performed, the soil was stripped, was collected the crude oil spilled (frozen), was mounted a hinge and no sanctions were applied.

On 19.09.2013, at 7:30, in Băicoi city, was found a crack at the crude oil transmission pipeline from Park 425 at Deposit 2 Forest, which led to the discharge of a mixture of sludge and salt water.

The polluter was SC OMV Petrom SA - ASSET VII Muntenia East, were affected 200 sqm of agricultural land, no analyses were performed, the injection was stopped, the sludge was collected in collection pits and was transported at the Băicoi Bioremediation Station.

No sanctions were applied.

In **Sălaj County** was recorded **1 accidental pollution**, as follows:

On 24.09.2013, at 18.20, Salaj ISU notified the overthrow of the SC Klacska Romania SRL tanker carrying petroleum products (gasoline and diesel).

Following the accident were spilled around. 1500 l oil product through the tank cap (no visible cracks were identified on the tank walls), on an adjacent land to DN 1H, approx. 50 m from the intersection with ND 1C out of the Rastoci locality, Ileanda commune, Salaj County (on right side of the running direction of Rastoci - Ileanda).

The tanker was raised from the gutter and emptied on 25.09.2012, at around 5.30. During lifting and twisting manoeuvres no other incidents occurred.

Representatives from the Ileanda commune City Hall, in the first phase, took measures to collect the product from the gutter and the impregnated absorbent products (placed by Salaj SGA), which were transported and stored temporarily in Ileanda City Hall.

To completely eliminate the effects of the pollution, to the carrier SC Klacska Romania SRL were imposed measures to remedy the affected soil (assurance of the concentration of oil products below the maximum value set out in Table 2 of the Annex on the assessment of environmental pollution Regulations approved by Order no. 756 of 3/1997 for less sensitive soils) and disposal of hazardous waste (impregnated absorbent material, contaminated soil, waste liquid collected from the gutter) in accordance with the legal provisions in force.

For decontamination of the affected soil, SC Klacska Romania SRL contacted SC Intex Eco Construct SRL.

It was established the soil remediation need on an area of approx. 300 square meters, actions were taken on site for the remediation of soil through injections with microorganisms.

In **Teleorman County** were recorded **8 accidental pollutions**, as follows:

On 11.04.2013, at 22:00, Ciuperceni Park 28 area was noticed that the 2151 well began to debit, through the column valves, drilling mud, water and gas, the amount of discharged fluid being of approx.7000 L.

The polluter was OMV-PETROM, was affected the soil on an area of approx. 1000 and no sanctions were applied.

On 31.05.2013, at 15:00, in the Park RÎCA area, on the route of the crude oil transmission pipeline from Park RÎCA to the main pipeline Icoana-Cartojani has taken place an attempted theft, which led to the discharge of approx. 200 litres of crude oil.

The polluter was OMV-PETROM, was affected the soil on an area of approx. 50mp-ditch on the side of the road towards the agricultural land, no sanctions were applied, pumping was stopped, the pipe was welded on the 5 cm area (in the place where it was cut), the spilled liquid was collected and were carried out soil cleaning works to remove the pollution effect.

On 29.07.2013, at 10:20, in Icoana-Cartojani locality, outside the commune of Tătărăşti de sus was noticed the corrosion of the crude oil transmission pipeline, which led to the leakage of an amount of approx. 500 liters crude oil on the ground.

The polluter is SC CONPET SA, the soil was affected on an area of approx. 24 sqm - agricultural land, private property and sanction was applied according to GEO 195/2005 art. 96, paragraph 1, point 7 in the amount of 25,000 RON.

The pipe pumping was stopped until the fault was rectified; the liquid spilled was collected, and were carried out soil cleaning works to remove the pollution effect.

On 31.07.2013, at 08:45, in Icoana-Cartojani locality, outside the commune of Tătărăşti de sus, Negreni village, was noticed the corrosion of the crude oil transmission pipeline, which led to the leakage of an amount of approx. 500 liters crude oil on the ground.

The polluter was SC CONPET SA, the soil was affected on an area of approx. 500 sqm - agricultural land, private property, no sanctions were applied, pumping was stopped until the fault was rectified, the earth was excavated to detect the fracture - 40 cm and the location of the damage was cleaned by emptying the collected oil and absorbent biodegradable material was spread.

On 17.09.2013, at 11:16, in Mereni commune, village Merenii de Jos, there was a car accident, which led to soil contamination with oil product.

The polluter was SC GIMY COM SRL, were affected approx. 30 sqm of soil, no sanctions were applied; the tractor head and trailer were removed, after which works were carried out to load the contaminated soil.

On 07.10.2013, at 07:30, was noticed the corrosion of the crude oil transmission pipeline 10 ¾ "from Deposit No. 9-Conpet, approx. 1000 m from Deposit No. 9 which led to pollution of soil on a surface of approx. 150 sqm public property land - road alignment (water ponding area).

The polluter was OMV PETROM SA, no sanctions were applied, pumping was stopped, the affected area was delimited, were dug collection pits, the leaking fluid was emptied; hinges were mounted and was applied absorbent material. The area was monitored.

On 06.12.2013, at 14:00, in the Park 67 Talpa area, on the mixing line of 158 well was recorded a crack resulting in the accidental spillage of mixed fluid (oil and salt water) estimated at about 170 litres, on an area of 60 sqm, represented by a road of OMV PETROM (approx.25mp) and public domain (pasture - approx.35mp) of Talpa commune.

No sanctions were applied, pumping was stopped, the affected area was delimited, were dug collection pits, the leaking fluid was emptied; hinges were mounted and was applied absorbent material and the area was monitored.

On 28.02.2013, at 8:21, a truck carrying 24 tons of ammonium nitrate calcium 27.22% (chemical fertilizer) from Bosnia and Herzegovina, to SC Maxagro SRL, overturned out of the locality of Birda.

The polluter was SC Global Ispat Ltd, Bosnia-Herzegovina, was spilled on the soil an amount of 1000 kg, no sanctions were applied, the load was moved into a train of the beneficiary and the chemical substance remaining on the ground, along with the shallow layer of soil was collected in bags and taken over by the beneficiary.

In **Timiş County** was recorded **1 accidental pollution**, as follows:

On 05.05.2013, at 2:27, in Ronaţ Station - CFR Timisoara, hydrochloric acid seeped out from a tank wagon.

The polluter was SC OLTCHIM SA , was recorded a leak quantity of 900 kg hydrochloric acid, which led to soil damage.

The company was sanctioned according to GEO 68/2007 on environmental liability with regard to the prevention and remedying of environmental damage Article 10 paragraph 5 with a fine of 20,000 lei.

The acid spilled on the ground was neutralized, the ground was stripped, the affected land was replaced with fertile land and the affected land was collected in bags and transported to SC OLTCHIM SA for storage in hazardous waste pits.

In **Vâlcea County** was recorded **2 accidental pollutions**, as follows:

On 04.11.2013, at 11:00, in Băbeni locality, a crude oil pipeline was damaged, which led to soil pollution, over an area of 50 square meters, with a mixture of oil and water - 200 liters.

The polluter was PETROM OMV Muntenia West, the pumping was stopped, the fracture was located and was excavated the identified area, the cause was removed by bushing, spreading of absorbent material, and stripping. No sanctions were applied.

On 29.08.2013, at 08:00, in Botorani village, section Ciobani, a crude oil pipeline was damaged, which led to soil pollution, over an area of 10 square meters, with a mixture of oil and water.

The polluter was CONPET SA, actions were taken to locate and isolate the affected area, to remediate the pipeline, to spread biodegradable absorbent material, to collect the crude oil and absorbent material, and to transport it in order to neutralize it;

The phenomenon of accidental pollution was eliminated 100%.

In **Vrancea County** were recorded **5 accidental pollutions**, as follows:

On 13.02.2013, at 11:45; 16.02.2013, at 07.30 and 17.02.2013, at 13.30 in Focsani Municipality, on the ring road, between SC Metale Internaţional SRL and Dedeman was recorded the corrosion of the Ø20" crude oil transmission pipeline Bărăganu - Onesti, which led to the appearance of oil stains on the surface of the soil.

The polluter was SC CONPET SA, was affected the soil on about 20 sqm, in the three points of damage. There were three successive failures (pore size 1-2 mm) in a period of 5 days, at a distance of 300-700 m from each other.

SC Conpet SA was given a fine in the amount of 50,000 lei, for violating the provisions of GEO 195/2005, article 28, letter d.

On 25.20.2013, at 8:52, in Focsani area, at about 100 meters until the roundabout CAREFOURR (in the running direction Focsani - Adjud) next to the E85 road undercrossing at about 1 m from it, was recorded the corrosion of the Ø20" crude oil transmission pipeline Bărăganu - Onesti, which led to the appearance of oil stains on the surface of the soil.

The polluter was SC CONPET SA, was affected the soil on about 20 sqm, actions were taken to close the sectioning valve upstream from the failure, the collection pit was excavated, was carried out the aspiration of the crude oil spilled into the collection pit and introduced the tank strainer in the protector air vent tube.

On 08.11.2013, at 16.30, in the Rugineşti area, Urecheşti locality, at the boundary with Bacau County, there were 13 explosions in chain, along the main crude oil transmission pipeline on the routes Bărăganu - Onesti, Rugineşti – Cornăţel segment. Two explosions occurred in Vrancea County and 11 in Bacau County. One of the explosions across Vrancea County occurred with oil spill.

The polluter was SC CONPET SA, were affected about 250 square meters of land, actions were taken to close the sectioning valve upstream from the failure, the oil leaked was emptied from the hole resulting from the explosion, the affected area was secured, to limit oil leakage were placed bags with absorbent material, the perimeter was marked in order to clean the area affected by crude oil pollution.

A sanction was applied in the amount of 2,000 lei under Law 18/1991 as amended, Article 111 letter h.