

## THE IMPACT OF HUMAN ACTIVITIES ON ENVIRONMENTAL QUALITY IN DÂMBOVIȚA COUNTY

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**Key words:** impact, human activities, pollutants, pollution, Dâmbovița County.

**Résumé.** La protection de l'environnement est apparue comme problème de l'humanité au moment où la contradiction entre homme et nature s'est accentuée de plus en plus fort; elle est devenue de nos jours un problème majeur, qui concerne toute l'humanité. Les activités humaines, orientées vers l'exploitation intensive des ressources naturelles, affectent de plus en plus fort l'état des facteurs environnementaux. Il y a plusieurs décennies, l'intervention de l'homme était de petite ampleur et ne laissait pas de traces prononcées, grâce au pouvoir de régénération de la nature. A présent, à cause du développement explosif de l'industrie, de l'agriculture et des autres activités, les agressions sur les facteurs environnementaux ont dépassé le seuil-limite de régénération de la nature, et par conséquent il devient nécessaire, dans le contexte du développement durable, de participer de plus en plus activement à la protection de l'environnement.

### Introduction

Dâmbovița County is situated in the south of the Meridional Carpathians, at the intersection of the 45<sup>0</sup> northern latitude parallel with the 25<sup>0</sup> eastern longitude meridian, corresponding to the hydrographic basins of Ialomița and Dâmbovița River. The surface of 4,054 km<sup>2</sup> of the county's territory is made up of mountains, transitional units from mountains to hills (the Subcarpathians), hills and plain. The maximum altitude reaches 2,505 m (the top Vârful Omu from Bucegi Mountains), and the minimum one is that of 129 m (in the low divagation plain of Poiana Commune).

The county's economy is characterized by an industrial-agrarian structure, the industry being the main branch and presenting a high diversification degree. The most representative activity domains are: metallurgy, extractive industry (oil and natural gas), machine-building industry, chemical industry, textile industry, and energy industry. As the industrial enterprises, for most of these branches, are situated principally in the urban area, we can say that the main environmental

components (*air, water, soil, vegetation*) suffer mostly because of the pollutant emissions, be they solid, liquid or gas.

### **1. The impact of human activities on air quality**

The industry is the main economic branch of the county, with a high diversification degree. The processing industry holds the highest weight (over 80%), and the most representative activity domains are the following: metallurgy (the county's production in this sector is situated on the 3<sup>rd</sup> place in the country) the extractive industry, with an old tradition (oil derricks can be found in Târgoviște, Găești and Moreni), the machine-building industry, and also traditional enterprises, textile industry, chemical industry, etc.

In Dâmbovița County, the industrial branch with the highest impact on the environmental components is the metallurgical one, by means of the units located on the industrial platforms of the towns, especially that of Târgoviște municipality. A significant impact on the environment goes to the construction materials industry, by means of the cement and lime plants whose location is mainly related to Fieni town.

The modifying effects that man has on the environment have been more obvious as intensity and diffusion over the last few years, because of the industrial development. Concerning the degradation of the environment, following the productive activities of this area, we can talk about *pollution with impact on people's health*. In this sense, the air quality data, resulted from the measurements achieved in Dâmbovița County (obtained from the Departmental Agency for Environmental Protection and other official sources), highlight pollution with powders in suspension, especially in the area of Târgoviște municipality, in Doicești and around this commune, to which one can add the pollution given by sedimentable dusts in Fieni area. Other pollutants emitted in the atmosphere are: sulphuretted hydrogen, gases like sulphur, nitrogen and carbon oxides, volatile organic compounds, NO<sub>x</sub> and heavy metals.

*The sources* with a potential impact on the department are:

- *in Târgoviște municipality and its neighboring area*, they are numerous and diverse: SC. Mechel SA (metallurgy, special steels production), SC. NEMO SA (machine constructions), SC. Vicas SA (paints and varnishes), SC. Oțelinox SA (steel drafting processes), SC. Cromsteel SA (chrome plating processes), SC. Erdemir SA, SC. Romlux SA (illuminating bodies), road traffic, etc.;

- *in Doicești locality*, pollutant emissions are produced in the activity carried out at the companies: The Electric Plant / Uzina Electrică (which uses black oil and lignite, as well as fuel for the electrogenic groups), SC. Nubiola România SRL (which produces whitening agents, green chrome

oxide, being the main source of sulphur dioxide and sulphuretted hydrogen, compounds resulted following the burning of the sulphur used as raw matter for the production of the ultramarine), SC. Soceram SA (producing bricks and other ceramic materials);

- *in Fieni town*, the polluting sources are: SC Carpatcement Holding SA (producing cement and construction materials) and SC Carneuse Holding SRL (lime producer).

Leaving aside the activity of industrial production, other polluting sources having a negative impact on the air quality in the area under analysis are: *transports*, namely road means of transport, their excessive use, especially lately, being a major source of pollutants (exhaust gas, phonic pollution, dust, etc.), all these contributing to increasing the pollution problem; because of the use of inadequate technologies, at present *agriculture* has become a potential polluting source for the environment, the main agricultural pollutants being chemical fertilizers and pesticides. At the same time, the processing industries in the domain of agricultural products are considered as well responsible for environmental degradation; *waste*, mainly its inadequate management, among others, constitutes another polluting source and implicitly of negative impact on the local population's health and comfort, especially in the urban area.

An important impact of the human activities on the atmosphere is given by the emission of large quantities of gas, among which carbon dioxide, methane, water vapors, nitrogen protoxide, ozone, which causes the so-called *greenhouse effect*. Among these gases, the most important role in the air pollution is held by carbon dioxide, nitrogen oxides and methane emissions, resulted from the use of fossil fuels, as they represent the main source of the 50% increase of the greenhouse effect gases in the atmosphere.

Beginning with the year 2000, at the level of Dâmbovița County, APM Dâmbovița (The Environmental Protection Agency of Dâmbovița) started to record these pollutants, the situation being as follows (Table 1).

The analysis of the evolution of these emission quantities during the period mentioned above shows the diminution of the quantity of carbon dioxide in the year 2006 in comparison with the year 2000, the maintaining of a high quantity of nitrogen oxides, especially at the level of the years 2003 and 2004, when the value of the yearly quantities went beyond respectively 150,000 and 100,000 tons.

Concerning the methane quantity, it increased in the year 2006 compared to the previous period, because of the more intensive use of solid and liquid fuels in the industrial energy sector, and also because of the enteric fermentation of animal wastes, as their number recorded an increase. These emissions of pollutants have as main sources: the extraction and primary treatment of fossil fuels (natural gases, liquid and solid fuels), especially for methane production, the production and use

of certain volatile organic solvents, engine combustion, especially exhaust gas, used water purging and waste spreading, natural gas distribution, etc.

Tab. 1- Total emissions in Dâmbovița County (t/year) - in the interval 2000-2006

Pollutant	Total emissions in Dâmbovița County (t/year) - in the interval 2000-2006						
	2000	2001	2002	2003	2004	2005	2006
CO <sub>2</sub>	2,265,304.8	1,583,870.9	1,270,929.2	1,183,548.0	1,430,979.3	976,974.7	1,222,032.0
N <sub>2</sub> O	110.51	78.19	43.30	153.29	102.66	68.29	46.65
CH <sub>4</sub>	74,203.43	10,726.13	11,663.48	3886.25	3192.45	18,061.60	15,444.57

Source: APM Dâmbovița.

In Dâmbovița County, energy is produced exclusively by burning fuels. The most relevant impact of this activity is that of combustion gases emission in the atmosphere (Fig. 1).

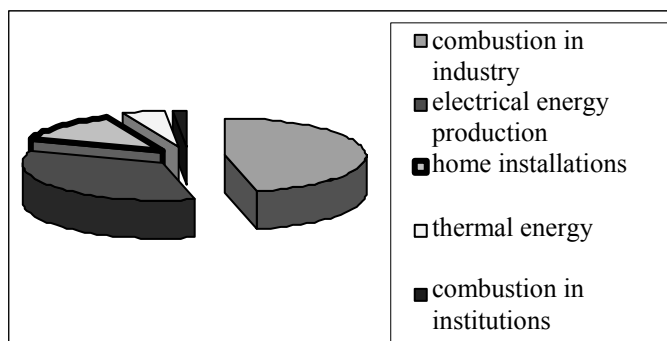


Fig.1 - Distribution of the weight of the emissions coming from different combustion sources in Dâmbovița County (2006)

Our conclusion concerning the total emissions resulted from the activity of energy production at the level of the department shows the following: the highest weight goes to combustion in industry – 46.08%; electrical energy production – 33.8%; home installations – 12.9%; low percentages are held by the generation of thermal power in the centralized network (5.02%), combustion in institutions and in the commercial sector (1.61%). Relevant is the activity from the Electric Plant/ Uzina Electrică Doicești, because of its significant emissions of atmospheric pollutants.

The evolution of the annual pollutant emissions is favorable and it derives from the interest of this activity sector for diminishing its impact on the environment (reducing the sulphur content in fuels) and also from the decrease of the need to generate electric and thermal energy.

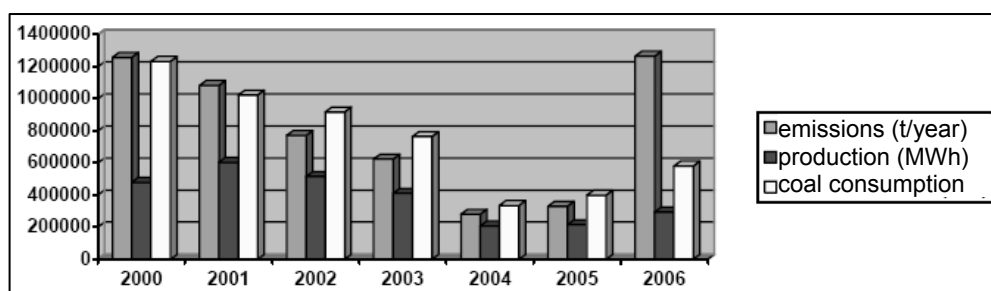


Fig. 2 - Dynamics of the proportion pollutant emissions – production – coal consumption at UE Doicești (2000-2006)

Concerning this pollutant, the average concentrations per 24 hours have gone beyond the maximum admissible concentration (CMA) – 0.15 mg/m<sup>3</sup>, its values being rendered in the following table (2) and figure (3):

Tab. 2 - Total powders in suspension

Sampling point	No. overpassings/no. measurements	Frequency of the times when the CMA was overpassed /24 h (%)	Annual average of the average concentrations /24 h (mg/m <sup>3</sup> )	Maximal value of the average concentrations /24 h (mg/m <sup>3</sup> )	Minimal value of the average concentrations /24 h (mg/m <sup>3</sup> )
Târgoviște	46/808	5.69	0.088	0.194	0.010
Doicești	2/204	0.98	0.063	0.178	0.006

**Sedimentable dusts.** For this indicator, the global atmospheric pollution level remained constant in Doicești area; in the area of Târgoviște municipality, there have been overpassings of the CMA (17 g/m<sup>2</sup>/month), while in Fieni area the values were high (table 3). Intensive pollution with sedimentable dusts in Fieni town and in the surrounding area is given, mainly, by the lime kilns, as well as by the calcareous stones transport and processing processes from SC. Carpatcement Holding SA. The pollution with cement dusts is the main form of alteration of the air quality nearby the source, nevertheless, it is strongly felt as well in the neighboring area, especially in Moțâieni locality. The dust emitted in the

atmosphere affects population health; it influences as well the normal development of the vegetation and of the agricultural cultures, and, in the same time, it affects the infrastructure in the above-mentioned area (Table 3).

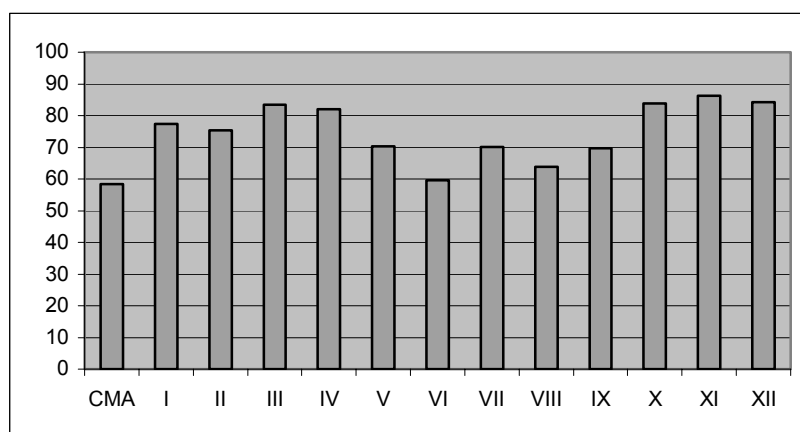


Fig. 3 - Average monthly concentrations of dusts in suspension in Târgoviște municipality (2006)

Tab. 3 - Average, maximal and minimal quantities for sedimentable dusts and the frequencies of overpassing the monthly CMA (2006)

Sampling area	Frequency of overpassing the CMA (%)	Maximum monthly concentration (g/mp)	Minimum monthly concentration (g/mp)	Average monthly concentration (g/mp)
Târgoviște	5.55	20.92	1.6	6.88
Doicești	0.0	15.41	1.62	4.47
Fieni	37.14	39.91	1.25	14.74

Source: APM Dâmbovița.

Concerning *gas pollutants* (sulphur dioxide, nitrogen dioxide, formic aldehyde, carbon monoxide, phenol and ozone), the average values for the year 2006 did not record any overpassing of the admissible concentrations specific for these pollutants. This situation was given by the reduced volume of fuel burning in industry and to the restrictions concerning the use of fossil fuels, with a high sulphur content, which resulted in a lower amount of such emissions. It was noticed, however, that the ammonia quantity increased in the year 2006 (Table 4 and Figure 4), compared to the previous years, because of an increase in the animal sector, which led to an increase of the weight of this pollutant that comes from

animal excrements (especially from aviculture), but also because of the use of nitrogen fertilizers for different agricultural cultures. At the level of the sources under analysis in Dâmbovița County, it is estimated that over 91% of the global ammonia emission comes from agriculture.

Tab. 4 - Total ammonia emissions in Dâmbovița County (t/year) for the period of the years

Pollutant	Total ammonia emissions in Dâmbovița County (t/year) for the period of the years:						
	2000	2001	2002	2003	2004	2005	2006
NH <sub>3</sub>	2944.05	2666.65	2906.77	1698.21	1997.34	6745.79	5567.26

Source: APM Dâmbovița

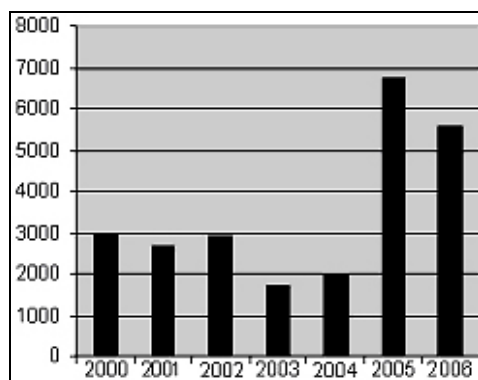


Fig.4 - Evolution of total ammonia emissions in Dâmbovița County (2000-2006)

Considering the polluting sources and their impact on the environment, at the level of the country the following *critical areas* in point of industrial pollution have been represented (Fig. 5):

- *Târgoviște area*, characterized mainly by the pollution with powders in suspension, especially the areas around SC. Mechel SA, where the concentrations continue to be high, over the admissible limits for the protection of the local population health;

- *Fieni area*, especially the central area of the locality, where one can feel the impact of the sedimentable dusts coming from SC. Carpatcement Holding SA;

- *Doicești locality*, influenced by the dust emissions from the Electric Plant (UE Doicești), and by the sulphuretted hydrogen from SC Nubiola România SRL.

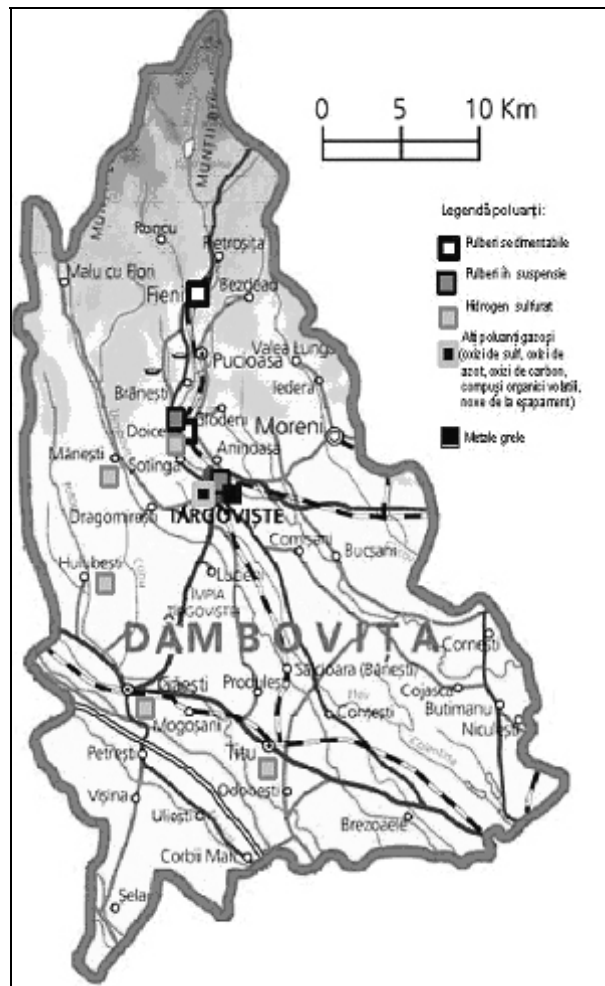


Fig. 5 - Dâmbovița County – critical areas affected by industrial pollution

### 3. The impact of human activities on water quality

Concerning this aspect, Dâmbovița County includes two hydrographic basins, respectively Buzău - Ialomița and Argeș - Vedea. Generally, at the level of the county two categories of impact on watercourse quality can be mentioned: those produced by urban used waters (industrial and domestic), which affect mainly *Ialomița River* - the principal collector of used waters for the localities Fieni, Pucioasa, Târgoviște - and *Neajlov River*- for the used waters from the water



purging station of Găești Town. The impact on watercourses is also present for the waters that cross the activity area of the oil derricks of Moreni (Cricov, Pâscov and Cezeanu River), of Găești (Cobia, Potop, Strâmbu, Saru River), and of Târgoviște (Slânic and Ilfov River). For these watercourses, high values, over the admissible maximum limits, (Table 5), have been recorded for class II (CMA = 50 mg/l) for the parameters chlorides and oil products, the main cause being the impact of the leaks of technological and escape water from the above-mentioned oil derricks.

Tab. 5 - Average values for the overpassing of the CMA (50 mg/l) for the chloride indicator

River course	Semester II/year	Chlorides
Cezeanu	2007	1164.89
	2006	788.825
Cobia	2007	59.255
	2006	488.185
Cricov	2007	833.31
	2006	602.7
Ilfov	2007	61.395
	2006	258.1
Pâscov	2007	304.43
	2006	567.245
Saru	2007	562.385
	2006	556.61
Slânic	2007	1943.8
	2006	859.735
Strâmbu	2007	609.42
	2006	397.78

Source: APM Dâmbovița.

Problems related to watercourse pollution, from clear or diffuse sources, with organic substances and decomposition products, following the input of used water from the town's purging stations have been noticed, following the analyses carried out, for the following hydrographic arteries: *Ialomița river*, where one recorded the overpassing of the maximum admissible quantity for ammonium (1.15 mg NH<sub>4</sub><sup>+</sup>/l, reported to 0.4 mg/l for class I quality); *Neajlov river*, with values of 1.9 mg/l for the same indicator, reported to the above-mentioned CMA; *Baiul River* – 6.21 mg/l, reported to the CMA. Concerning river water quality, at the level of the county, on quality classes, for the year 2007, compared to 2006, the situation is as follows (Table 6-8):

Tab. 6 - Repartition of the watercourse length on characteristic zones in the basin of upper Ialomița (2006)

River zones	Total km	Quality class				
		I	II	III	IV	V
<i>Ialomița</i> : source - upstream confluence Râtei	19.5	x				
<i>Ialomița</i> : confluence Râtei – Brănești	35.5		X			
<i>Ialomița</i> : Brănești - Băleni	53.0			x		
<i>Râtei</i> : source - confluence Ialomița	7.0	x				
<i>Cricovul Dulce</i> : upstream Moreni - Bălțița	32.5			x		
<i>TOTAL basin Dâmbovița County – Ialomița River</i>	108.0					

Tab. 7 - Repartition of the watercourses length on characteristic zones in the basin of upper Ialomița (2007)

Watercourse	Zone	Total length (km)	Class I (km)	Class II (km)	Class III (km)	Class IV (km)	Class V (km)
Ialomița	Upstream conf. Valea Horoabei	8.0	X				
Ialomița	Cheile Tâtarului	11.5	X				
Ialomița	Dobrești	21.0	X				
Ialomița	Moroieni	29.5	X				
Ialomița	Brănești	55.0	X				
Ialomița	Downstream Târgoviște	81.5		X			
Ialomița	Băleni	111.0			x		
Cricovul Dulce	Upstream Moreni	29.5			x		
Cricovul Dulce	Bălțița	62.0				x	
Scândurarilor	Lăptici Peat Bog	2.0	X				
Râtei	Râtei Cave	7.0		X			

Tab. 8 - Repartition of the watercourses length on characteristic zones in the Argeș-Vedea basin (2007)

Watercourse	Zone	Quality					
		Total km	Class I	Class II	Class III	Class IV	Class V
Argeș	Entrance-exit county	54		54			
Dâmbovița	Entrance-exit county	105			105		
Ilfov	Entrance-exit county	80			80		
Colentina	Entrance-exit county	41			41		
<i>Total hydrographic basin</i>		280		54	226		

Source: APM Dâmbovița.

The analysis of the tables above shows an improvement of the water quality class in the upper Ialomița basin (class I). At the same time, Dâmbovița River, all along its course in the county, belongs to class III in point of water quality, along with Ilfov and Colentina River.

At the same time, in this area another type of water pollution is present as well, the *phenomenon of salinization*, persistent actually, in the existing ground-water table. A special case is represented by Bucșani commune, where in 2006 and 2007; the values of the CMA (250 mg/l) were overpassed, being comprised between respectively 548 mg/l and 765 mg/l, for chlorides (Fig. 6).

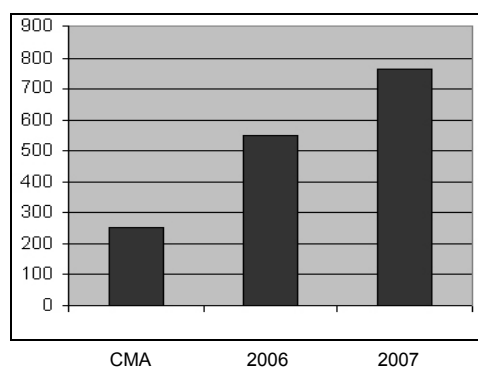


Fig. 6 - Average chloride concentration for the years 2006/2007 – ground-water table in Bucșani area

#### 4. Impact of human activities on soil quality

Soil quality is affected in various degrees by diverse factors, as they can exert influences on the deterioration of its characteristics and functions, respectively on its productive capacity and, especially, as they can affect agricultural products and food security, sometimes triggering serious consequences concerning the general quality of human life. The main causes of soil pollution in Dâmbovița County are determined by the *oil industry* activities and by the *inadequate depositing of solid waste* in the precincts or nearby industrial units.

In this sense, important are the *dust, ashing, attle, oil residue deposits*, but also the quarries used by the following societies: Mechel SA. Târgoviște (with the cinder yards from Udrești and Lucieni), Carbonifera SA. Ploiești (the working point Șotânga, the cinder yards from Dealu Cărbunaru and Mărgineanca), Carpatcement Holding SA. Fieni (the quarries from Pucioasa, Malu Roșu and Lespezi), Termoelectrica SA. – Doicești (with ash dumps and cinder yards at Poiana Mare and Teiș), Erdemir SA. (with a sludge bed and a waste deposit), OMV-Petrom SA. (oil residue deposits) and Elsid SA. Titu (coke dump).

At the same time, there are other sources included in different categories of soil degradation, for instance: *active terrain gliding; superficial and deep erosion; sandy terrains*, exposed to wind and water erosion, as well as the *excessively humid land patches*. From this viewpoint as well at the level of Dâmbovița County, the following *critical areas in point of soil degradation* have been identified (Table 9):

Tab. 9 - Dâmbovița County – Critical areas in point of soil degradation (2007)

Degraded land following the ceasing of certain industrial activities	Lands		Lands occupied by oil residue deposits
	Agricultural	Forest	
- Șotânga. Teiș (Parc Central Teiș): 0.20 ha - Hulubești (Parc 42): 0.30 ha - Hulubești (Parc 45 Strâmbu): 0.30 ha - Valea Mare (Parc 20 Saru): 0.30 ha - Fierbinți (Parc 3): 0.30 ha - Cobia (Parc 7 Cobia): 0.30 ha - Șotânga (Parc 26 Șotânga): 0.30 ha - Gorgota (Parc Gorgota): 0.30 ha - Râzvad (Parc Râzvedeanca): 0.30 ha - Bucșani (Parc Nou): 0.30 ha - Moreni (Parc 6 Scortescu): 0.30 ha - Moreni (Parc 419): 0.30 ha - Dragodana (Parc 10 Șuta): 0.30 ha - Comișani.Lazuri (Parc Lazuri): 0.60 ha - Gura Ocnitei (Parc 45): 0.30 ha - Petrești (Parc 2 – trasee conducte colectare): 0.62 ha	- Bucșani: 1.80ha - Ocnita: 0.10 ha - Iedera: 0.02 ha - Vârfuri: 0.05 ha - Aninoasa : 5.29 ha - Boțești: 0.08 ha - Doicești: 0.67 ha - Dragodana : 1.23 ha - Dragomirești: 2.25 ha - Gheboieni: 0.39 ha - Glodeni: 0.94 ha - Gura Ocnitei: 2.79 ha - Mănești: 1.80 ha - Râzvad : 3.04 ha - Șotânga : 3.03 ha - Vulcana: 0.10ha - Cobia: 0.18 ha - Hulubești: 2.75 ha - Răscăeți: 1.11 ha - Valea Mare : 0.79 ha - Vișina : 0.33 ha	- O.S. Bucșani: 0.63 ha - O.S. Câmpina : 2.62 ha - O.S. Moreni: 1.46 ha - O.S. Pucioasa : 1.07 ha - O.S. Sturzeni: 10.54 ha - O.S. Târgoviște : 19.56 ha - O.S. Valea Mare: 15.21 ha	- Cobia: 0.60 ha - Valea Mare: 0.40 ha - Moreni: 0.82 ha - Gura Ocnitei: 0.55 ha - Bucșani: 0.10 ha - Șotânga. Teiș: 0.41 ha - Potlogi: 0.04 ha
TOTAL: 5.22 ha	28.74 ha	51.09 ha	2.92 ha

Source: APM Dâmbovița.

We can notice that the most intensive soil pollution occurs in the areas with industrial activities, mainly those related to oilfields and mines. Most pollution cases have been recorded in Moreni, Gura Ocnitei, Bucșani, Râzvad, Valea Voievozilor, Cobia, Șotânga, etc. The pollution on agricultural and forest lands, given by the infiltration of salty water and oil in the soil has led to the

decrease of soil quality and even to its degradation, especially in the above-mentioned localities. The agricultural character of Dâmbovița County triggers as well an extensive use of fertilizers and pesticides, and so they represent another source of soil pollution. The most affected lands belong to the localities situated in the Subcarpathian area, where fruit-growing tree plantations are dominant (Voinești, Gemenea, Mănești, Cândești, etc.), and to the localities of the plain area (Băleni, Lungulețu, Comișani, Văcărești, etc.), where the main production is represented by cereals and vegetables.

### **5. Environmental management directions in dâmbovița county**

The objectives of the environmental policy are: environmental protection and the improvement of environmental quality, public health protection, rational use of natural resources and, at the same time, promoting European-wide measures for the solution of the environmental problems, through international involvement.

The implementation of the environmental policies, both for the area under analysis and nationally, is achieved by means of projects for: a modern and profitable infrastructure, air, water and soil pollution control and reduction, these projects being supported by means of different financing projects. In this sense, at the level of the year 2007, in Dâmbovița County were finalized and were being carried out a series of projects that aimed to: improve and modernize the water and sewerage network infrastructure and the purging stations, control and reduce air, water and soil pollution by introducing and using advanced technologies. In the years 2006 and 2007, 14 environmental projects were finalized, with direct implications on environmental protection, while 6 other projects were about to be completed.

Concerning the investments and expenses for environmental protection, the main weight goes to the air quality domain (97%), followed by water quality investments (14%).

### **Conclusions**

Concerning the *Impact of human activities on environmental quality in Dâmbovița County*, with special reference to the main components of the environment, we can synthesize the following aspects:

1. *Air*. Following the main activities, we can speak about a *pollution with impact on population health*, whose principal causes are the industrial activities specific for the localities that have a significant weight in the local economy, mainly *Târgoviște municipality, Fieni town and Doicești commune*, with local factors of air degradation. At present, air quality is negatively influenced especially by the concentrations of powders in suspension and sedimentable dusts, as we have shown.

2. *Water*. It has been noticed that a part of the rivers that cross the territory of Dâmbovița County have problems because of the *pollution with organic substances and decomposition products*, following the drainage of used and insufficiently purged waters from the urban treatment stations. The water of the local rivers is primarily affected by the *oil derricks activity*, where frequent overpassing of the maximum admissible quantities has been recorded in point of class II.

3. *Soil*. From the previous analysis it results that an important role in soil quality deterioration goes to *oil, coal or other types of exploitations*, as well as to the creation of mining dumps, industrial waste dumps or domestic waste dumps, and to fertilizers and pesticides. At the same time, soil pollution has *natural causes* as well (besides the anthropic ones), like landslides, superficial and deep erosion, permanent excessive humidity, river landslides or other phenomena associated to them.

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