



Industrial Environmental Impact on Rural Area in Turda-Câmpia Turzii Region

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Natural premises of the development of studied territory

The studied territory is located in the southern part of Cluj county, along side of an important European road: E60, associated with other important roads as DN15 and DN75. The studied territory consists mainly from the large Arieş valley, presenting also the features of a corridor. The average slopes are under 5°, being smaller on the terraces located on the right bank of the Arieş. This is because of the presence of the piemontan glacies terraces of the Arieş and the presence of secondary valleys which generate deposition cones rich in underground water resources.

The complex slopes is characterised by an active morphodynamics, materialised by a varied scale of erosion processes: gulling, torrentiality, land sliding, that intervene in modification of the slopes profile. The interfluvial surfaces, terraces of bridges and the river meadows are characterised by a great geomorphological stability and are suitable for antropical arrangements.

By climatic way, the Turda- Câmpia Turzii depression is characterised by an energetic potential of 118 kcal/cm²/year, a little smaller than in the adjacent regions, because of the absorption exercised by the water vapours and the existing atmospheric pollutants. The values of the main climatic elements are: 8,6° C for the annual average temperature, 550 mm annual rainfall, a circulation of the air masses of type foen.

Hydrographical network is fully tributary to Arieş having an average density of 0,5 km/km² and a reduced slope, highlighting the subsequent

character of Arieş with a emphasized tendency of erosion in the left bank, that imparts the valley a pronounced asimetric character.

The average flow of Arieş is 22 m³/s, at hydrometric station Turda.

Natural resources of the underground are in closely correlation with the geological formations present in territory: ghips at Mihai Viteazu and Copăceni, limestone at Tureni and Copăceni, salt in the anticlinal act Turda-Ploscoş, sand at Gligoreşti and Corneşti.

The agricultural lands are capitalised by diversified cultures and have been subjected to some soil erosion controlling works.

The specifically pedogenetical conditions of this area lead to the generation of a diversified edafic layer, consisting of luvic clays chernozems on the Arieş slopes, cambic chernozems, rendzinas on Jurassic limestone, gleic luvisols and unevoluated soils, regosoils formed on the neconsolidated friable rocks that occupy extended surfaces along the river banks.

The natural vegetation specific to the studied zone, is composed by association of oaks and hornbeams, and other species of shrubs and herbaceous plants. Deforested of the oaks and hornbeams led to the phitocenoze herbaceous installation with *Festuca rubrae*, *Poa nemorales*, *Dactylis polygamma*, *Trifolium medium*. In the areas with salts soils is establish the presents of halophyte plants, shaped, on sorts and species by the concentration degree of salts.

Table 1a. Land use in Turda- Câmpia Turzii area

	1989				
	Agricultural land area	Arable land area	Arable / agricultural	Cultivated land area	Cultivated / arable
	ha	ha	%	ha	%
TOTAL JUDEȚ	413,402	203,360	49.2	199,947	98.3
TURDA	7,680	5,695	74.1	9,243	162.3
CÂMPIA TURZII	1,711	1,346	78.7	1,087	80.7
Călarasi	3,477	2,355	67.7	1,487	63.1
Luna	4,500	3,577	79.5	3,023	84.5
Mihai Viteazu	3,317	2,286	68.9	3,598	157.4
Petreștii de Jos	6,152	3,317	53.9	3,101	93.5
Ploscos	3,849	2,653	68.4	1,667	63.3
Săndulești	1,916	1,102	57.5	265	24
Tureni	5,882	3,223	54.8	2,870	89
Viișoara	5,396	3,646	67.7	2,308	63.3
TOTAL AREA	43,880	29,200	-	28,649	-

Table 1b. Land use in Turda- Câmpia Turzii area

	1993				
	Agricultural land area	Arable land area	Arable / agricultural	Cultivated land area	Cultivated / arable
	ha	ha	%	ha	%
TOTAL JUDEȚ	424,377	177,204	41.7	169,933	95.9
TURDA	7,553	5,566	73.7	10,190	183
CÂMPIA TURZII	1,688	1,184	70.1	1,187	100.2
Călarasi	3,422	2,307	67.4	1,585	68.7
Luna	4,439	3,269	73.6	2,857	87.4
Mihai Viteazu	3,320	2,196	66.1	2,009	91.5
Petreștii de Jos	6,131	3,024	49.3	1,970	65.2
Ploscos	3,898	2,577	66.1	1,620	62.8
Săndulești	1,916	1,023	53.4	400	39.7
Tureni	5,750	2,980	51.8	2,657	89.2
Viișoara	5,339	3,435	64.3	2,412	70.2
TOTAL AREA	43,456	27,561	-	26,887	-

The landed fond, agricultural production and livestock

The studied zone is extended on approx. 52.637 ha area, that represents 8% from the area of Cluj county.

By agricultural view, this zone occupies a main part from the meadow and the terraces of Arieș (approx. 75 %) characterised as the most fertile land from the county, as well as important sections from the south-west part of Transilvana Plain, with the warmest climate from the county and also with soils that are suitable to any culture.

In the peripheral zone of this perimeter prevail less fertile land, how are that from Petrești, Tureni communes, as well as sections from communal territory Mihai Viteazu, where the climate is influenced by the adjacent mountain space.

The area can be characterised as the richest agricultural region from the county, because of the plain lands preponderance, as well as of the quality of meadow and terrace soils as compared with those from the Someș meadow, by example.

In the way of the land utilisation is ascertained that the arable lands domination (52.5 % compare to 29.5 % average on county) to the

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prejudice of natural pastures (only 28.2 % compared to 37.5 % average on county).

The vineyards and fruit tree plantations occupy 1.8 % compared to 1.9 % in county. It is remarked the fact that, as part of this plantations, the vineyards occupy 0.6 %, being proportionally more wide spread as any other area from the county. This structure of uses categories is highlighted also of the area weight to the respective category. So, to a total area of only 8 % from the total county area, the studied area participate with 14 % to arable lands, and with 23 % to vineyards, and to the hayfield only with 4 %.

The agricultural area represents 82.5 % from the studied territory area as compared with 68.9 % that represent the agricultural lands of the county reported to the total administrative area of the Cluj county. The development of agricultural areas was made in the forests detriment whose weight is only 6 % as compared to 24 % at county level. The forest reduced weight has negative impacts on the slope fields integrity that are massive affected by erosion, especially in the section from Transilvania Plain included in the studied area.

Table 2. The share of the administrative units to the forming of the land uses

Territory	% by studied area		
	total	agricultural	arable
TURDA	17.4	17.4	20.1
CÂMPIA-TURZII	4.5	3.9	4.3
Călărași	7.2	7.9	8.4
Luna	10.1	10.2	11.9
Mihai Viteazu	9.0	7.6	8.0
Petreștii de Jos	13.8	14.1	11.0
Ploscoș	7.9	9.0	9.3
Sândulești	4.3	4.4	3.7
Tureni	14.1	13.2	10.8
Viișoara	11.7	12.3	12.5
TOTAL	100	100	100

An important characteristic of the landed fond structure is that the non-agricultural uses have an increased weight because of the existence of the two towns with a higher degree of industrialisation, and also the fact that the forest, owning a decreased weight, spreaded areas are affected by erosional phenomenons. (See tables 1a, 1b and 2).

The area participate to the forming of the animals number in the county with 9,0 % horned cattle, 20 % swine, 10 % sheep and 11 % poultry. The animal average loads in ha are the same as those recorded to county level, only in swine the area have a small advantage. (See table 3.)

Table 3. The animal loads of the studied area, compared with the average on ha

Species	Animal number			
	In studied area		In Cluj county	
	heads	Load*	heads	Load*
Horned cattle	9,391	22.1	107,918	23.6
Swine	46,088	167.2	224,324	113.9
Sheep	32,744	77.2	339,152	74.2
Goats	326	0.8	10,269	2.2
Poultry	153,973	850.7	1,374,768	1057.5

* heads/ 100 ha

It is significantly the fact that all area has lost proportionally more number of animals as the county in average, with the swine exception,

species that is situated at the level of 70 % that number from the year 1989.

Environmental pressures

Turda – Câmpia Turzii zone represents a strong industrialized zone of Cluj county, characterized by a great pollution potential generated by big pollutant units.

Air pollution by dust sedimentation and suspended particles presents average values that overtakes aprox. 5 times CMA values .

From atmospheric pollutants emitted by industry, power stations and heat generation stations, the highest values expressed in thousands tones/year corresponds for CO₂, NO_x, dust sedimentation and suspended particles, hydro), industrial, municipal, domestic and agricultural wastes. (See table 4.)

Table 4. Air pollution sources

Nr.	Polluting unit	Generated pollutants in tones/year								
		Aldehyd.	CO	CO ₂	Hydrocarbons	NO _x	Organ. Subst.	Suspended particles	SO _x	Dust
1.	S.C. UCT. S.A. TURDA	0.175	0.022	7,352.766	2.351	22.976	0.145	0.874	0.034	0
2.	S.C. CIMENTUL S.A. TURDA	3.45	0.458	143,842.6	46.027	449.504	4.6	17256	0.687	26,290.56
3.	S.C. IZOCER S.A. TURDA	0.091	0.011	3,820.604	1.221	11.938	0.121	0.457	0.017	0
4.	S.C. IZOMAC S.A. TURDA	0.097	0.011	4,184	1.336	13.074	0.732	0.48	0.017	14.18
5.	S.C. ELECTROCERAMICA TURDA	0.099	0.01	4,338	0.682	6.054	0.135	0.517	0.017	0
6.	S.C. TURDEANA	0.023	0.002	1,010	0.322	3.155	0.031	0.12	0.003	0
7.	S.C. CASIROM TURDA	0.198	0.026	8,343.232	2.65	26.071	0.256	0.999	0.038	190.4
8.	S.C. STICLA S.A. TURDA	0.527	0.068	22,056	7.054	68.924	0.697	2.644	0.107	0
9.	S.C. TURDALACT.	0.026	0.003	1,118	0.357	3.493	0.035	0.134	0.005	0
10.	R.A. TRANSPORT LOCAL	0.01	0.001	440	0.14	1.375	0.01	0.052	0.002	0
11.	S.C. CARPIMEZ	0.002	0.011	120	0.049	0.43	0.003	0.014	0.011	0.143
12.	S.C. AGROMECC. TURDA	0	0	24	0.007	0.075	0	0.002	0	0
13.	HOSPITAL	0.041	0.004	1,777	0.568	5.552	0.056	0.212	0.007	0
14.	S.C. TURDEANA	0.025	0.002	1,100	0.351	2.763	0.034	0.131	0.005	0
15.	S.C. TURDAPAN	0.005	0	260	0.082	0.812	0.007	0.03	0	0
16.	S.C. TRANSARIES	0.013	0.01	560	0.179	1.75	0.017	0.067	0.02	0
17.	R.A. TERMOFICARE	1.307	0.171	5,4727.04	19.511	168.885	1.743	6.561	0.363	0
	TOTAL	6.089	0.81	255,073.2	82.887	786.831	8.622	17,269.294	1.333	26,495.283

Also, the soils from the whole zone are polluted by atmospheric depositions of dust sedimentation and acid precipitation resulted from NO_x and SO_x in nitric and sulphuric acid, that causes the contamination of underground water from zone.

Water pollution of Arieş river is significantly in the superior basin because of mining activities of nonferrous ores extraction and processing from the Apuseni Mountains perimeter. At this is added the waste industrialized, municipal waters and also the pluvial waters that continuously collect and concentrate the pollutants from air and soil.

By analyzing the statistical dates is established in the last years the change tendency of the agricultural fields uses from zone, decreasing of the arable field areas and the increasing of the pastures and hayfield weight. (See Table 1a, 1b).

This phenomenon is explained by the lack of material means of cultivation- maintenance of the arable land, characteristic situation for the transformations in the transition period.

The phenomenon of decreasing of the soils qualities, associated with decreasing of the fodder production by ecological disturbances and the negative effects of zone pollution are factors that induced the increase of the pastures and hayfield areas, breeding has the principal weight in assuring of the subsistence of the rural population.

In the last few years are constituted fluctuations of the socio-economical components in zone with altering of the relationship between urban centers and outlying districts, linked by the population dynamic by concentrations, dispersions, centralization and decentralization. In the view of agricultural economy weight, modifications are

made by changing of land uses, decreasing of the vegetal and animal production.

A dominant characteristic is the process of perturbation-inhibition of the vegetal herbaceous

layer correlated with the decreasing of the soil quality in the studied perimeter and the increasing of the affected areas by different forms of the natural and antropic risks.

Table 5. The wastes situation

Polluting unit		Waste quantities (t/year)		
		Produced	Utilised	Stored
TURDA	Electroceramica	270	0	270
	Uzinele Chimice	330	323	0
	Cimentul	24,912	15,446	9,466
	Casirom	1,054	964	110
	Izomac	163	0	162
	Sticla	1,265	94	136
	Agrocom	7,000	7,000	0
	Hospitals	4,000	4,000	0
	Turdalact	9	9	0
	Izocer	243	77	140
	Turdeana	547	547	0
RAGCL	50,046	50,046	0	
Total TURDA		99,797	79,506	10,014
CÂMPIA TURZII	Industria Sârmei	135,841	96,417	39,424
	Cercon Arieşul	31,387	31,387	0
	RAGCL	550	550	0
Total CÂMPIA TURZII		167,778	128,354	39,424
Total Area		267,575	207,860	49,438
TOTAL JUDEȚ CLUJ		68,037	293,787	385,054

Correlation between pollution phenomenon and the spontaneous flora extent

In Turda Câmpia-Turzii area, agricultural and industrial antropic activities caused disturbances in vegetal biocenosis, by disappearances of some species of great scientifically value and of the complexes of vegetation.

Because of the intense antropic pressure, in the area of Arieş cuesta (Câmpia Turzii-Viişoara-Luncani), that includes a large surface, with a different mosaic of vegetal associations of steppic-xeric type, have disappeared in the last time a series of vest-paleartic elements, from that we mention: *Nepeta ucrainica*, *Centaurea trinervia*, *Astragalus aspis*, *Iris pontica*, *Astragalus vesicarius*, *Goniolomon tataricum*, *Hesperis tristis*. Lopoşa hill, represents the area where has been describes the endemic subspecies *Astaragalus excapus* ssp. *Transsilvanicus*, that in present day are almost disappeared. In Băile Sărute Turda spa area, because of its specific character, are included a series of halophyte continental elements, and the most valuable is the endemic tansilvano-pannonica *Plantago schwarzenbergiana* species, that has

disappeared in the surrounding areas because of the intensive grazing.

In the Arieş river meadow area, that includes a series of eutrophic peat-bog eyes, where some decades ago, acad. Emil Pop pointed out the boreal Nordic nemoral *Angelica palustris* species, at the lowest altitude from the country, that now has disappeared.

In the limestone massifs area from Petreşti-Sânduleşti zone, that includes Cheile Turzii and Cheile Turenilor which are in reservations regime, have been recorded loses of valuable calcophile species like as: *Centaurea stoebe* ssp. *Umbrosa* and *Scutellaria supina* that have disappeared, while the *Spiraea hzpericifloia*, *Sorbus dacica*, *Taxus baccata*, *Iris arenaria* and *Dracocephalum austriacum* species are in danger.

Conclusion

In the last decades, the area Turda - Campia Turzii has been subjected to an intense antropic pressure, manifested through an intense industrial pollution which affected all the environmental compartments.

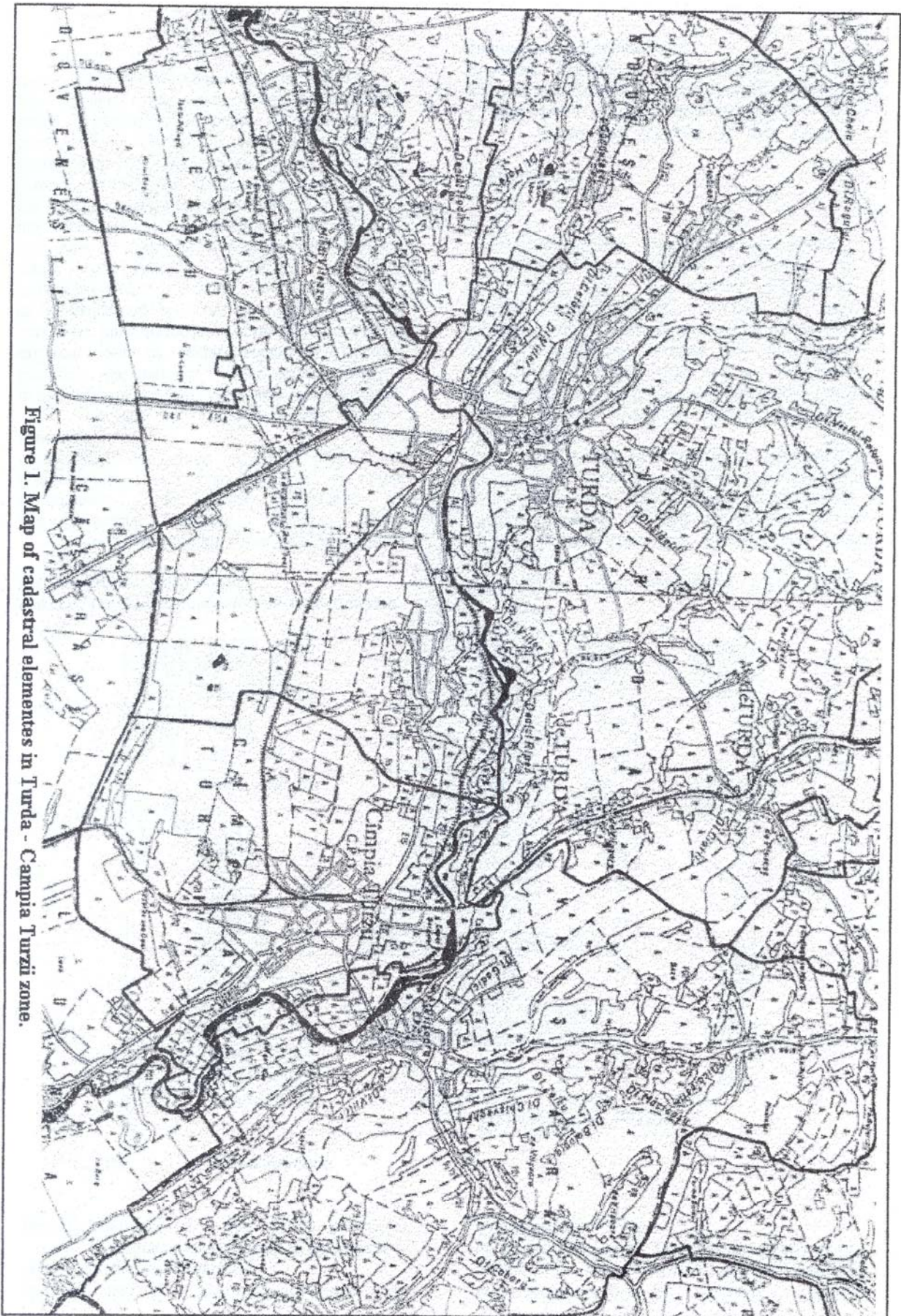


Figure 1. Map of cadastral elements in Turda - Campia Turzii zone.

The prolonged and continuous pollution of the atmosphere led to changes in the terrestrial ecosystems, manifested through the decreasing of the photosynthesis process of the green plants, decreasing of the biosyntheses of the organic substances, different degrees of phytotoxic effects, disappearance of the sensitive species, decreasing of the primary productivity with the diminishing of the quality and quantity of the fodder and animal production.

There have been recorded social-economical effects related to the migration of the population from the rural areas to the cities, and to the changes of the land use.

The pollution of the surface water in the Aries watershed, and of the underground waters affected the aquatic ecosystem as well as the human health.

There are highly requested measurements for mitigation of the industrial pollution through implementing of nonpolluting technologies, use of the existing pollution control technologies, plantation of green areas and agrotechnical measures to improve the quality of the hayfields and pastures, the soil fertility and to reduce the risks caused by landslides, soil erosion and soil degradation through salinisation due to the presence of salt in the subsoil.

Bibliography

Adriano, D., C., Johnson (1997), Acid Precipitation, Biological and Ecological Effects, Springer, Verlag Publ.

Diaz, L., Savage, G., Eggerth, L., Golueke, Cl., (1996), Solid Waste Management for Economically Developing Countries, CalRecovery, Hercules, USA.

Fărcaș, I., (1976), Zona industrială Turda-Câmpia Turzii. Studiu bioclimatic. Teză de doctorat, Cluj-Napoca.

Mac, I., Irimuș, I., (1991), Zone susceptibile fenomenelor geomorfologice de risc în sectorul căii ferate Apahida-Câmpia Turzii, Studia UBB, Geogr., 36, nr. 1, Cluj-Napoca.

Nyarady, E., J., (1939), Enumerarea plantelor vasculare din Cheia Turzii, București.

Prodan, I., (1931), Flora Câmpiei Ardelene, Bul. Acad. de Agric., 2, Cluj.

Schur, J., (1868), Enumeratio plantarum Transilvaniae Vindoborae.

Țuca, I., (1973), Vegetația pajiștilor xerofile din SV-ul Câmpiei Transilvaniei. Teză de doctorat, Institutul Agronomic București.