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Ambient air quality issues in Timisoara in the context of atmosphere protection as a result of site organization within residential areas

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Abstract: After 1990, when the land was restitute and it was released for free circulation, has been found the trend to reactivate the periurban area of major cities, like as Timisoara. This trend of chaotic development, the necessity of a complex approach to the problem controlled in terms of urban and environmental protection needs. It requires the intervention of responsible organizations, from the elaboration of the habitation policy, to general and zonal plans of urbanism. It is necessary to provide in the urban development plans the possibility of having these dwelling areas in periurban areas with all issues arising from it: road networks and direct communications, rapid transportation, utilities and facilities, green areas, maintenance areas surrounding residential neighbourhoods.

Keywords: periurban area, habitation policy, green areas, residential area.

1. INTRODUCTION

A common post-revolution phenomenon in Romania is the proliferation of residential neighbourhoods, made for the benefit of residents of large cities, but on the administrative territories of the communities from the vicinity. These neighbourhoods typically represent "second home" or "holiday accommodation", located to some elements of natural interest area - rivers, lakes and forests or represents the desire and the possibility of some of the inhabitants of big cities to retire the outskirts of cities to benefit from a dwelling more advantageous in terms of surface and silence.

The world civilization is forced to move toward a new development model based on the concept of sustainable development [1], and the construction of housing estates on the outskirts of big cities tends to be a solution to the problem of housing development.

The local authorities and developers of urbanism documentation were faced with a fait accompli, having to include these spaces in existing built-up area, as bodies of building. It often these residential areas do not receive the necessary utilities – road access, water supply, gas, sewerage, telecommunications, public transport and some minimal facilities [2].

But even if when these utilities minimum are satisfied, the zone around these neighborhoods lacking. These most often lacks even caring to those who have set up homes in those areas, they were stored building materials needed and left surplus excavated earth to surrounding areas, do not care for green spaces around houses and grow natural vegetation, etc.

2. MATHERIALS AND METHODES

An important problem for the atmospheric pollution is the particles with aerodynamic diameter less than 10 micrometers, passing through the nose and throat and penetrates into the pulmonary alveoli causing further inflammation and allergies.

To be determined these particulates have been standardized methods to make their analysis:

- Reference method for the sampling and measurement of PM10 is stipulated in SR EN 12341 - Air quality [3].
- Reference method for the sampling and measurement of PM2.5 is stipulated in SR EN 14907 - ambient air quality [4].
- Load limit values for air particulate matter are presented in Law No. 104 from 2011 regarding the quality of the surrounding air [5].

3. RESULTS AND DISSCUSSIONS

Now we see an uncontrolled development of peripheral areas. There alternate unsanitary living areas, poor neighbourhoods or old homes, with luxury residential areas with various improvised solutions to energy and water supply and sewerage system solution. It finds a real assault on the natural environment tending gradually to destruction. In contrast with these area it meet the fields of garbage, true areas of infection, or giant industrial sites that are in an advanced state of decay that occupy large areas of land.

Local authorities must change their attitude towards these areas that could be a potentially important in the context of sustainable development.

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The trend of (re)ruralisation is evident in small and medium towns [6] and it manifests by giving up the urban facilities (water supply, heating) - which became too expensive for some urban residents, or by a significant flow of return migration and uncontrolled urban expansion outside space for housing, where they are lacking the most basic rule of facilities (both prosperous areas and poor areas) [7].

At national level, in the period 1990-2012 it was observed a decline in urban population in large cities (over 100 000 inhabitants) and reducing the number of medium sized cities (between 20 and 100 thousand inhabitants) after their demographic decline. In parallel an increase in the number of small towns (less than 20 thousand inhabitants) it was observed, as well as their total population. These trends are caused by a negative natural increase of population migration from cities to the rural area (as a result of industrial restructuring) or periurban areas, especially in areas of major cities including polarization in small towns in this area (see table 1) [7]. One such centre of polarization is Timisoara, where, in the period 2005-2015 it was reveals an insignificant decrease of population (0.25%), according to data from the National Statistics Institute.

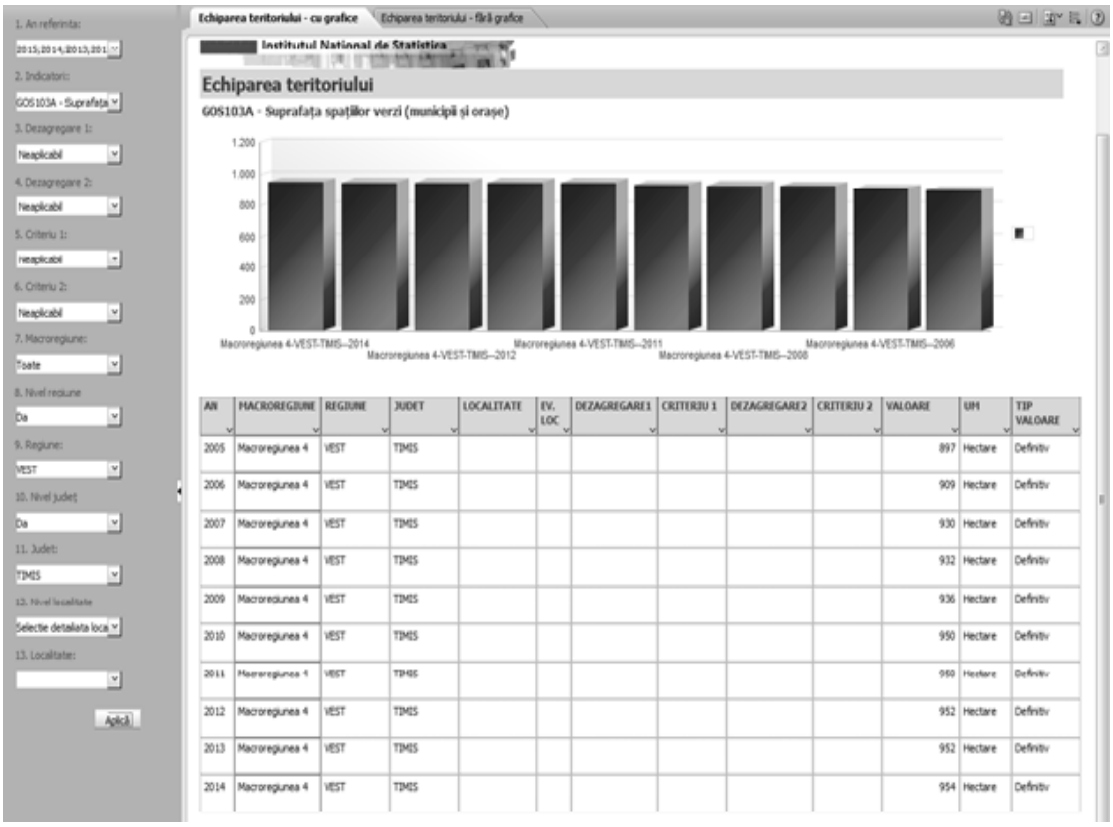
For a harmonious development of the residential areas - urban or periurban – the problem is to provide the necessary utilities and creating or maintaining green spaces sufficiently developed and arranged.

Table 1. Evolution of administrative - territorial division

Evolution of administrative - territorial division (1968-2012)		1968	2012
Urban	Municipalities	47	103
	Cities	189	217
	Total	236	320
Rural	Village	2561	2861

The green areas represent a functional category in the localities whose specific is determined primarily by vegetation and secondly by the building, including equipping for cultural and educational activities, sports or recreation.

In recent years the increasing of green space is insignificant. This was determined on the one hand, by the lack of involvement of local administrative authorities, the increased activity in the construction sector, and on the other hand, by the attitude of the population. The situation of its existing green spaces and recreational areas at national level is unsatisfactory. In Timis for example in 2005 there were 897 ha occupied by green spaces, while in the year 2010 there were inventoried 950 ha and 954 ha in the year 2014 [8].



AN	MACROREGIUNE	REGIUNE	JUDET	LOCALITATE	EV. LOC	DEZAGREGARE1	CRITERIU 1	DEZAGREGARE2	CRITERIU 2	VALOARE	UM	TIP VALOARE
2005	Macroregiunea 4	VEST	TIMIS							897	Hectare	Definitiv
2006	Macroregiunea 4	VEST	TIMIS							909	Hectare	Definitiv
2007	Macroregiunea 4	VEST	TIMIS							930	Hectare	Definitiv
2008	Macroregiunea 4	VEST	TIMIS							932	Hectare	Definitiv
2009	Macroregiunea 4	VEST	TIMIS							936	Hectare	Definitiv
2010	Macroregiunea 4	VEST	TIMIS							950	Hectare	Definitiv
2011	Macroregiunea 4	VEST	TIMIS							950	Hectare	Definitiv
2012	Macroregiunea 4	VEST	TIMIS							952	Hectare	Definitiv
2013	Macroregiunea 4	VEST	TIMIS							952	Hectare	Definitiv
2014	Macroregiunea 4	VEST	TIMIS							954	Hectare	Definitiv

Figure 1. The surface of green space in 2005-2014, Timis county

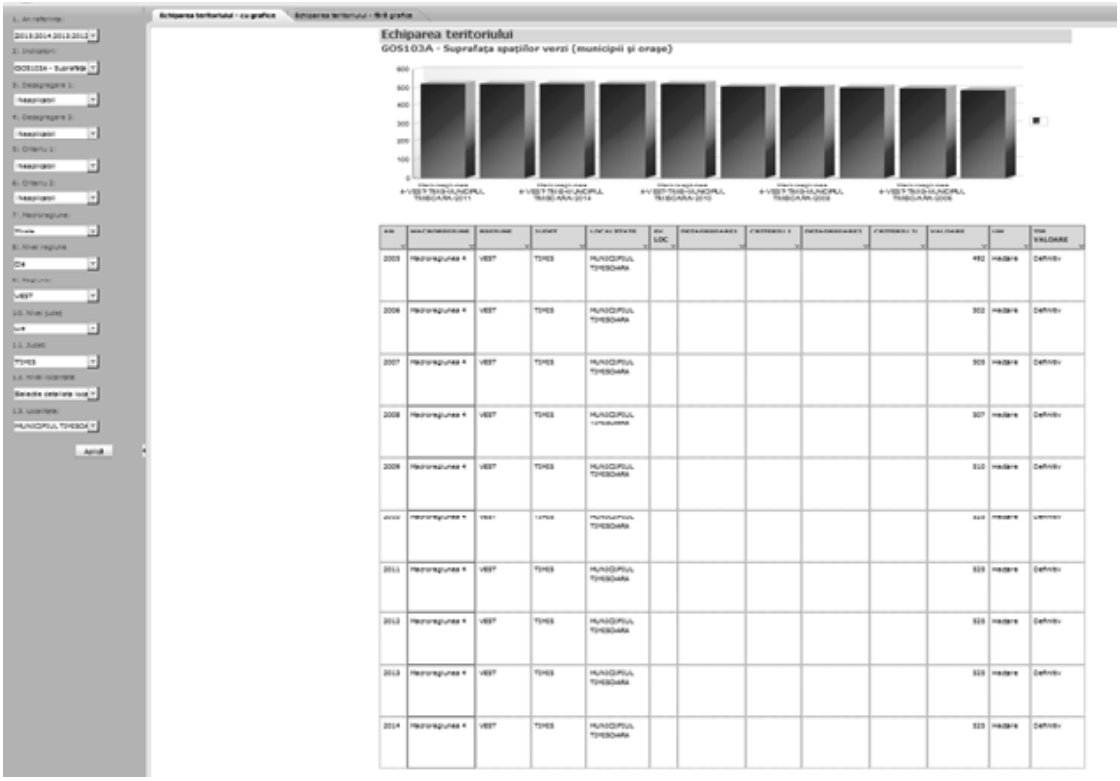


Figure 2. The surface of green space in 2005-2014, Timisoara

Compared to Timisoara, the growth surface occupied by green spaces is small, from 492 ha in 2005 to 525 ha in 2014.

From an ecological perspective, urban green spaces are a real moderator of the impact of human activities on the environment. They have an important contribution to atmospheric chemical treatment. In addition to chemical treatment of the atmosphere, that maintaining the day - night balance for the production of oxygen, the vegetation performs a physical treatment by retaining dust and particulates. In parallel with chemical and physical treatment of the atmosphere, the vegetation performed a bacteriological purification thereof, destroying a large part of microorganisms through the process of evolution of oxygen and ozone, particularly the conifers, but not only. The vegetation plays a vital role in moderate climate areas.

In the middle of the cities, the buildings and paved surfaces or concrete creates a specific urban environment with higher temperatures and air circulation restriction, which leads to the production of so - called effect of "heat island". In contrast to this, the vegetation through shading and increasing humidity helps to create a more comfortable environment. The rich vegetation contributes to increased 7 to 14 percent relative humidity with parks and forests, with beneficial effects on surrounding areas [2].

Another benefit of the vegetation is the attenuation of noise.

Green spaces, especially the compact green spaces are a really barriers for noise, contributing significantly to reducing their level, during the growing season. Some research shows that noises, that reach urban intensities between 40 and 80 decibels, can be halved in case of curtains tree with a width of 200-250 m. Green spaces, when they are natural one, serve to preserve and perpetuate the natural vegetation from the areas where are located cities by providing and preserving habitats for different species, which can sometimes have greater diversity than in habitats rural.

Report to the population, the green spaces allocated per habitant is not encouraging in Timisoara city and periurban areas because European rules provide a level of 17 to 26 square meters of green areas per inhabitant, value untouched so far in the pole of growth Timisoara. In Timisoara this value level is 14.70 square meters / inhabitant in 2005, 15.68 sqm / inhabitant in 2010 and 15.72 square meters / inhabitant in 2015 [Statistical Yearbook].

Another important aspect as the quality of life and living space is the protection of air breathed by residents, which includes qualitative aspects of the air.

In the context of the atmosphere protection, the most pressing problem for Timisoara is the increaser amount of immissions of particulate matter (PM10), so the air quality monitoring is one of the main priorities of local authorities.

A major amount of particulate matter PM10 (10 micrometers in diameter) come from construction activity worksite / demolition / municipal household work, activities that need to be regulated in order to reduce dust pollution of the environment.

Table 2. Limit and target values for the air pollution with particulate matter

Law No. 104 from 2011 regarding the quality of the surrounding air Particulate matter PM10	
Limit values	50 $\mu g/m^3$ - daily limit value for human health protection
	40 $\mu g/m^3$ - annually limit value for human health protection
Law No. 104 from 2011 regarding the quality of the surrounding air Particulate matter PM2.5	
Target value	25 $\mu g/m^3$ – annually target value
Limit values	25 $\mu g/m^3$ – annually target value that it must to be reached until 1 January 2015
	20 $\mu g/m^3$ – annually target value that it must to be reached until 1 January 2020

09/11/2016	TM-1	TM-2	TM-3	TM-4	TM-5
Ora	PM10 - aut (µg/m³)	PM10 - aut (µg/m³)	PM10 - aut (µg/m³)	PM10 - aut (µg/m³)	PM10 - aut (µg/m³)
01:00	34.7458	26.1345	24.0614		824.806
02:00	35.9944	25.7263	24.8659		825.983
03:00	33.9076	25.3296	22.2157		826.377
04:00	23.7514	21.257	20.8627		825.807
05:00	21.4566	20	21.3743		826.086
06:00	23.3547	19.8627	21.8575		826.235
07:00	26.8855	20.5154	21.0866		826.37
08:00	24.1541	20.1704	21.8711		827.22
09:00	24.6303	20.5447	20.595		825.359
10:00	25.6285	20.6816	19.7626		824.727
11:00	21.6022	19.2905	16.7242		824.964
12:00	15.3547	17.3249	16.2725		825.704
13:00	17.9804	18	17.095		825.185
14:00	21.4652	19.5182	16.905		27.6283
15:00	31.2073	19.6723	17.6863		23.229
16:00	26.7793	17.6751	16.5894		22.1369
17:00	30.3296	17.8599	17.6267		22.5866
18:00	34.8073	20.4553	18.6602		23.2228
19:00	35.1452	26.493	20.3081		24
20:00	38.0252	25.4426	23.9525		24.8994
21:00	40.3081	27.2297	23.4497		26
22:00	44.0616	27.5938	27.4944		25.0531
23:00	41.3883	26.4609	26.7235		26.1285
24:00	40.3398	25.1811	25.9804		25.919

Figure 3. PM10 values recorded in Timisoara [8]

We present the data recording for the PM10 fraction of particulate matter to air pollution.
The values of PM 10 at TM 3 station, October =17.99
The values of PM 10 at TM 3 station, November =20.87
The values of PM 10 at TM 2 station, October =19.22
The values of PM 10 at TM 2 station, November =21.18
The values of PM 10 at TM 1 station, October =29.02
The values of PM 10 at TM 1 station, November =34.44
The values of PM 10 at TM 4 station, October =33.21
The values of PM 10 at TM 4 station, November =43.77

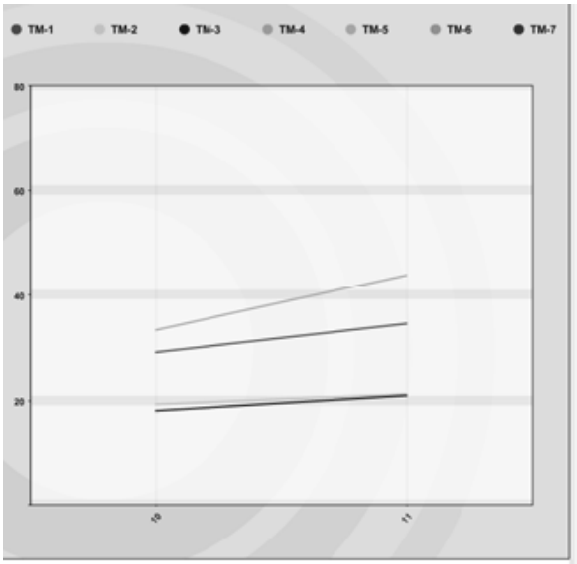


Figure 4. Monthly data for PM10 parameter

None of daily values recorded for PM10 not exceed the limit value set by law, but still represents a potentially infringing on human health.

4. CONCLUSSIONS

At the planning of residential areas it must to consider all the issues relating to the operation of these areas: physical accessibility, provide of urban infrastructure and minimal equipment as stipulated rules, not ultimately ensure the protection of atmospheric air.

The environmental impact by expanding urban ecosystems is because most of the population lives in areas bordering without providing basic services (drinking water, sewage, waste collection and treatment, adequate housing, healthcare, food and energy).

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