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EVALUATION OF TERRITORIAL CONFLICTS CAUSED BY RESIDENTIAL EXPANSION IN BUCHAREST SUBURBAN AREA. CASE STUDY: VOLUNTARI CITY

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Contents:

1. INTRODUCTION.....	73
2. METHODS.....	73
3. PROBLEM FORMULATION.....	74
4. STUDY AREA.....	74
5. RESULTS AND DISCUSSION.....	76
6. TERRITORIAL CONFLICTS EVALUATION.....	76
7. DIMENSION OF THE RESIDENTIAL AREAS IN THE PROXIMITY OF GAS STATIONS.....	77
8. CONCLUSIONS.....	79
9. ACKNOWLEDGEMENTS.....	80
10. REFERENCES.....	80

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Evaluation of territorial conflicts caused by residential expansion in Bucharest suburban area. Case study: Voluntari City

Constantina Alina Tudor

L'évaluation des conflits territoriaux causés par l'expansion résidentielle dans la zone périurbaine de Bucarest. Étude de cas: La ville Voluntari. L'aménagement territorial de l'espace aide les diverses utilisations du terrain à s'associer sans causer des dysfonctionnements ou des conflits. Dans la zone suburbaine de Bucarest les erreurs d'approche dans l'aménagement du territoire ont changé dans ces dernières années sa physionomie, particulièrement grâce au développement imprévu des zones résidentielles. Les conséquences de la consommation accidentelle de l'espace dans la ville Voluntari décrit un espace défavorisé par la complexité des problèmes environnementaux qui apparaissent. À cet effet ont été appliquées des méthodes pour évaluer la taille des conflits territoriaux causés par le développement imprévu des espaces résidentiels dans moins de 15 m des stations de distribution de carburant. Les résultats ont mis en évidence spatialement et quantitativement les zones en conflit, en suggérant l'emplacement imprévu des espaces résidentiels comme la principale conséquence de la création des voisinages incompatibles avec les stations de distribution de carburant. Les conflits territoriaux continuent à croître, leur identification et leur évaluation étant la solution de démarrage de nouvelles stratégies pour une bonne planification de l'espace avec un impact positif sur la qualité de l'environnement et du logement.

Mots clés: les conflits de localisation, écosystème urbain, la qualité de l'environnement.

Evaluarea conflictelor teritoriale generate de expansiunea rezidențială din zona suburbană a Municipiului București. Studiu de caz: Orașul Voluntari. Planificarea teritorială a spațiului ajută diferitele moduri de utilizare a terenului să se asocieze fără a provoca disfuncționalități sau conflicte. În zona de influență a Municipiului București greșelile de abordare în planificarea teritoriului i-au modificat fizionomia în ultimii ani, în special datorită dezvoltării neplanificate a spațiilor rezidențiale. Consecințele consumului întâmplător de spațiu în orașul Voluntari conturează un spațiu dezavantajat de complexitatea problemelor de mediu care apar. În acest scop au fost aplicate metode de evaluare a dimensiunii conflictelor teritoriale generate de dezvoltarea neplanificată a spațiilor rezidențiale la mai puțin de 15 m de stațiile de distribuție carburanți. Rezultatele au evidențiat spațial și cantitativ arealele conflictuale, sugerând amplasarea neplanificată a spațiilor rezidențiale ca principală consecință a creării vecinătăților incompatibile cu stațiile de distribuție carburanți. Conflictele teritoriale continuă să ia amploare, identificarea și evaluarea lor fiind soluția pentru demararea unor noi strategii de planificare corectă a spațiului cu impact pozitiv asupra calității mediului și locuirii.

Cuvinte cheie: conflicte locaționale, ecosistem urban, calitatea mediului.

1. INTRODUCTION

Suburban area represent an area surrounding an urban center [1], characterized by the expression of the relations with the city due to human character transfer and bringing functions in city support [2]. In Bucharest suburban area, the rapid development of residential and commercial areas around the cities [3], negative externalities [4], the dynamic of land use changes [5], political indecisions [6] and assimilation of peripheral functions within the city [7], are the main causes of territorial conflicts, with direct projection on environmental factors [8], infrastructure development [9], population comfort and behavior [10].

Territorial conflicts between different lands use types [11], particularly between residential area and commercial areas are omnipresent in the socio-economic systems and have not received sufficient attention in territorial planning [12].

Compatibility identification and assessment of current functions reveal the importance of territorial planning. The main purpose of territorial planning is avoiding malfunctions and stopping 'cancerous' urban sprawl, replacing malfunctions with a redesigned [13] and restructured [14] sustainable urban landscape.

2. METHODS

The analysis used the orthophotoplans, the scale: 1: 5000, made in 2005. Information extracted from these plans relates to land use of Voluntari city, the polygons surface represented by the gas stations and residential areas, to which attributes were attached (dwellings height and type: individual or collective).

General data about gas stations were extracted from administrative flow (gas stations establishment year, tanks' number and capacity, total capacity of throughput gasoline) and from direct observations (number and height of individual and collective dwellings in the neighborhood of gas stations, the presence of oil slicks at gas stations and also of green spaces).

The impact delimitation and dimension of conflict areas were established using Buffer and Clip software functions of ArcGis 9.3, to which updated information regarding residential development in the last five years were added. This information was obtained through Google and Bing applications. Buffer is a GIS function that "builds a new object or objects by identifying all areas that are within a certain specified distance of the original objects"[15]. Buffer analysis resulted in buffer zones, 15 m around gas stations, in accordance with the legal distance established by Order 536 of June, 23, 1997 [16]. Quantitative data were obtained using Clip function, which by extracting, established a set

of polygons that allowed the identification of surface inhabited areas, negatively influenced by the proximity of the gas stations.

3. PROBLEM FORMULATION

Changes that influenced the Bucharest suburban area during the past years were caused by land use modifications and residential areas construction in an unsustainable manner. Access to main roads, land price, green area (suburban forests) and aquatic areas are the main criteria for the individual or collective dwellings location in Bucharest suburban area. These advantages have generated malfunctions in term of environmental and housing quality, mainly due to functional heterogeneity and incompatible association between residential areas and conflicting functions.

4. STUDY AREA

Voluntari city is located in Romanian Plain, in Vlășia Plain division, between the rivers Colentina and Pasărea. The relief is generally flat, slightly fragmented by the existing river (Saula River) [17].

From the climate perspective, Voluntari city is situated in a temperate-continental climate, with slight excessive nuances (average annual temperature 10.7°C and average annual precipitation 609 mm, recorded at Afumați meteorological station), characterized by temperature variations over the four seasons. An important role in the atmosphere pollution dynamics is the wind speed (3.2 m/s at Afumați station) and thermal stability.

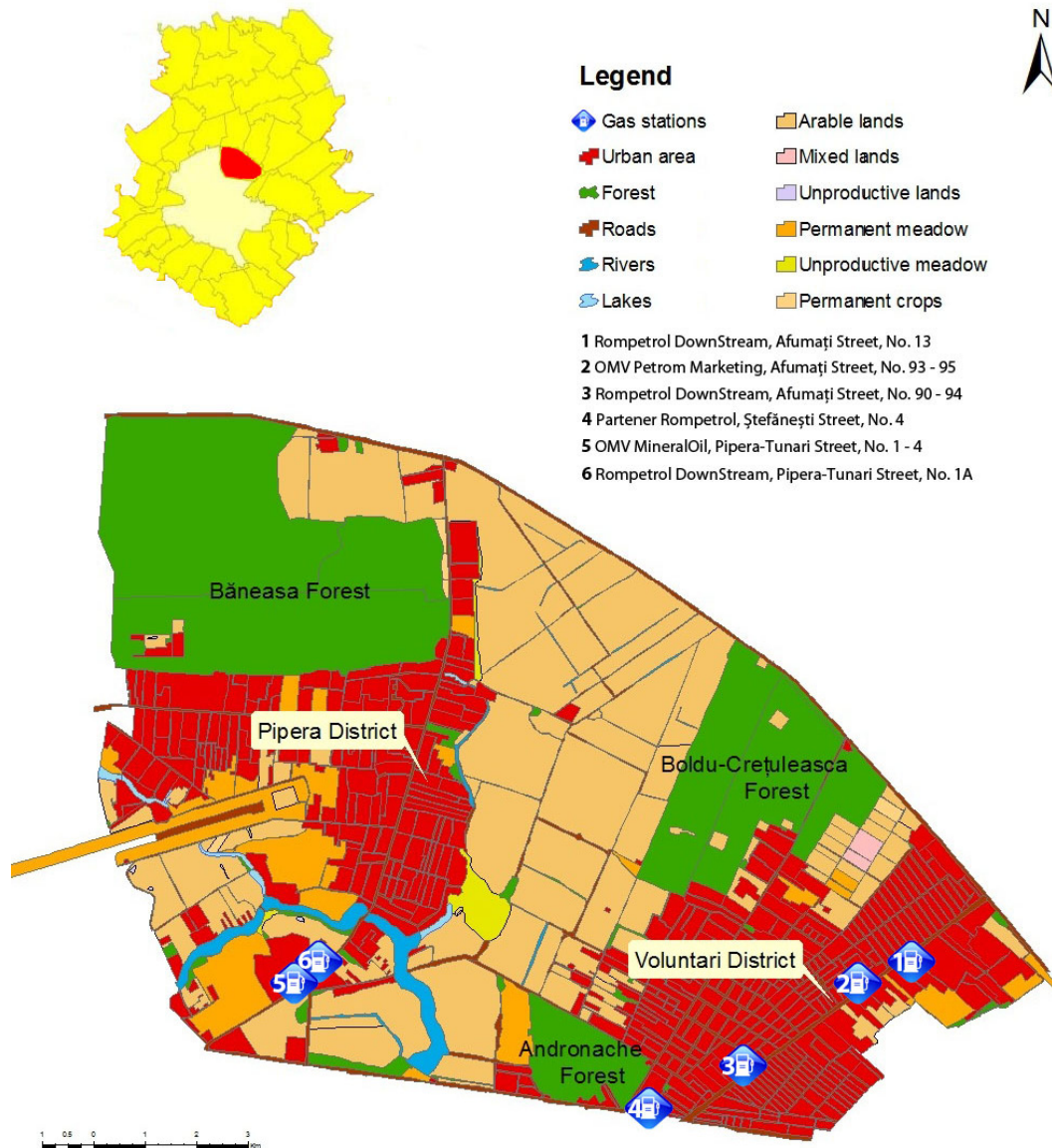


Fig. 1 Land use in Voluntari city

The transformation of agricultural land use to residential and commercial use has become a pressure factor [18] on environment quality and housing safety.

The local administrative unit (LAU2) has an area of 3733.12 hectares, characterized by a high degree of human intervention due to urbanization, green areas systematization and forest planning (Fig. 1). The extensive area of agricultural land in Voluntari city (226.29 hectares in Voluntari District and 966.22 hectares in Pipera District) allowed the expansion of constructed areas. Excessive land fragmentation and removing agricultural land from the circuit determine a high environmental pressure.

5. RESULTS AND DISCUSSION

In Voluntari there are six gas stations (four gas stations in Voluntari District and two gas stations in Pipera District), with a total area of 1.10 hectares.

Urban development in recent years and the need for space led to residential areas expansion near the existing gas stations established in 1996, 1998 and 2002 (Table 1). This residential development model was adopted throughout the entire local administrative unit, residential neighborhood of gas station becoming a potential source of environmental pollution [19].

6. TERRITORIAL CONFLICTS EVALUATION

In the study area, landscape heterogeneity can easily be observed through the proximity between residential areas and gas stations. The weight of residential area that exceed the legal limit is 2.56% (Rompetrol Downstream, Afumați St, 13), 6.05% (OMV Petrom Marketing, Afumați St, 93-95) and 0.18% (Rompetrol Downstream, Afumați St, 90-94).

Direct correlations (0.76) between residential area and the year of establishment of gas stations in Voluntari empirically demonstrate that since 2002 the location of these gas stations followed peripheral areas of residential districts. However, the demand for space for individual and collective dwellings has determined their establishment in the gas station proximity (Fig. 2), which led to combination of two functions difficult to be managed in terms of quality of the environment.



Fig. 2 Residential areas location near gas stations

Indicators such as the number of tanks, their storage capacity, total capacity of throughput gasoline and number of pumps, help to quantify the gas stations' impact on the

surrounding areas. Gas stations with more than 2 tanks and a throughput gasoline capacity greater than 1000 mc, must respect specific recommendations about the location conditions and the safety distances to certain dwellings type. Rompetrol gas station, on Street Afumați, 13 is located in a heavily urbanized area. Correlated with the residential areas located in immediate neighborhood, this gas station has high capacity storage tanks (113 m³) and a large total capacity of throughput gasoline (1312 m³) (Table 1).

Table 1: Gas stations general characteristics

GAS STATION	Surface from gas station proximity (< 15) %		Establishment year	Tank number	Tank capacity storage (m ³)	Total capacity of throughput gasoline (m ³)
	Residential area	Non-residential area				
Rompetrol DownStream, Afumați St., 13	2.56	97.44	1996	6	113	1312
OMV Petrom Marketing, Afumați St., 93-95	6.05	93.95	1998	2	120	1471
Rompetrol DownStream, Afumați St., 90-94	0.18	99.82	2002	4	240	2000
Partener Rompetrol, Ștefănești St., 4	0	100	2002	2	80	1350
OMV Mineraloil, Pipera-Tunari St., 1-4	0	100	2004	3	160	3000
Rompetrol DownStream, Pipera Tunari St., 1 A	0	100	2004	3	180	1956

Three out of the six gas stations are located in residential area affecting individual and collective dwellings in close proximity through functionality and contextualism [20], so urban context has allowed this combination of incompatible functions.

7. DIMENSION OF THE RESIDENTIAL AREAS IN THE PROXIMITY OF GAS STATIONS

Rompetrol gas station is located on Afumați St., 90-94, in Voluntari District and determines a strong pressure on individual dwellings, especially due to increasing demand for space that allowed the annexation of these dwellings in the vicinity of Rompetrol

station. 16 individual dwellings, with height GF + 1 floor, 1 dwelling with GF + 1 floor + attic and 2 dwellings with only ground floor have been identified along Rompetrol stations, thus breaching the law. Affected areas in which individual dwelling are located is approximately 706 square meters (Fig. 3). In this area there is a functional heterogeneity due to the storehouses and commercial and residential spaces.

OMV gas station, on Afumați St., 93-95 is also poorly located in relation with residential areas. Residential areas affected by OMV functioning are collective dwelling varied in height. 1 block of flats with GF + 7 floors and other 3 block of flats with GF + 3 floors, GF + 4 floors and respectively GF + 6 floors were identified. Total surface of these collective residential areas is approximately 1725 square meters (Fig. 3)

The area is deficient in green spaces, with only four trees located in the vicinity of collective dwellings and residential congestion. Furthermore, this area does not allow the annexation of other green spaces to reduce effects of locational conflicts on the environment and also on human health [21].

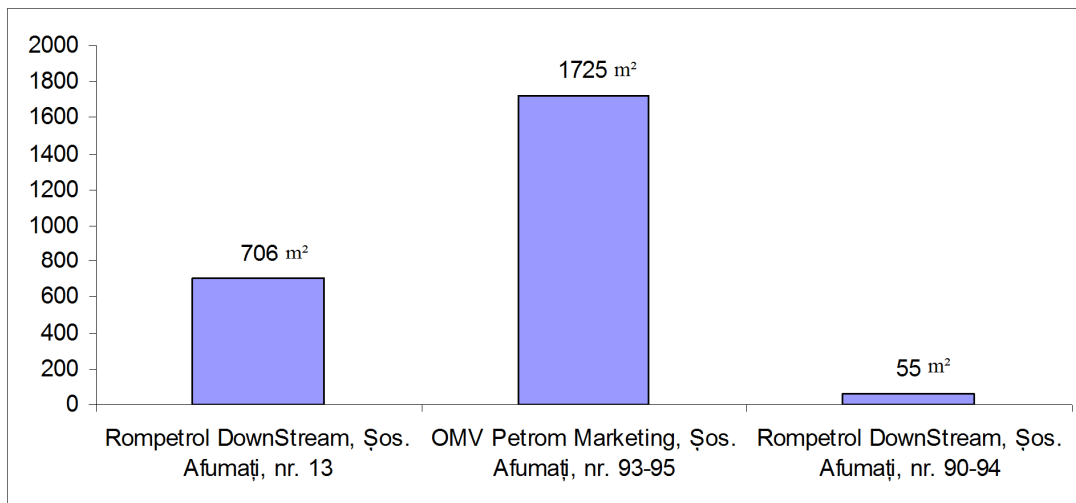


Fig.3 Affected residential area located at less than 15 m from gas station

Rompetrol gas station, located near Voluntari exist towards Bucharest, is different from the other stations. It is placed in an open space, where residential areas are scattered and green space from proximity mitigate the negative effects of this gas stations functionality.

Inhabited area affected by the Rompetrol station presence is 55 square meters (Fig. 3). In the area there are other dwellings under construction.

The open space area associated with nine trees and shrubs in the vicinity of Rompetrol station together with the green space of the Laboratory for Quality Control of Pesticides mean a better control of locational conflicts.

8. CONCLUSIONS

Gas stations from Voluntari, all together, generate malfunctions on both environmental factors and human health. Territory support capacity is exceeded, sustainable development policy is ignored, the infrastructure is overburdened and pollution on each environmental factor is increasingly difficult to manage in terms of environmental management in these areas. Thus the continuing evolution of these territorial conflicts leads to environment's degradation.

Strict demarcation of protection zones imposed to gas stations for safety of residential areas will avoid risks on population's health and on environmental quality.

Joining these two incompatible functions: gas stations and individual and collective dwellings has significant effects on air quality affecting population health and landscape aesthetic through failing of hygiene conditions. Moreover, the effects are amplified due to location of the gas stations along the National Road DN2, where traffic increase air pollution with different solid particles coated with various volatile hydrocarbons and lead, resulted from incomplete combustion of fuels in various cars engines [22].

If demand of living space increases more in Voluntari city, then there will be an expansion of residential areas in proximity of gas stations, which will not be compatible in terms of functionality and will create a strong footprint on the environment.

If the urban context is be respected, gas stations and residential area which will be built will take into account the urban compatibility and will be located in the Voluntari city outskirts, along the main road traffic. The urbanism principles will be respected as well as the commercial and social need without conflict with residential areas.

Consequently, uncontrolled urbanization must be stopped by identifying urban areas for potential development of sustainable functions.

Planning, prioritization and rehabilitation of affected areas by locational conflicts are fundamental to stop unplanned development and to understand the meaning of normality in these areas [23].

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