

Spatial analysis of locational conflicts

Case study: Locational conflicts generated by the expansion of built up surfaces in the northern area of Bucharest, Romania

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Introduction

Urban sprawl doesn't always accounts the carrying capacity of the land. At the same time the expansion of built up surfaces determines the accentuation of specific problems in human settlements, classified by Gill et al. [1] into cumulative (characteristic to human settlements but with greater dimension in cities – consumption of energy and raw materials, emissions of pollutants, modifications of environmental components) and systemic (due to the social, economical and environmental characteristics of human settlements – heat island, locational conflicts, absence of urban services ensuring safety, hygiene and health in the peripheral areas [2], absence of adequate infrastructure [3]).

A land use conflict represents a negative spatial interaction materialized through a rejection between a specific land use type and certain neighboring land uses determined by the existence of significant negative spatial externalities from economical, social, environmental or sanitary perspectives [4]. The main causes generating locational conflicts are represented by the competition for natural resources (eg. the use of land), the uneven distribution of costs and benefits emerged from the development process and the environmental impacts determined by land use changes [5] or by the current activities characterizing certain land uses. The characteristics and intensity of locational conflicts are determined by the scale at which the study is conducted.

The spatial distribution of certain incompatible land uses can generate unwanted impacts both on the residents and environmental components and can determine the development of inefficient human settlements [6].

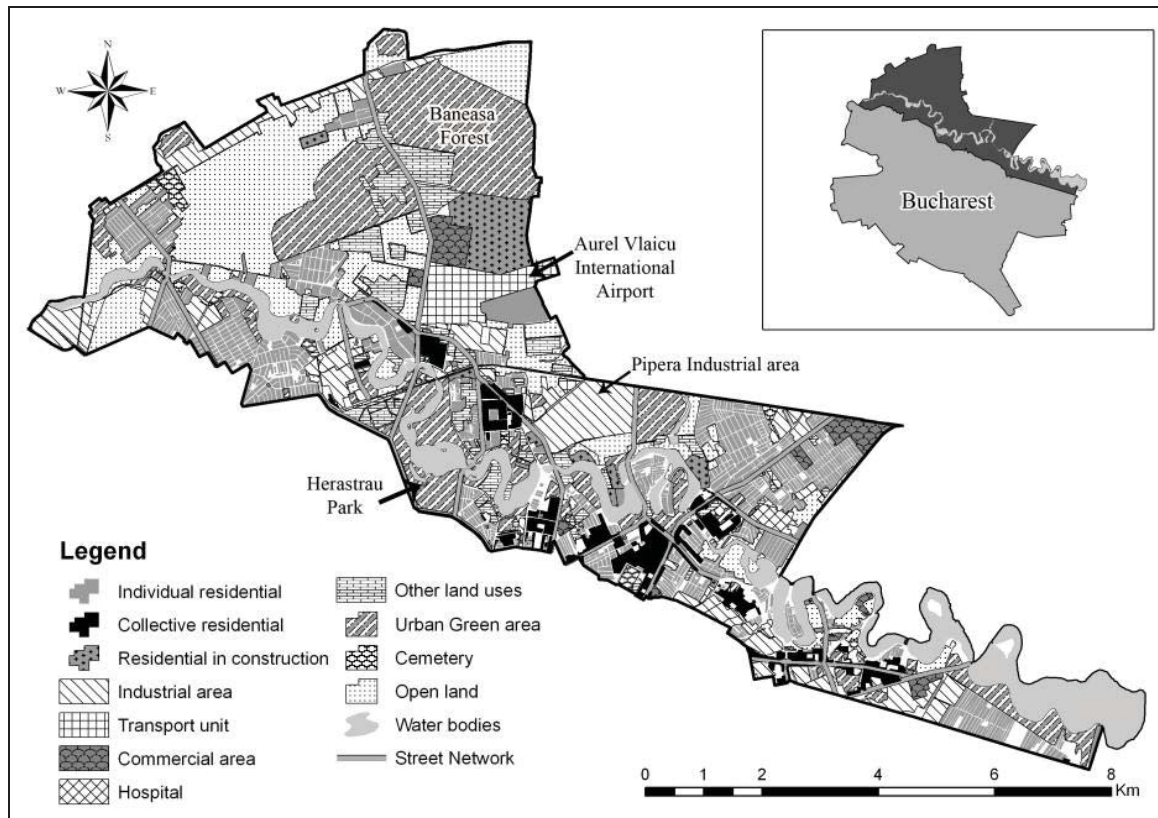
The main categories of land use conflicts studied at international level are focused on the association of residential areas with industrial areas, waste landfills, waste incinerators and the proximity effect on land prices.

In Romania, land use conflicts appeared mainly as a result of two historical periods: 1975-1990 due to the forced industrialization process carried out in the communist era (which lasted until 1990), and after 1990 as a result of the economical revival and the intensification of uncontrolled urban development that led to the replacement of agro-ecosystems by commercial, administrative and residential areas. The aim of this paper is to identify and analyze land use conflicts existing in the northern area of Bucharest and to spatially model their impact on the expanding residential areas. The main objectives are: 1) to analyze the dynamics of built up surfaces between 1975-2010; 2) to analyze the spatial and temporal dynamic of locational conflicts and 3) to spatially model the impact of locational conflicts on residential areas.

Study area

The study area, with a surface of 71,82 km², overlaps the northern area of Bucharest, the capital city of Romania, including 29,66 % of the city area, between the northern city limit and the first main street situated south of the lakes along Colentina River. This area was chosen for this study because of its privileged position (in the proximity of the main roads ensuring the link with the main week-end touristic area of Romania– Prahova Valley, and of the airports) and the favorable natural potential (Băneasa Forest, the lakes along Colentina River) that distinguished it as the area with the most intense phenomenon of built up surfaces expansion in Bucharest. This fact favored the emergence of locational conflicts, especially regarding residential areas.

In 2010, the main land uses encountered in the area were: 36.95% green areas (including urban parks, sport facilities, open air museums, urban forest, agricol areas, open land representing 18.8% of the study area and cemeteries – 0.71%), 11.06% water bodies (the lakes along Colentina River), 14.1% individual residential, 8.93 industrial area (partially in reconversion), 5.37% transport units (including Aurel Vlaicu International Airport, railways), 4.05% collective residential (of which 1.11% representing the built up surface), 2.79% residential in construction, 1.97% commercial areas, 0.4% hospitals and 13.98% other functions (education, administrative, roads, etc)



Map 1: Land uses in the study area (2010) (processing after cadastral surveys and aerial images)

Methodology

In order to analyze the impact of locational conflicts there were used topographical maps, scale 1:25000 from 1975, cadastral surveys and aerial images from 2005 with a medium resolution of 0,5 – 2 m. Information derived from aerial images was updated for 2010 by using the cartographical online applications developed by Google (<http://maps.google.com/>) and Microsoft (<http://www.bing.com/maps/>) and field trips. The digital database was realized in ArcGIS 9.3 (Environmental System Research Institute, California, CA). It contained information regarding the land use, extracted from the cartographical material and aerial images. This database was used to identify locational conflicts. The spatial analysis was realized using the ArcGIS and Idrisi Andes programs. The quantification of temporal and spatial land use changes, especially the evolution of built up surfaces was realized using the Land Change Modeler in Idrisi. The quantification of locational conflicts' impact on the residential areas was carried out through a proximity analysis implying the use of buffers. They had as parameters different distances, chosen according to current legislation, which vary depending on the impact intensity of the land uses producing externalities (airport, hospital, cemetery, industrial area). Through these buffers it was measured the surface of residential area exposed to a high, medium and low impact induced by the proximity of the above-mentioned land uses.

Results and Discussion

The diachronic analysis of the cartographic materials highlighted that the built up surface has continuously increased in the last 35 years in the northern area of Bucharest reaching a 43.94% in 2010. The surface of residential areas increased by a 19.77% from 1975 to 2010 and there has been recorded an important conversion from individual residential to collective residential (increase of 100% in collective residential). The industrial areas extended their surface by a 49% because of the emergence of new small industrial units. Compared with the reference situation (1975) there can be observed a reduction of green areas along Colentina River and agricultural land in favor of areas with residential and services function (mainly commercial).

By corroborating the information obtained through cartographic materials' processing with the field trips there have been identified the following locational conflicts: residential area - industrial area / area used for transportation purpose (railways, airport) / cemetery / hospital. The dynamic of all these types of conflicts was positive due to the increase in surface of the land uses that generate them.

The buffer analysis underlined that 82.06% of the residential areas in northern Bucharest are situated less than 1000m away from industrial areas, active or in reconversion, (30.38% at less than 300m). The residential areas under construction are affected only in proportion of 29,01% (7.17%) by this type of conflict, but instead 60.74% are situated too close of the airport (under 1000m). When accounting the whole residential area, the surface affected by the proximity of the airport represents only 16.47%, meanwhile hospitals affect 1.19% of the total residential area and cemeteries 1.92%. For all the types of conflicts, the affected residential surface increased compared with the one registered in 1975.

Conclusion

Despite the growing concern for a better spatial planning, especially in urban areas which are vulnerable to problems, the surface of residential areas affected by locational conflicts is increasing. This phenomenon is due to the failure of applying a strict legal framework, which could regulate the distribution and minimum distances between certain land uses and to a flawed process of reconversion.

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