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TOPOGRAPHIC SURVEY SUPPORT FOR ZONAL URBAN PLAN DEVELOPMENT: A CASE STUDY OF GIARMATA-VII, TIMIȘ COUNTY, ROMANIA

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Introduction

Peri-urban development requires accurate topographical and cadastral information to support land-use planning, residential expansion, and infrastructure development. The integration of property boundaries, road networks, and technical easements is essential for preparing coherent Zonal Urban Plans (PUZ). This study examines a 33,090 m^2 area in Giarmata-Vii, Timiș County, focusing on the contribution of topographical and cadastral documentation to functional zoning and territorial organization. Particular attention is given to residential development, circulation networks, green spaces, and restrictions associated with existing technical infrastructure. The analysis also highlights the impact of gas pipelines, overhead power lines, and drainage channels on land-use planning. Accurate spatial data are essential for identifying construction restrictions and ensuring efficient territorial organization.

Material and method

The study is based on topographical, cadastral, and urban planning documentation for a 33,090 m^2 area in Giarmata-Vii, Timiș County, consisting of two cadastral properties. The methodology includes the analysis of property boundaries, functional zoning, access roads, green spaces, and technical infrastructure restrictions. The U.02 urban regulation plan and the technical memorandum were examined to identify the proposed functional areas and their spatial distribution. Numerical calculations were performed to verify the territorial balance and assess the influence of gas pipelines, overhead power lines, and drainage channels on residential development. The analysis also examines the consistency between cadastral boundaries, proposed land-use categories, and infrastructure protection zones.

Result and discussions

The graphical results illustrate the relationship between the existing site conditions, proposed functional zoning, and technical infrastructure constraints. Figures 1–4 highlight the spatial organization of the studied area, territorial balance, urban regulations, and proposed circulation profiles.

The analysis of the 33,090 m^2 site in Giarmata-Vii highlights the importance of topographical and cadastral information in residential land-use planning (Fig. 1). The proposed territorial balance allocates 42.27% to individual housing, 15.51% to housing areas subject to a temporary construction ban, 7.53% to mixed residential and service functions, 25.24% to circulation networks, and 9.45% to green spaces (Fig. 2). The urban regulation plan illustrates the proposed functional zoning, residential plots, access roads, and technical infrastructure corridors (Fig. 3). The circulation profiles demonstrate the planned organization of roadways, sidewalks, and associated infrastructure (Fig. 4). The territorial balance is numerically consistent, with no difference between the proposed functional areas and the total site area. decisions.

However, the natural gas pipeline, 20 kV overhead power line, and drainage channel impose important restrictions on construction and spatial organization. In particular, 5,132.80 m^2 are subject to a temporary construction ban, emphasizing the need to integrate technical easements into urban planning. The integration of topographical data, functional zoning, and infrastructure restrictions supports more coherent and sustainable urban development.

The verified territorial balance provides a reliable basis for assessing land allocation and the impact of technical easements on future residential development.



Fig. 1 – Study area in Giarmata-Vii

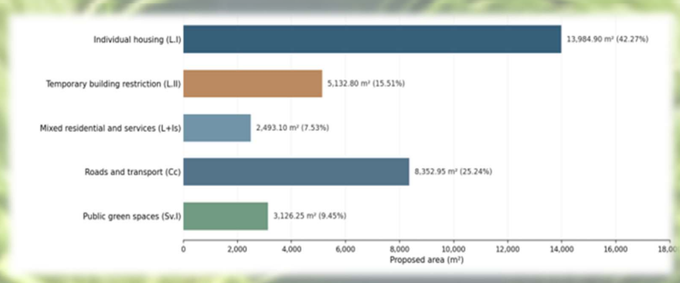

Fig. 2 – Proposed functional zoning balance

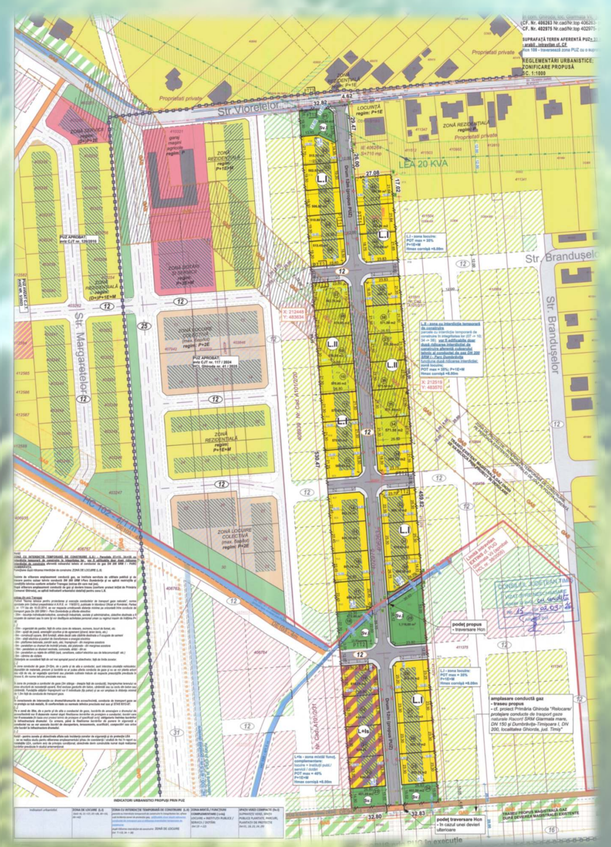

Fig. 4 – Proposed road cross-sections

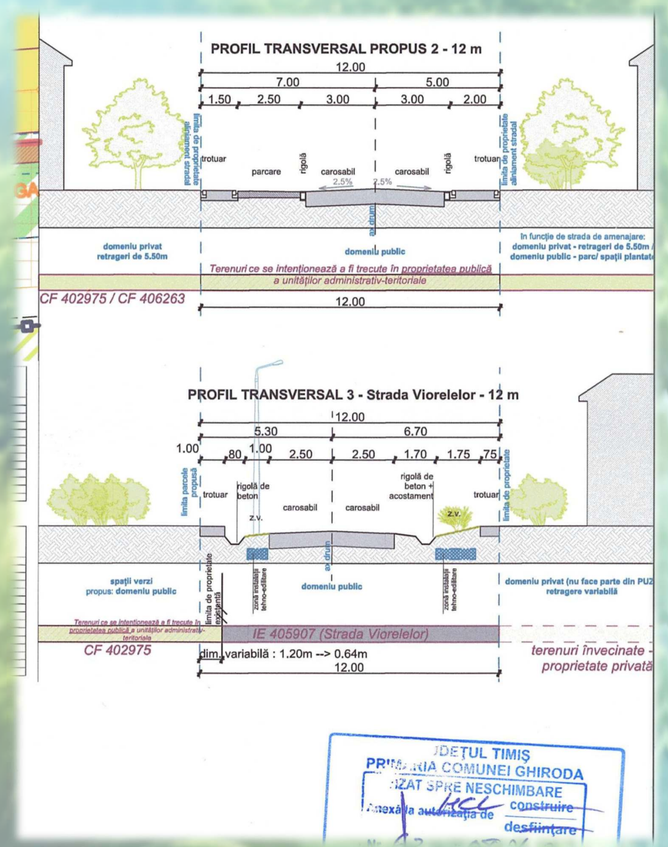

Fig. 3 – Urban planning regulations and zoning (U.02)

Conclusions

The study highlights the essential role of topographical and cadastral information in supporting functional zoning and urban development in Giarmata-Vii. The analysis of the 33,090 m^2 site confirms a consistent territorial balance, with 57.77% allocated to individual housing and housing areas subject to temporary construction restrictions, while 34.69% is reserved for circulation networks and green spaces. The natural gas pipeline affects 15.51% of the regulated area, while the overhead power line and drainage channel impose additional spatial constraints. Integrating cadastral boundaries, urban planning regulations, and technical easements is essential for coherent residential development.

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