Some Aspects of the Implementation of the Land Plot Normative Monetary Valuation Methodology

*Yu. Palekha (State Enterprise Y. Bilokon Ukrainian State Scientific-Research Institute of Urban Design "DIPROMISTO"), A. Tarnopolskyi, M. Malashevskyi (The National Academy of Agrarian Sciences of Ukraine), O. Malashevska (National University of Life and Environmental Sciences of Ukraine), Ye. Tarnopolskyi (The National Academy of Agrarian Sciences of Ukraine)

SUMMARY

The key issues and perspectives of the implementation of the advanced land plot normative monetary valuation methodology in Ukraine have been scrutinized. The advantages and peculiarities of land plot monetary valuation using GIS technology have been substantiated. The issue of topological inaccuracy of valuation object boundaries and its constituents, i.e., settlements and territorial communities have been analyzed. According to normative monetary valuation practice, the need for revising the limits of valuation areas for agricultural and forest land have been substantiated. It has been suggested to single out three types of territorial communities according to the peculiarities of territory zoning and the determination of the joint zonal coefficient. With the example of Hleyuvate territorial community, the results of geoinformational modeling at the normative monetary valuation determination based on the spatial analysis principles of ArcGIS Pro geoinformational system. The research findings are aimed at the increasing the effectiveness of normative monetary valuation of land plots in Ukraine, especially, for territorial communities consisting of one big city and scattered small rural settlements.

*Keywords*: territorial community, GIS, spatial analysis
Introduction

At the current stage, the economic mechanism of land relations regulation, the key constituent of which is land valuation, is of major importance (Kurt & Kurt, 2020; Debrunner & Kaufmann, 2023). The largest source of the local community budget is the land use charge, calculated according to monetary valuation (Ibatullin et al., 2022; Sugito et al., 2023). Monetary valuation guarantees the increased budget revenue by 10-20%; it predefines the priority of the evaluation, as well as the ongoing improvement of land monetary valuation projects technical documentation. The implementation of geoinformational technologies and software for land monetary valuation (Ghimire, 2020; Aydinoglu & Bovkir, 2017) ensures the necessary accurateness and allows for the quick altering the information on the land plot functional use, which directly influences the land plot value.

Electronic maps and GIS spatial analysis methods allow for the quick and qualitative collection and processing of monetary valuation source data (Wang & Jing, 2019; Maruniak, Palekha, & Kryshtop, 2022). At the current stage, some elements of GIS only are used for most normative monetary valuation projects of both agricultural land and urban land. According to the advanced methodology (Cabinet of Ministers of Ukraine, 2021), it is almost impossible to develop the technical documentation on land normative monetary valuation without or with partial use of geoinformational technology.

Method and Theory

The land plot normative monetary valuation methodology (Cabinet of Ministers of Ukraine, 2021) sets the advanced principles of land plot normative valuation, the gist of which is the following:

• The valuation objects are land plots within a territorial community or its part.
• A unified valuation formula based on rental approach is introduced.
• The number of components to be determined is reduced; the determination itself is simplified.

The advanced methodology predefines the obligatory implementation of GIS technology for the determination of zonal coefficient Км4: “coefficient characterizing the zonal factors of land plot placement (Км4), is determined by the result of geoinformational modeling”. The simplified determination of coefficient Км4 based on the expert ball valuation is allowed for villages, settlements, towns, and territorial communities with less than 50 thousand population. The experience of territorial zoning for territorial communities with various populations (Chernihiv, Uman’, Hleyuvate) witnesses the geoinformational modeling is practicable for all territorial communities, since it increases the calculation fairness and provides a better variability of Км4 coefficient.

Land plot monetary valuation using GIS has a number of advantages:

• The automated considering of local factors, influencing the land plot.
• Database with the possibility to get the full information at any time.
• Automated monetary valuation certification.

We used ArcGIS 11.4 and ArcGIS Pro software (Tracking Analyses and Spatial Analyses modules) by ESRI for geoinformational modeling. Tracking Analyses was used to develop the matrix of connection between evaluation area centers and the community center, and main places of work, community centers, and places of public entertainment (transport and functional factors), main facilities of water, heat, gas, and electricity supplies as well as water disposal facilities (engineering and infrastructural support), social infrastructure facilities and those of social and city-planning significance (the level of services sector and environment appeal). The result of geoinformational modeling is the development of a transport connection matrix with the determination of three coefficients: Si (transport and functional availability), Ui (engineering and organization of public services and amenities), and Ci (social and city-planning appeal).
In order to evaluate two other factor groups, i.e., territory environmental quality and physical and geographical and geomorphological conditions, the geoinformational modeling based on the determination of the area occupied by the specified factor in the evaluation area is used. As the result, two coefficients are determined: \( E_i \) (environmental quality) and \( F_i \) (physical and geographical and geomorphological conditions). The number of factors considered at the determination of coefficients greatly depends on the peculiarities of the territorial community. Spatial Analyses was used for geoinformational modeling.

**Results**

The development of technical documentation on the land normative monetary valuation and the implementation of the advanced evaluation methodology revealed some challenging issues. There is the issue of the accurateness of administrative and territorial units’ boundaries. Evaluation areas should be developed as closed polygons, with no overlapping boundaries. The boundaries of evaluation areas should not overlap the boundaries of villages, settlements, towns, or territorial communities. The practical normative monetary valuation in some territorial communities has already revealed numerous cases of topological inaccuracy between land plots and settlement boundaries and territorial community boundaries. Even more, there are several cases of topological inaccuracy between the settlement boundaries and territorial community boundaries. The implementation of the methodology (Cabinet of Ministers of Ukraine, 2021) in these cases has some disadvantages, since index cadastral maps sometimes have inaccurate data. In these cases, the technical documentation developers should envisage the clarification of valuation object boundaries or its parts like settlement or territorial community (Verkhovna Rada of Ukraine, 2015).

The only evaluation component, which is determined by the modeling, is currently zonal coefficient, therefore, the responsibility for the designation of the evaluation area boundaries and zonal coefficient \( K_{m4} \) determination is increased.

The areas out of settlement like agricultural land, forests and water objects are also subject to zoning. It is necessary to set the optimal dimensions of the evaluation area considering the physical and geographical and planning features. The methodology limits the evaluation area by 1000 hectares. This limit is reasonable for settlements (Malashevskyi, Kovalchuk, & Malashevska, 2021), whereas the unified agricultural land mass often exceeds the 1000-hectare limit. It also applies to forest land (Malashevskyi & Malashevska, 2022). We believe, it is reasonable to either increase the limit to 2500 hectares, or lift it.

In practice, the allocation of railroad precincts, mines, and quarries to separate evaluation areas is easy. The allocation of easement areas of gas, and oil pipe lines and high-voltage power lines is more complicated. In most cases, there is no documentation on land allocation for these facilities. Therefore, it is reasonable to consider the situation and use the approved spatial planning documentation with respective planning restrictions.

The experience of geoinformational modeling for the development of technical documentation for a number of territorial communities of Ukraine (Maruniak, Palekha, & Kryshtop, 2022) allows to suggest, that it is necessary to combine the experience of experts of land management, GIS, and spatial planning for the successful accomplishment of this evaluation stage. Three types of territorial communities can be singled out by the peculiarities of territory zoning and determination of joint zonal coefficient \( K_{m4} \):

- **Territorial communities**, consisting of one city, and, in some cases, a number of small settlements.
- **Rural territorial communities**, the largest share of which is agricultural land. For such territorial communities, scattered small rural settlements, i.e., centers are typical.
- **Territorial communities** with the features of 1 and 2 type. For such communities, formed based on mining industry (Donbas, Prydniprovya), geoinformational modeling is necessary irrespective of their population (Fig.1).
Conclusions

The results of the normative monetary valuation of the territorial community should be presented in digital form. However, not only is it important for the territorial community to upload the data to the State Land Cadastre database as an xml file, but also to create the automated land plot value calculation module for the budget revenue monitoring and rental payments regulation. It should become the key tool of the territorial community financial and economic sustainable development policies and post-war reconstruction in the near future.

The maps of natural and agricultural land zoning and soil suitability classification cartograms, developed based on the basis of national agricultural land normative monetary valuation, are not available at the time, which is a challenge for those developing the evaluation. In addition to that, the quality of these maps needs to be improved, which makes for the field investigation of the soil suitability classification in the course of evaluation.

References


