

Halyna Hreshchuk\*, Pavlo Kolodiy\*

## **Usage of GIS – Technologies for Plots of Land Registration**

### **1. Introduction**

Land is the cornerstone of human livelihood, which provides us with the necessary resources for the economic and social activity. Nowadays there is bigger and bigger influence of the regional economic specifics on the rate, structure and efficiency of landplanning and land organization, area management and boundary determination for the commercial usage of the land. Land ownership is closely linked to the interests of the local community, state and other landowners, which are connected with the relevant areas of the socio-economic development of the territories. And this leads to multi functionality in the usage of every single object separately. However, the modern form and methods of effective land use do not facilitate rational land distribution among different branches of the national economy, different landowners and land users. That is why, special attention should be paid to the register, as a special management function, and that is one of the basic mechanisms of the land administration in order to ensure the optimal protection and land use of any purpose, regardless of the form of ownership and management. Through the effective system of the land use under the circumstances of the resource limits. That is why the register introduction requires the use of the GIS systems. This will help not only to save the information about the objects of land planning, but also to fix different changes and the sequence of such changes. This aspect of the GIS usage is very important, because land organizing enterprises are the source of information about new objects in the cadastral register.

### **2. The Methodology of the Research and Used Materials**

The main tasks are to research the basic concepts and accounting categories in the sphere of the land relations in the Ukraine and to create a systematic approach

---

\* Lviv National Agrarian University, Lviv, Ukraine

to the numerous problems that will facilitate the optimization of the accounting processes, use, reproduction and protection of the land to meet the demand of society in the limited resources. This will provide balanced social, economic and environmental development of the cadastre relations in the long term.

### 3. Discussion and Results

GIS technology application in the landplanning allows for the entering and updating the information in the database with the help of modern methods of Geodesy and therefore always have the most accurate and complete information. Special features allow to performing the analytical data processing, modeling various events, for example, related to the changes in the area, the owner or the categories of the land.

Whilst working with the cadastral database, it is necessary to take into account that after entering all necessary data into the database, it is needed to be constantly updating information to maintain it up to date, for the competent management of the land resources it is necessary to have three-dimensional information. The data on the local terrain is important for land assessing, and for the decision other issues, that are connected with area management.

The use of geographic information systems allows for switching to completely to paperless work technology. Depending on the configuration and the software, the systems can be used as an additional tool for the performance of survey work and for the collection and processing of the field and other information. Therefore the problem of the map data updating for the account that appeared in the Ukraine is extremely acute. Geographic information systems have become a usual tool to assist in solving problems of the mainstreaming and integration of the planning and cartographic materials [1]. They successfully function in the areas such as automated mapping, resource management and economy. But not all GIS can provide processing and inclusion in the system the information that differs by the character and the source of the creation. To support the mapping information the support of the additional features associated with the type of representation, the technological calculations and the involvement in the geographic information system technical documentation is required. For the successful solving of these problems, in our opinion, it is necessary to have software that enables on the base of the GIS to create a single information environment that includes both the standard functions of GIS and technology associated with modern methods of data collection and their presentation. Nowadays, these tasks are successfully solved by the software Digitals and ArcGIS, which allow you to implement an integrated approach to the renewal of the planning and cartographic materials with a high level of automation of the graphic works, accumulation and systematization of the information in the form of databases, charts and maps, efficient storage and retrieval of the information in the form of the electronic archives.

For example in the formation of the exchange files, where all the information about the land and its user is entered, an automatic check is performed of the exchange files In4 directly in Digitals every time the files are saved in the In4 format. This eliminates the use of the additional programs and considerably simplifies the finding and correcting of the errors. All errors are now corrected directly in the checking box In4. Whilst moving through the list of the errors that have been found, the incorrect line is highlighted in the text In4, so you can immediately proceed to the correction.

The corrections that were made are automatically transferred to the output DMF file, that is why the consistency is provided (Fig. 1).

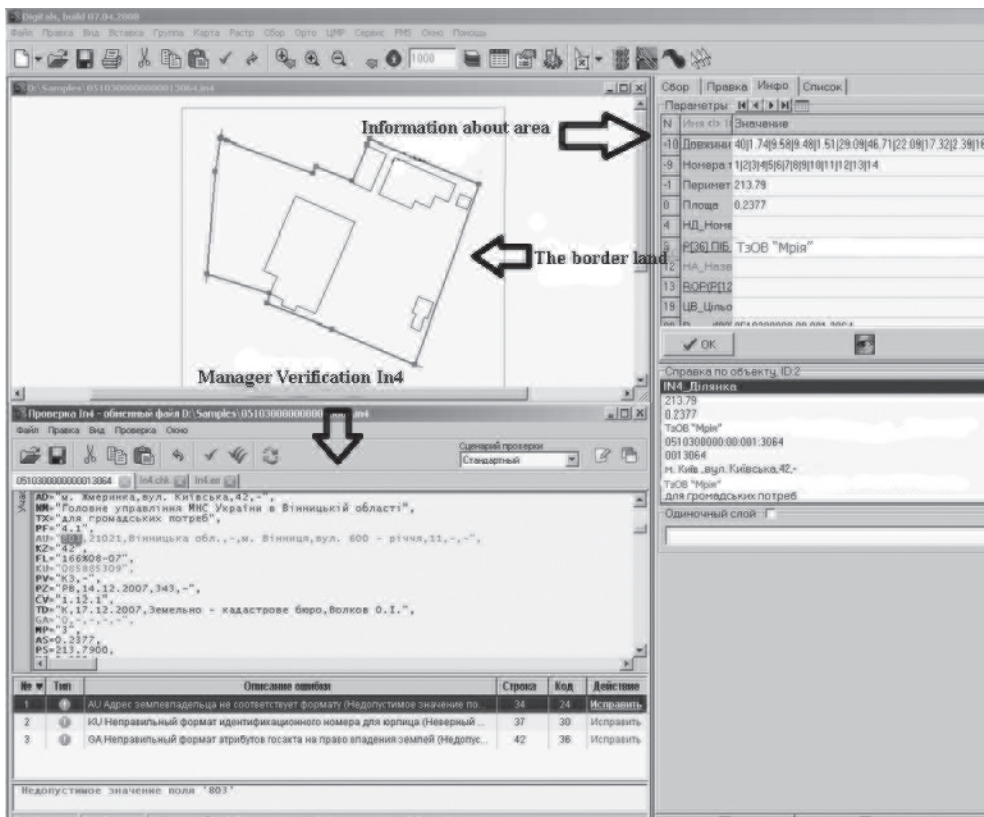


Fig. 1. The creation of the exchange file and its correction in Digitals

With its service Google Maps and Virtual Earth allow to reach free satellite images in any area and of different resolution.

Digitals now allow, without using third-party applications, easily add these bitmaps into the vector map in a subbase and use them for control, vectorization, planning and so on (Fig. 2).

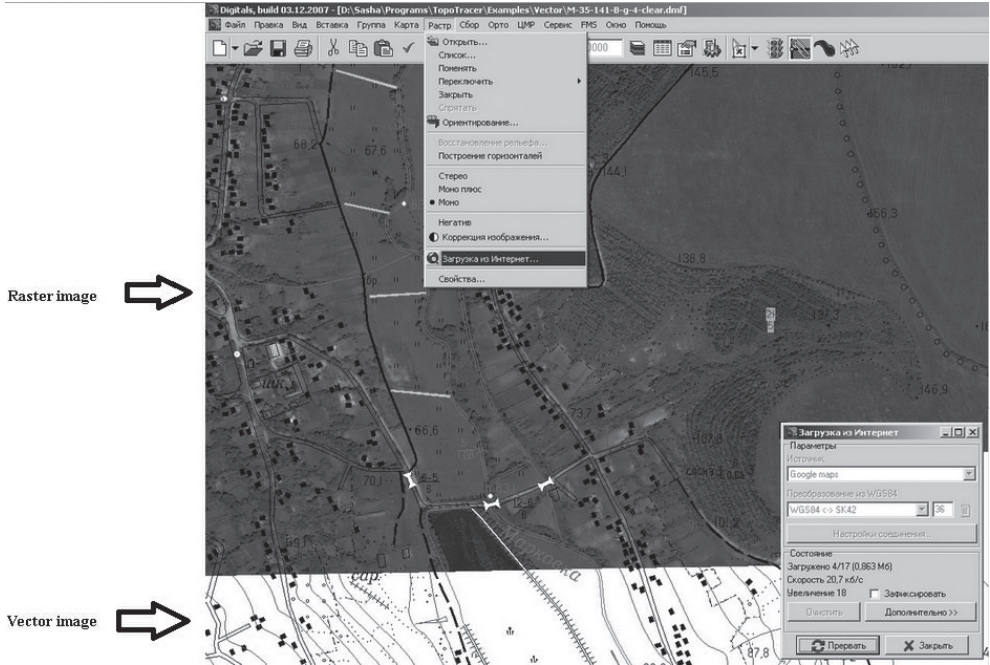


Fig. 2. Bitmaps in Digitalis

By using the built-in mechanism Digitalis coordinate transformation, photos can be transformed into the desired projection map. Once uploaded bitmaps are available in offline mode and can then be shared on the local network. The software complex Digitalis is completed with semi-automatic vectors to work with the scanned maps and plans. The program automatically recognizes typical topographic objects and allows for the achieving of higher accuracy for lower labor costs. To construct a three-dimensional image in Digitalis map can be presented as a three-dimensional object that can rotate and move, that gives the possibility for considering it from all sides. This view is convenient for the error detection heights assigning points.

The selection and the edit of the point list is available in a three-dimensional objects directly view (Fig. 3). 3D Mode in the Navigator window allows you to quickly review any designated object or group of objects in a three-dimensional form.

The presence of all these GIS technology enables land surveyors quickly and effectively (often in laboratory conditions), with the necessary accuracy to conduct the formation of the cadastral objects. In addition, GIS solves the problem of the compatibility of the coordinate systems. Most surveys are conducted in the one coordinate system, but the processing the results and further checking – in another, and the acceptance of results of the land cadastre chamber takes place in the third coordinate system. Typically, the GIS tools enable land surveyors to solve this problem quickly and efficiently.

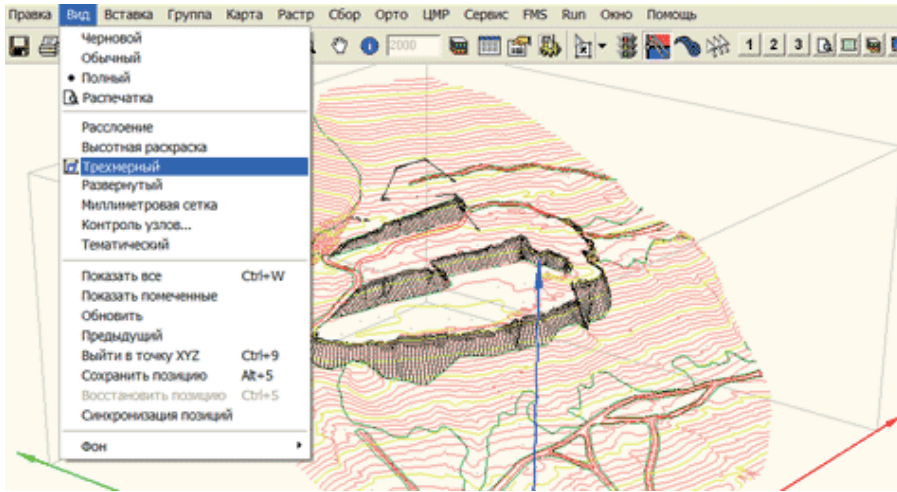


Fig. 3. Three-dimension in Digitals

To solve the problematic issues in the land accounting on the large areas, you can use remote sensing data (RSD) and the procedures of the photogrammetric processing of that information, meaning the determination of the size, shape and spatial position of objects by measuring their images.

The involvement of these methods of the data collection allows for highly efficient solving of the following problems based on GIS technology [3]:

- creation of the thematic maps of the different scales for the purpose of land management,
- construction of digital elevation models,
- the land inventory,
- monitoring and evaluation of the soil losses due to various natural disasters,
- highly accurate drafting of soil maps and plans of locality,
- operational support of the digital database in the continuously updated state.

In the process of land reform, significant changes were generated to the system of land ownership and land use, including negative ones, because new forms of management were created merely without land documents, consideration of any prospects of the development and the justification of the size of the land ownership and land use, that is why improper placement of the limits arose, etc. The task of the scheme of the land administrative district on improvement of land ownership and land use is to consider the ecological and agro-ecological assessment of the land and types of agricultural landscapes, the development of the land relations and other conditions, to develop the proposals directed to the elimination of the defects and formation of a stable, balanced system of land ownership and land use [2]. The development of new forms of the land ownership and land use and improvement of the existing one should be carried out on a specific basis, which means that every land



ownership and land use must have particular features: location, purpose, boundaries, area, limiting use, encumbrance rights (easements), and so on and also has to be justified by the project. One of the main principles of the land cadastre is its visibility, which is ensured by the availability of maps. However cadastral data must necessarily be objective, which is also ensured by the continuous introduction of the changes to the system of land cadastre data, besides the application of the new technology saves time and cost of funds for land cadastre. The compliance with these and other principles of the land cadastre can be achieved by the use of GIS technology.

Accurate and complete information on land resources increases revenues to the budgets of all levels, starting from land payments, organization of the rational use and protection, operational regulation of land relations and the introduction of the regulated land market.

#### 4. Conclusions

As you can see from the above said, GIS application allows you to use cadastral map, which includes tasks to ensure the optimal distribution of the land between the areas of the production, use and registration:

1. Preparation of the cadastral objects.
2. Building through the application on the basis of the SLC materials and the materials of the border plans of the new cadastral objects.
3. Examination of conditions for the formation of these objects.
4. Preparation of the protocol for the object formation as a cadastral document.
5. Creation of cadastral maps of the cadastral quarter based on data from various sources (materials surveying, remote sensing, etc.) – a document, containing information about the presence, location and boundaries of accounting objects on the territory of the cadastral quarter.
6. Preparation and publication of the graphic documents subdivision “Lands,, of the state land register.
7. Preparation and publication of the graphic documents of the cadastral plan of the land – a document that contains information about the specific land.
8. Adding the results of the current changes: registration of the rights, refinements of the borders, transactions with the objects of the account.

Any project of land planning should be based on the maximum land law acts. A clear accounting and use of land in the Ukraine is a necessity due to several socio-economic factors and especially the special role of the land in the economic system of the state, and GIS technology provides a summary of various information sources into a single national system, it also guarantees the update of the planning and cartographic materials with the required accuracy, preparation of the relevant databases, data analysis for the information about the status of the land, their use, registration, placement, assessment, distribution between the owners and users.

---

## References

- [1] DeMers M.N.: *Fundamentals of Geographic Information Systems*. 2nd ed., John Wiley, New York 1999.
- [2] Stupen M.H., Lesechko M.D: *Vdoskonalenia vykorystania zemel' naselenych punktiv v umovach rynku*. Lviv 2004.
- [3] Svitlychnyi A.O., Plotnytskyi S.V.: *Osnovy geoinformatyky: Navchalnyi posibnyk*. Sumy VTD „Universytetska knyga“, 2006.