

# LITHUANIAN LAND INFORMATION SYSTEM

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## **Abstract**

LIS is a convenient tool in the legal, administrative and economic decision-making process. The data of LIS includes: cartographic basis of spatial land datasets, thematic spatial land datasets and a variety of important information from the cadastre, registers and information systems. Lithuanian Land Information System is a developed and expanding field of information technology, which could be more used by the public users of Lithuania and other countries. The aim of this research is to determine the popularity of LIS services in Lithuania and promote a wider range of their usage possibilities among Lithuanian and foreign users. The object of the research is Lithuanian Land Information System. To achieve the aim the following objectives have been set out: to review the use of LIS in other countries; to describe the services that LIS offers and the data it compiles; to determine the popularity of LIS in Lithuania. In order to carry out the research the analysis of literary and cartographic material was used, a survey in writing was conducted. The data was processed with Microsoft Excel programme, the diagrams and informative pictures were presented. According to the research results, Land Information System helps to solve the problems of the land reform, planning, agriculture and rural development in countries of various development levels. The electronic services of LIS are provided for the receivers of LIS data in Lithuania free of charge, they are accessed through LIS map browser. The services are convenient and easy to use. After analysing the survey data, it can be stated that Land Information System is not very popular. It ranked the third place among all the presented information systems and obtained 9.5 percent of the respondent votes.

Key words: Land Information System, spatial data, LIS services

## **Introduction**

In the EU countries the development of LIS receives a lot of attention and funds; thus Lithuania keeps up with other EU countries in the field of LIS development. It is important that LIS data can be obtained by natural and legal persons of the Republic of Lithuania and foreign countries as well as other foreign organisations, which use the LIS data and the electronic services of LIS. Therefore, a large part of services is publicly accessible to the farmers, students and other public users. They can use the information of the collections of the spatial data, perform a review of the statistical data, create and download various maps. It can be done free of charge. After learning to use the LIS services, students can use them for the practical, course and final works. A good knowledge of LIS services helps the specialists of many fields in professional and practical activity. When analysing the literature and monitoring the situation, the author noticed that many users do not know how they could use the public services of LIS. Therefore, this information must be publicised and shared.

**The aim of the research** – to determine the popularity of LIS services in Lithuania and promote a wide range of their usage possibilities among Lithuanian and foreign users.

To achieve the aim the following objectives have been set out:

- to review the use of LIS in other countries;
- to describe the services that LIS offers and the data it compiles;
- to determine the popularity of LIS in Lithuania.

## **Methodology of the research and materials**

The object of the research – Lithuanian Land Information System. The article discusses publicly provided services for the unregistered or registered users. To carry out the research the analysis of literary and cartographic material was used, a survey in writing was conducted. A survey on popularity of publicly available internet access in Lithuania was carried out in 2015. 50 respondents were interviewed. The most famous information systems of land resources were listed in the survey. The data was processed with Microsoft Excel programme, the diagrams and informative pictures were presented.

## Results and discussion

In 1660, Denmark presented a data system, which began to perceive the plot of land as the basic spatial unit. Later on, the term “cadastre” came into use in Austria. In 1970, the term “Land Information System” (LIS) was introduced. It combines and replaces all the terms used before (Vainauskas, 2012).

The data of LIS is compiled, renewed, grouped, its accessibility to the users is constantly growing. The basis of LIS is the unified spatial system binding the data suppliers and receivers. (Ciparisse, 2003).

LIS is a convenient tool in the legal, administrative and economic decision-making process. This system helps to solve the problems of the land reform, planning, agriculture and rural development. LIS enables data comparison, analysis, helps to make design solutions in the United Kingdom, North America and other developed countries. The wide use of LIS reveals the importance of the information compilation and search in order to improve the decision-making capacities and quality (Sounders, Cufler, 1993). In the developing countries LIS is also gradually recognised and installed, starting with the long legal process, social-economic reforms, which create the adequate official environment for the development of LIS (Sounders, Cufler, 1993). For example, since 2012 Mongolia has been developing the system of structured cadastre data collections with the “Multi” user access to the data collections in order to avoid data duplication in different organisations and adapt to the international standards in the field of LIS. The aim of the specialists is to create the land evaluation methodology operating on the basis of LIS. (Tuul, 2012). The above-mentioned information from various sources proves the importance of LIS in the countries of various development levels, its significance in the contemporary world.

The services of LIS can be defined as activities remotely provided for the service receivers by the system with the help of information measures (LIS..., 2011).

The electronic services of LIS are provided for the receivers of LIS data free of charge, they are accessed through LIS map browser which can be accessed through <http://zis.lt/> or <http://www.geoportal.lt/map/> adding „the services of LIS“ (Fig. 1). The services are constantly developed and the provided information is updated.

After accessing the LIS map browser, the tools for the work with maps can be seen on the left side of the screen. There are 7 tools on the toolbar (Fig. 1) and the author describes them in the order according to their number in the picture.

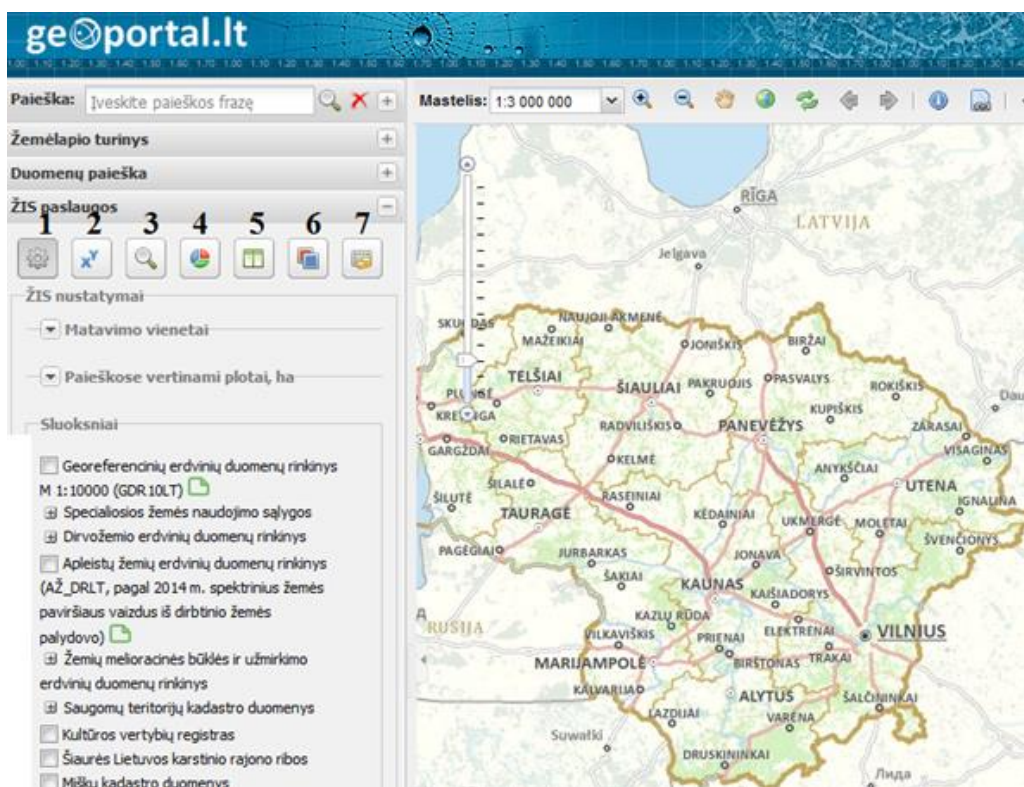


Fig. 1. LIS map browser with the toolbar

Explanations: paieška – research; mastelis – scale; žemėlapių turinys – the content of a map; duomenų paieška – the data research; ŽIS paslaugos – the services of LIS; ŽIS nustatymai – the settings of LIS; matavimo vienetai – measurement units; paieškose vertinami plotai, ha – the areas evaluated in researches, ha; sluoksniai – layers

1. LIS settings. It is a tool which is activated in the system, it enables to see the list of the data collections, the option lines of the units of measurement and the areas estimated in the searches. In the section “Units of measurement” the units of area and length can be set. In the section “Areas estimated in the searches”, if the task requires it, an area interval is indicated according to the units of measurement chosen above.

Through the section “Layers”, the layers, which are presented in the map browser, can be activated. The active layers can be controlled and deactivated in the line “Map content”. Here the layers and their separate elements can be activated and deactivated, there is a button next to every layer which, after pressing it, allows performing more actions with the corresponding layer: to see the legend, to set the transparency to the layer, etc.

2. Object search according to their coordinates. This function allows carrying out the search of the spatial objects position with the set X and Y coordinates. The coordinates can be set manually by clicking the left button of the mouse on the data setting square. The set coordinates are shown in the map as dots, lines or areas upon the user’s request after choosing one of the drawing tools.

3. Object search according to the area. This service allows carrying out a search of the area spatial objects around the earth according to the set area interval. It is really convenient when the location data of the specific municipality or the cadastre needs to be analysed.

From the presented list the requested collection of the spatial data, where the search is chosen to be carried out, is indicated, the type of the area objects, of which the search will be carried out, is indicated. The desired place is also indicated, i.e. the municipality, the cadastre location are chosen. The search area could be indicated pressing the button “Indicate the territory on the map”. The button “Search” enables the function. The obtained results can be printed out and saved with the help of the corresponding buttons.

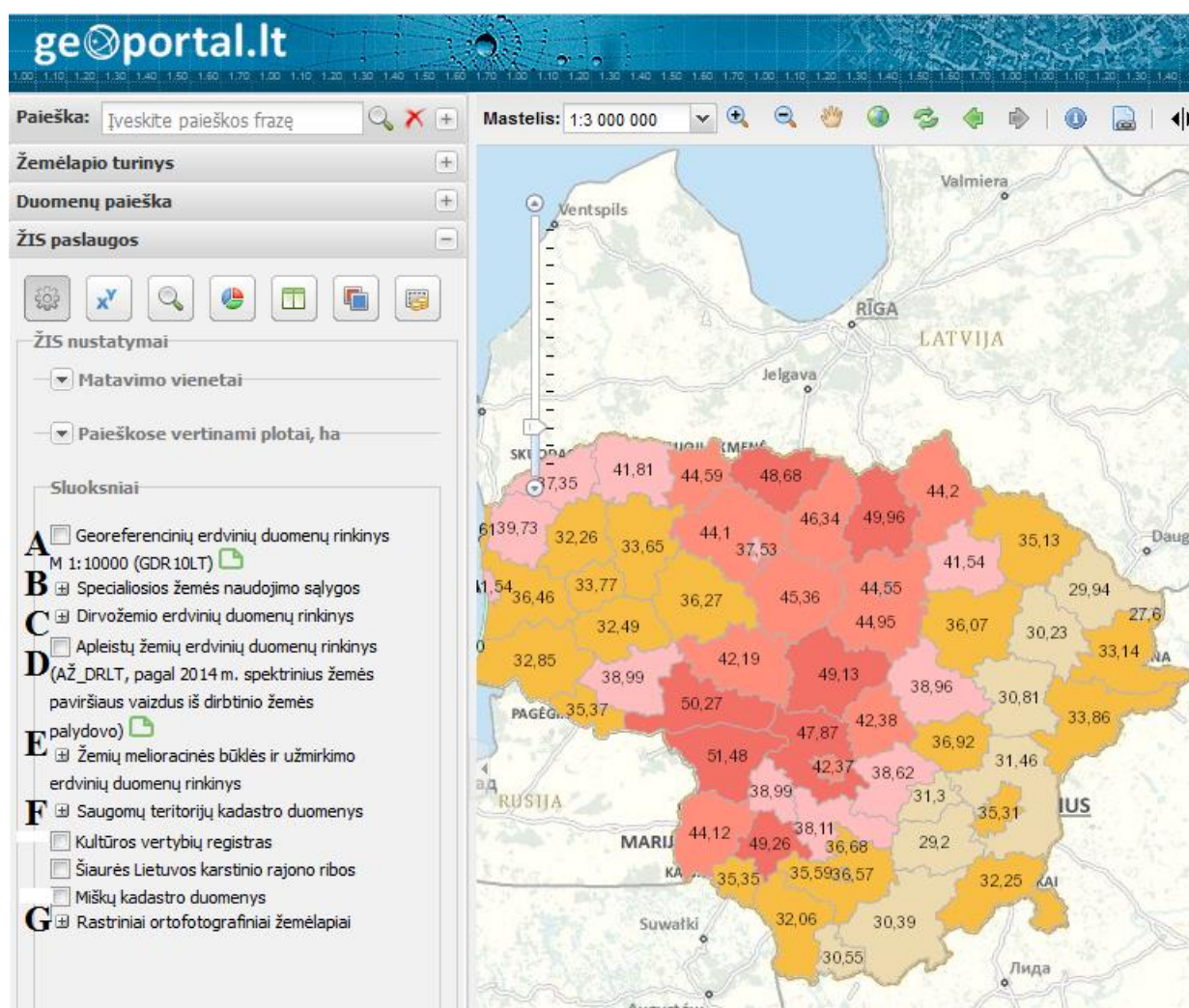
4. Statistics of the indicated objects. Analysis of the spatial data about the land in the indicated territory is conducted. Analysis results present statistical data of the indicated objects, such as total amount, total area, total length, etc. The function is enabled by pressing the button “Statistics of the indicated objects”. From the list menu one shall select the spatial data set where statistics is to be calculated and indicate the type of objects for statistical calculation. The function is enabled by pressing the button “Calculate statistics”. Result field presents the search results, the object description, total amount and area. There is an option to see the graphic expression of the data. By pressing the button “Depict objects graphically”, a PDF file with graphically depicted objects is generated.

5. Map comparison. With the help of this service, a comparison of different maps is carried out in two equal-sized map windows. The service is called up by pressing the button “Map comparison”. The map comparison is carried out on a vertically half-split desktop. The service is convenient to compare the different data of the same area, it can also be used to either review the area or to carry out an analysis.

6. Search of scanned plans. The service is provided in various criteria (in administrative boundary, specified scope, plan name) and the search of scanned and geographically oriented (binded) reclamation plans or cameralistic land productivity evaluation plans is carried out. The service is called up by pressing the button “Plan search”. On the list you can select one of two options: project-based scanned land reclamation material, or cameralistic land productivity evaluation plans. After ticking, the layer is turned on, and the wanted plans will be displayed on a map. The plan can be searched by administrative boundary and you can specify the scope in which the search should be conducted. After specifying the wanted search criteria, the plan search can be carried out by the button “Search”. The name of the found plan is provided in a result box. Plan download links are displayed in a column.

7. Rent and sale of land and forests. This is a service of the search of the rent and sale of land and forests published now or previously on auctions is carried out. This is a kind of the service when in a specified area the search of rent and sale of land and forests published now or previously on plot auctions, is carried out. There is the possibility to conduct a search according to various criteria: the type of land use, the type of auction, the auction status. The service is called up by pressing the button

“Rent and sale of land and forests”. Before starting the work, a layer of rent and sale plots has to be turned on. In areas of search, purpose and type, the criteria of plot search and auction status are indicated. Then while choosing the area, the data is indicated: the entire territory of Lithuania or a specific municipality. After tapping in the criteria, you can search for plots with the help of the button “Search”. Any found plot that is in a result table will be displayed on the map (highlighted in red) by pressing the mouse. In order to use LIS services, it is necessary to review basic spatial datasets, which are presented to public users. Figure 2 presents the basic spatial datasets, which are assigned with capital letters, according to which the short name of a dataset will be presented. Spatial datasets on land are being generated using the Lithuanian coordinate system of 1994, which is approved by the Government of the Republic of Lithuania on 30 September, 1994.



**Fig. 2.** Spatial datasets on land are presented on layers

Explanations: paieška – research; mastelis – scale; žemėlapių turinys – the content of a map; duomenų paieška – the data research; ŽIS paslaugos – the services of LIS; ŽIS nustatymai – the settings of LIS; matavimo vienetai – measurement units; paieškose vertinami plotai, ha – the areas evaluated in researches, ha; sluoksniai – layers

The cartographic base of spatial datasets on land consists of the following: a digital raster orthophotographic map ORT10LT (G) of the Republic of Lithuania 1: 10,000 and the data of geo-referencial basis cadastre GDR10LT (A)

A) The data of geo-referencial basis cadastre consists of three-dimensional objects related to water bodies, land cover, transportation network, engineering communications, geodetic points, heights, place names, etc (Kryžiauskas, Motiejauskas, 2010, Gudritienė, Abalikštienė, 2015).

G) Lithuanian digital orthophotographic map covers the entire territory of Lithuania. It is created on the basis of aerial photography. The data consists of several packages. One monochrome raster data package in the period of 1995-1999 and three polychrome raster data packages in the period of 2005-2006, 2009-2010, and 2012-2013. The production work of a new orthophotographic map is currently in process (GIS..., 2015). The thematic spatial datasets on land consist of the graphic (vector) data of objects, their identification codes and descriptive information, both quantitative and qualitative indicators. National thematic spatial datasets are as follow:

1. The soil dataset Dirv\_DR10LT of the Republic of Lithuania 1: 10,000;
2. The dataset Mel\_DB10LT of reclamation condition and drench of Lithuanian land 1: 10,000;
3. The dataset SŽNS\_DB10LT of special land use conditions of the Republic of Lithuania 1: 10,000.

B) The dataset SŽNS\_DB10LT of special land use conditions of the Republic of Lithuania stores the information about the objects to which the Government of the Republic of Lithuania on 12 May, 1992 by resolution No. 343 “On the Approval of Special Conditions for the Exploitation of Land and Forest” the special conditions for the exploitation of land and forest were established (ŽIS..., 2015).

C) The soil dataset Dirv\_DR10LT of the Republic of Lithuania 1: 10,000 is constituted under a Lithuanian soil classification and Lithuanian soil typological units of the general structural list, in which the data on Lithuanian soil positioning, their physical and agrochemical qualities and other characteristics is systemised and coded (ŽIS..., 2015). The dataset structure is as follows: soil types, the predominant composition of the surface texture by Fere, the predominant composition of the pedogenetic texture by Fere, a soil productivity score.

D) The dataset AŽ\_DB10LT of abandoned lands of the Republic of Lithuania, which contains information about unattended, unexploited, or unusable under the established basic land use of the landed property (ŽIS..., 2015).

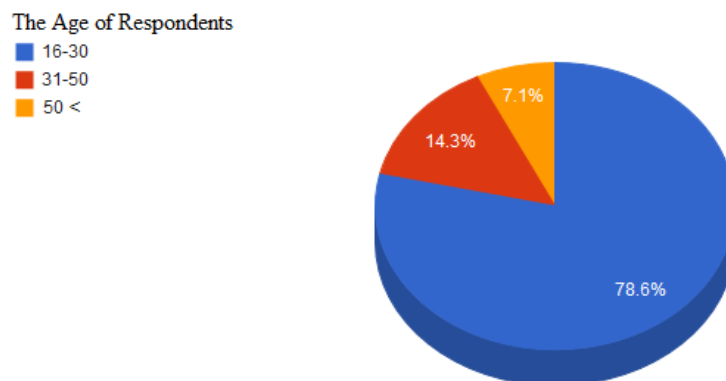
E) The information about drained (good and poor reclamation condition) areas of land, discarded areas of well drained land, and non-drained areas of land is stored in the dataset Mel\_DB10LT of reclamation condition and drench of Lithuanian land (ŽIS..., 2015).

F) The data of cadastre, register, and information systems contains a lot of important information.

The column introduces the data from the following:

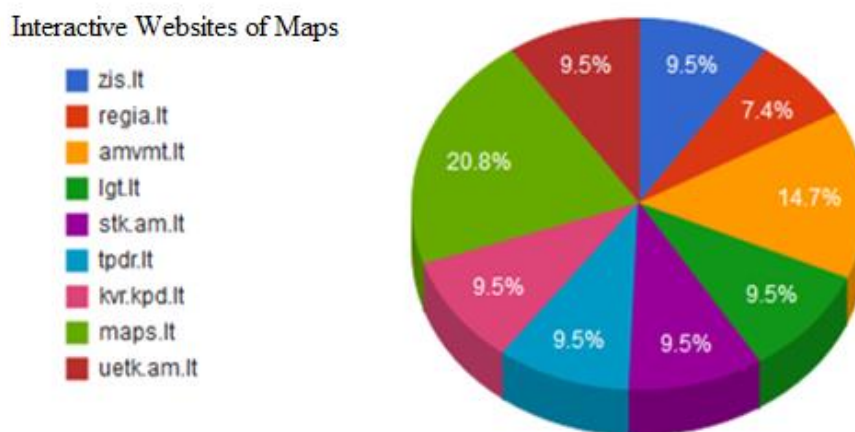
- The cadastre of the Republic of Lithuania of protected areas
- The cultural heritage register
- The underground register
- The information systems of state geology.

Most of the respondents are young, aged from 16 to 30 years old, they represented 78.6 of the total number of respondents. It is very good, because this group of respondents regularly use the achievements of information technology (Fig. 3).



**Fig. 3.** Age of respondents

9 public internet access points, among which zis.lt was mentioned in the first place, were introduced (Fig. 4).



**Fig. 4.** Percentage of the popularity of public internet access

According to the results of the survey, it can be said that the most in-demand internet site is an interactive map website (maps.lt), it obtained 20.8 percent of the votes of respondents. The Land Information System (zis.lt) and underground register (lgt.lt) are in third place, as both obtained 9.5 percent of the votes of respondents. Although the survey was attended by plenty of young people, the results suggest that the Land Information System is not very popular, so it can be said that there is the lack of popularity of this data.

Summarising the results, it can be said that the Land Information System is a developed and still developing area of information technology, which could be more widely used by both Lithuanian and other countries' public users.

One of the tasks of the reasearch is to publicise and popularise the Lithuanian Land Information System, so that more public users could benefit from it.

### Conclusions

1. The LIS helps to solve land reform, planning, agriculture and rural development problems in countries of various levels of development.
2. LIS recipients in Lithuania are provided with free of charge LIS electronic services, they are convenient and easy to use and can be accessed on LIS map browser.
3. LIS data consists of the following: the cartographic basis of spatial datasets on land; the thematic spatial datasets on land, and a lot of important information for cadastre, register, and information systems.
4. An analysis of the survey data suggests that the LIS is not very popular, among all the provided information systems, it occupied third place and obtained 9.5 percent of the votes of respondents.
5. The Lithuanian LIS is a developed and still developing area of information technology, which could be more widely used by both Lithuanian and other countries' public users.

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