FREE PUBLIC GEODATA SERVICES – THEORETICAL STUDIES OF APPROACH IN LITHUANIA AND POLAND

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Abstract. Efficient use of spatial data is achieved only by sharing them. Increased use of spatial data prompted the need to develop infrastructure which allows to provide data and describe their information from a variety of sources, regardless of the data format or its structure. For this reason, the infrastructure of EU spatial information (INSPIRE) was launched to be developed. The aim of this spatial information infrastructure was to harmonize the exchange of geographic data on state and international levels, creating transparent and favorable conditions for the use of geographic data by promoting product development, decision making in management, business, social, cultural and other spheres, thereby increasing the volume and efficiency of the use of geographic information, as well as the development of value-added services and products.

Public availability of the data allows to apply it for educational purposes (to develop students' practical skills). University students both in Lithuania and Poland use public services provided by geoportals to tackle different spatial tasks. Evaluation of services provided by geoportal.lt and geoportal.gov.pl has revealed that some information in the Help section is missing, the data is not always downloadable, while in different cadastral registers data discrepancies were detected. The quality and availability of free geodata services of the Lithuanian geoportal were positively evaluated by 48.68 percent of Lithuanian students, negatively - by 37.57 percent, 13.76 percent of students had no opinion. The quality of spatial data and services by the Polish geoportal were appreciated by 50.30 percent of Polish students, negatively – by 28.31 percent, 14.81 percent had no opinion. It can be concluded that free public spatial data services are readily available to users, easily understandable, controllable, adaptable to students' practical activities and applicable in a variety of tasks.

Key words: INSPIRE, geodata service, geoportal

1. INTRODUCTION

Up to this day in the countries of the European Union a variety of spatial data is collected and stored by different authorities. Over a decade ago most spatial data was "isolated" by managing their authorities in databases, and their access to other users was rather limited. Increased use of spatial data prompted the need to develop infrastructure for the provision of the data and describing their information from a variety of sources, regardless of the data format or its structure. The need to avoid duplication of data collection and updating functions as well as sharing of spatial data not only at national, but also at international level have led to a common spatial information infrastructure emergence. In 2007, based on the Directive 2007/2 / E of the European Parliament, development of the infrastructure for spatial information (INSPIRE) was launched [6].

The INSPIRE Directive aims to enable member states to use compatible spatial data taken from primary sources, such as ortho-images, air and water pollution or meteorological data, network of roads, rivers, administrative boundaries, land cover and so on. It is important that spatial data are compatible, usable and easily accessible among the member states of the European Union [3].

In Annexes I, II and III of the INSPIRE Directive, sets of spatial data are classified by themes, divided according to different priorities. The annexes of the INSPIRE Directive provide themes that should be met by one or more of the official spatial data sets: for the national spatial data management the most important are the themes of Annex I and II (geographic names, administrative units, addresses, cadastral parcels, transport networks, hydrography, protected areas, terrain elevations, ground cover, ortho maps, geology), and a wide range of themes in Annex III, covering natural, social and economic aspects [9].

The Directive is compulsory for all member countries, which are obliged to take measures according to which public authorities would exchange spatial data sets and services to tackle public tasks. Member states of the European Union are required within set time limits to transpose the tasks of the INSPIRE Directive into national law and implementing it legislation, and to provide INSPIRE network services of the following types (Fig. 1) [2; 9].
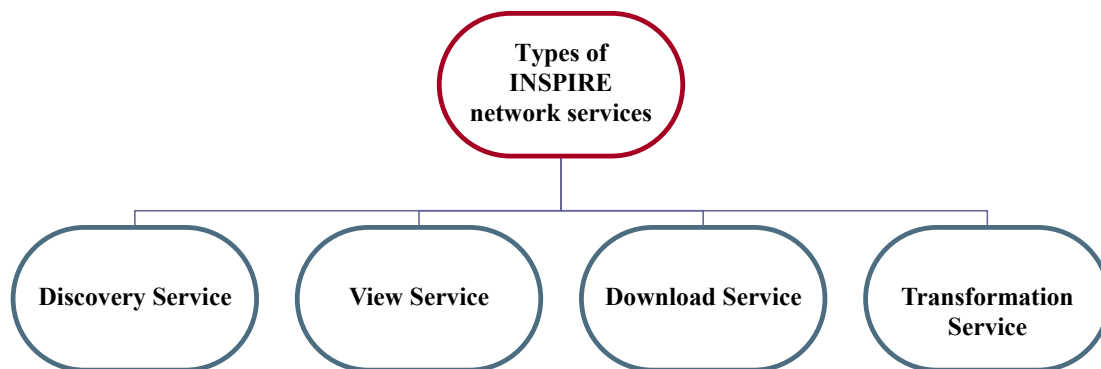
Fig.1 Types of INSPIRE network services. Source: www. inspire.ec.europa.eu [9]

Lithuania, as an EU member state accepts the obligations to properly organize, standardize and under possibly most favorable conditions provide accumulated spatial data not only to Lithuanian citizens, but also to institutions of the European Union [2]. In accordance with the principles of the INSPIRE Directive, it is sought that spatial data are collected only once and maintained at a level which ensures greater efficiency of their usage. The data must be easily understandable, interpretable and visualized by the right content and in user-appropriate form. It must also be possible to combine spatial information obtained from different sources and to use it for a variety of consumer needs. Geographic information must be complete and widely available, and the conditions of use cannot hinder possibilities of intensive application of national spatial data [3; 11].

Efficient use of spatial data is possible only by sharing them [16]. For the purpose, both in Lithuania and Poland information infrastructure of spatial data was developed. The main objective of Lithuanian spatial information infrastructure (LISI) is to harmonize the exchange of geographic data on the state level [1]. Create transparent conditions and facilitate the use of geographic data for various purposes. Promote product development, decision-making in resource management, business, social, cultural and other areas, thereby increasing the scope of application of geographic information and its efficiency, as well as the development of value-added services [8].

It is important that interoperability between integrated geographical information and communication technologies would be implemented and applied in the activities of the public sector. Develop modern information technology-based infrastructure of Lithuanian geographic information and existing on the Internet public sources of geographic information. The aim is to provide accessible on the Internet, balanced and quality official geographic (georeferenced) data for the whole territory of Lithuania, provide structured information (metadata) on designed in Lithuania spatial data sets and other important geographic data sets [4].

It is also aimed to integrate geographical, statistical and data of the main state registers as well as other geographically related information of the national public sector, so that different sets of data, managed by different institutions, could be accessible in a single infrastructure, used and analysed as a whole. Ensure organizational, systemic and technological integrity of elements of the infrastructure at all levels: in the context of the European Union's initiatives, in the Republic of Lithuania, and at regional and local levels, respectively [10].

It is highly important to promote the use of spatial information and integration of new data sets into the infrastructure of Lithuanian geographic information, constantly informing about the possibilities offered in management, business, social, cultural and educational spheres. It is purposeful to include in the programs of higher education practical activities through which students (future mapping, GIS, IT professionals) would gain wider knowledge on data management, use and presentation possibilities.

2. MATERIAL AND METHODS

In this article, using theoretical research methods, a systematic analysis of the content of legislation, annual INSPIRE reports, Lithuanian spatial information infrastructure project (2007) is carried out.

A comparative analysis of public services provided to users in Lithuania and Poland by interactive sites *geoportal.lt* and *geoportal.gov.pl.* (Fig. 2) is carried out through the operations of thinking, looking for similarities and differences.

University students and faculty in Lithuania and Poland during lectures and workshops apply spatial data in mapping and for spatial analysis of different tasks. To assess the quality of public services of spatial information, a questionnaire survey was conducted. Responses were received from 27 Lithuanian and 24 Polish students.
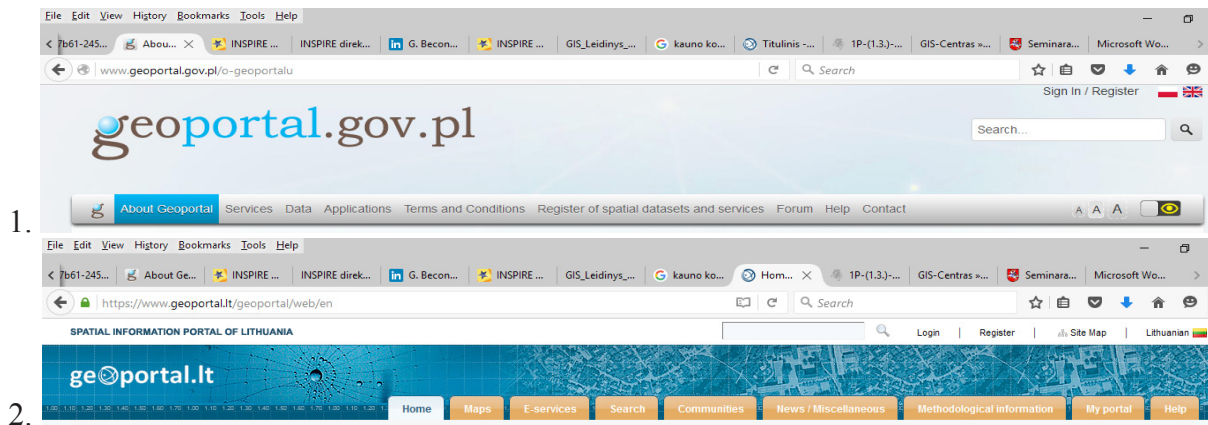
Fig.2 Web site links of spatial information portal in Poland (1) and Lithuania (2)

Assessing the need and quality of free public geodata service, the following evaluation criteria were distinguished: easy to find spatial data, convenient preview and geoportal management tools, downloadadable data, valid and correct spatial data, clear e-service methodology, possibility to report on errors, presence of spatial data inaccuracies, flaws, the data is not free, uncoordinated metadata, difficult access and management, crowded geoportal content, spatial data management requires special software, missing information in the *Help* section.

Applying mathematical methods, evaluation and summary of the results are provided, the results are presented graphically. Applying theoretical deductive-inductive method of thinking, logical conclusions were drawn.

3. RESULTS AND DISCUSSION

3.1. Comparison of free Spatial Geodate Service in Poland and Lithuania

The aim of *geoportal.gov.pl* and *geoportal.lt* in principle is to enable the provision of centralized data to users on designed and managed by state registries, registers, state and local government authorities and other people spatial data sets and their metadata [12; 13]. Provide users with electronic search, preview, download and transformation services of spatial data sets (Regulations on Lithuanian spatial information portal, December 17, 2012. No. 1P- (1.3.) - 515) [14].

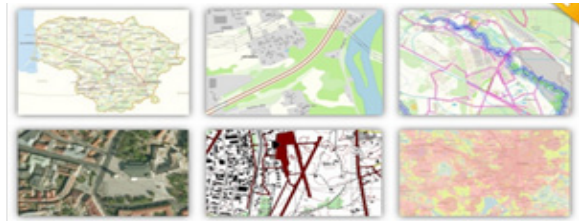*Fig.3 Free public Spatial Geodate in Poland.
Source: Geoportal.gov.pl [13]*

*Fig.4 Free public Spatial Geodate in Lithuania.
Source: Geoportal.lt [12]*

The users of the Lithuanian spatial information portal (Fig. 5. *geoportal.lt*) are provided with interactive electronic services: the users of spatial information online management e-service are able to design, manage and edit spatial data, to cooperate in providing and analyzing them; the users of electronic services on the inspection of matching measurement data with georeferenced cadastral data are able to upload available measurement data, and by using dedicated tools are able to determine whether they meet the official georeferenced cadastral data; the users of electronic services for issuing consent on construction of transport communications, engineering networks and building structures on state

land, where no plots are formed, in the geoportal are able to load a plan or mark a territory, electronically submit applications for consent to the issuing authority which approves, or justifiably rejects and informs the applicant; the users of electronic services on land fund analysis and land evaluation of the Republic of Lithuania may obtain information on the parcels of land provided in the geoportal, can carry out spatial analysis of land situation and land plot assessment based on available in the geoportal spatial data sets and selected by the user quality indicators.
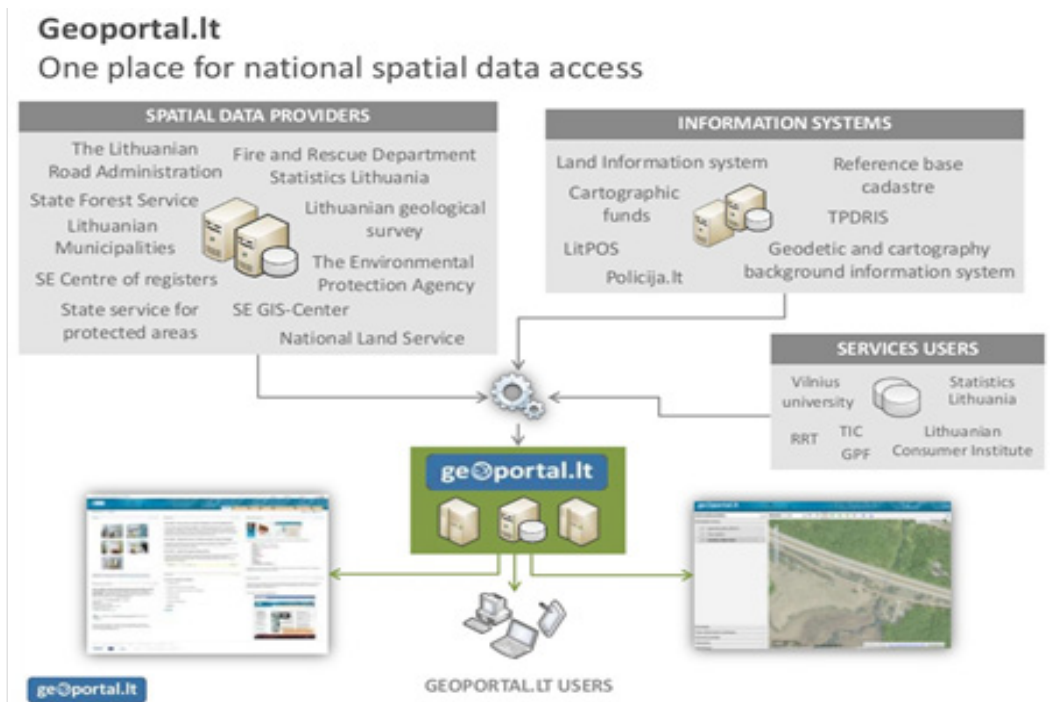
Fig.5. Management structure of the geoportal.lt in Lithuania [8]

The content of the Lithuanian geoportal free service consists of more than 250 publicly available data sets. The data are provided by 32 state organizations, the metadata system consists of more than 500 documents.

In Poland the geoportal dates back to 2005, when the Head Office of Geodesy and Cartography launched the *geoportal.gov.pl* project [13]. The project was funded under the Sectoral Operational Programme "*Improvement of the Competitiveness of Enterprises*" in 2004-2006. The main goal of the *geoportal.gov.pl* project was to improve the competitiveness of enterprises by providing them with on-line access to services based on spatial data, including cadastral data and metadata. Other important goals of the project included [13]:

- Development of entrepreneurship as well as increasing innovativeness and competitiveness of enterprises due to access of spatial data.
- Improving decision processes in enterprises, regarding investment decisions.
- Modernizing the work of public administration (on central, regional and local level) within the scope of the project, by means of introducing new IT technologies.
- Increasing the knowledge and importance of spatial data as well as cadastral data among entrepreneurs.
- Savings (in terms of time and costs) for entrepreneurs using the geodesy services.
- Enriching the offer of enterprises providing services based on public spatial data.
- Participation in the development of information society.

Under the *geoportal.gov.pl* project developed the infrastructure of nodes of the National Infrastructure of Spatial Data (*Krajowej Infrastruktury Informacji Przestrzennych - KIIP*), cooperating and providing services ranging from searching and providing data to data analysis. The network of KIIP nodes has been built on three levels: central, regional and local. The project did also result in the development of an internet portal: www.geoportal.gov.pl – acting as a broker, providing users with spatial data and services. The project was finished in 2008, and it resulted in the development of the following data bases: Cadastral data, Geographic database, Database of Topographic Objects, Orthophotomaps, Topographic map rasters, Thematic map rasters, State Register of Borders, State Register of Geographical Names, Numeric Terrain Model, Metadata sets and services of spatial data [9; 13].
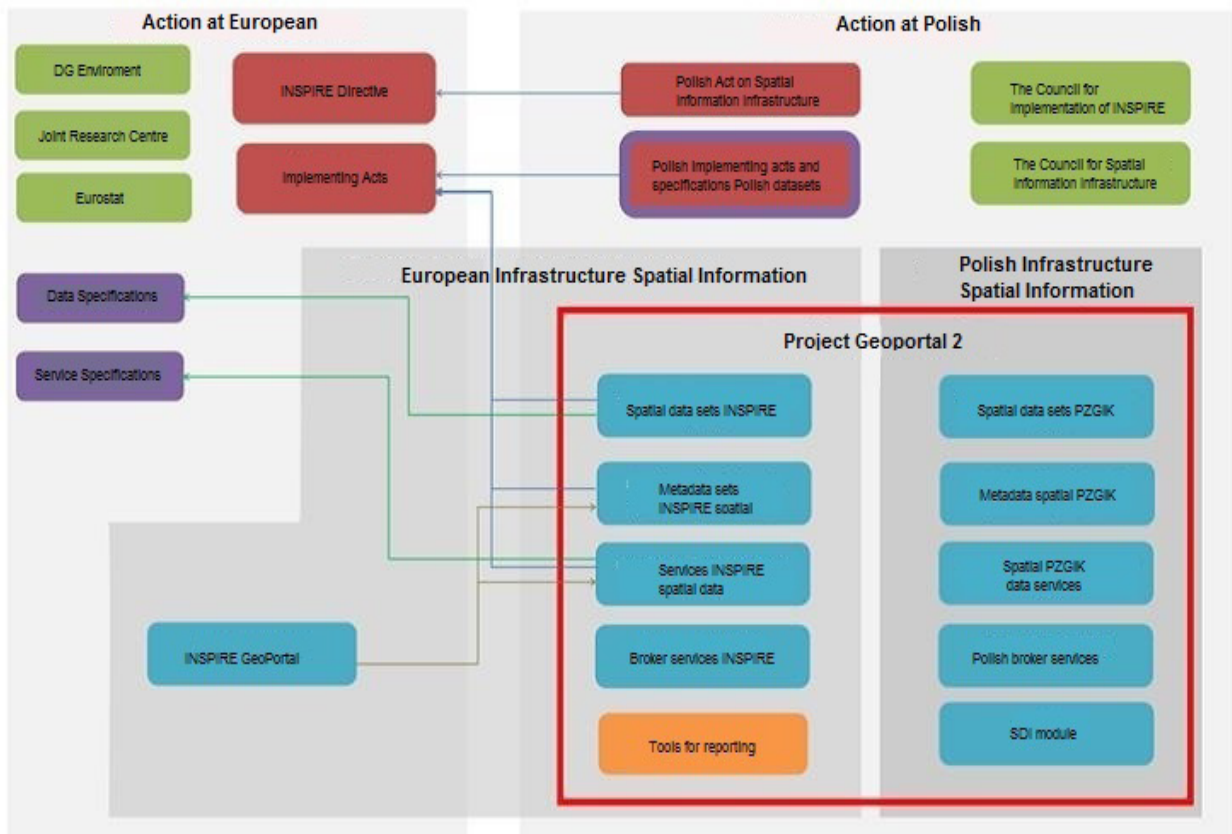
Fig.6 Geoportal.gov.pl. Project Geoportal 2 content.
Source: http://geoportal.gov.pl/en/o-geoportalu/powiazania-geoportalu/powiazanie-z-inspire [13]

Once the *geoportal.gov.pl* part finished, in 2009 a new project started aimed at continuation and enhancement of the previous activities: GEOPORTAL 2 – development of spatial data infrastructure in the area of georeferential registers and related services (Fig.6).

One of the components of the national Land Parcel Identification System is cadastral data. The Agency for Restructuring and Modernization of Agriculture provides cadastral data in the form of a service on the Polish territory, with the exception of some of the larger cities, such as Warsaw, Krakow (approx. 99 proc. of the country). Shared layer contains information on the approximate boundaries of parcels, but they can be used only in terms of approximate identification and spatial localization of a plot and its surface estimate [16].

The content of the National Geoportal maps consists of 12 primary layers: State Register of Geographical Names, State Register of Borders, Data registration, Data on cadastral, Sculpture areas (shading), Relief (Hypsometry), Database, Database of topographic objects, Orthophotomap, Scans of topographic maps, EuroBoundaryMap. European map boundaries is a geodatabase on the level of accuracy of 1: 100 000, covering 41 countries in its scope. It contains geometry, names and codes of administrative and statistical units. These data are successively updated by the members of EuroGeographics, national agencies, mapping and cadastral Europe [13; 15].

Today Poland has a prepared Database of Topographic Objects (TDB) – information and data about topographic objects. This database is appropriate to the maps in the scale 1: 10 000. The content of the database includes 10 thematic areas, where each of them is saved in several layers: administrative units, a network of roads and railways, buildings and installation, land cover, land use, the network of watercourses, protected areas, geodetic networks, objects, the network of public utility lines, points of address. Polish Geoportal presents TBD in 2 components: vector topographic data base (base TOPO) and digital map (base KARTO). In the project Geoportal 2, the national sets of data have been processed to form complying with the specifications for INSPIRE topics described in the annex to the Act on the IIP: geographical names, administrative units, addresses of property registration, transport networks, hydrography [9; 15].

The INSPIRE initiative is implemented in the activities of European infrastructure for spatial information in order to ensure access and share of spatial data by each of the members of the European Union. It is possible to use the data at European level for planning and research related to envi-

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ronmental policy, agriculture, transport, energy and education.

3.2. The free Service of Spatial Geodate application in education

Free spatial data services allow to find, view or download a particular data set. Registered users may choose in the maps browser publicly available or on order services from thematic catalog, where review services are grouped according to popular uses: geo-reference data, data for land surveyors, municipal data, maps of the Lithuanian National Atlas and others [5]. During practical exercises students both in Lithuania and Poland use and apply spatial data in a variety of tasks. Usually interactive maps on the basis

of orthophotos are formed. Spatial data availability and suitability for a particular purpose is an important condition. In order to determine the opportunities and problems of spatial data use in education, a survey of students based on provided criteria was conducted. The functionality of geoportals, data availability, convenience of tools, user-friendliness, correctness et al. were assessed (Fig.7).

University students both in Lithuania and Poland use public geodata services provided by geoportals to tackle different spatial tasks, however, having evaluated services provided by *geoportal.lt* and *geoportal.gov.pl*, it was found that information is missing in the *Help* section, the data is not always downloadable, in different geographic data registers data mismatches and errors are observed.
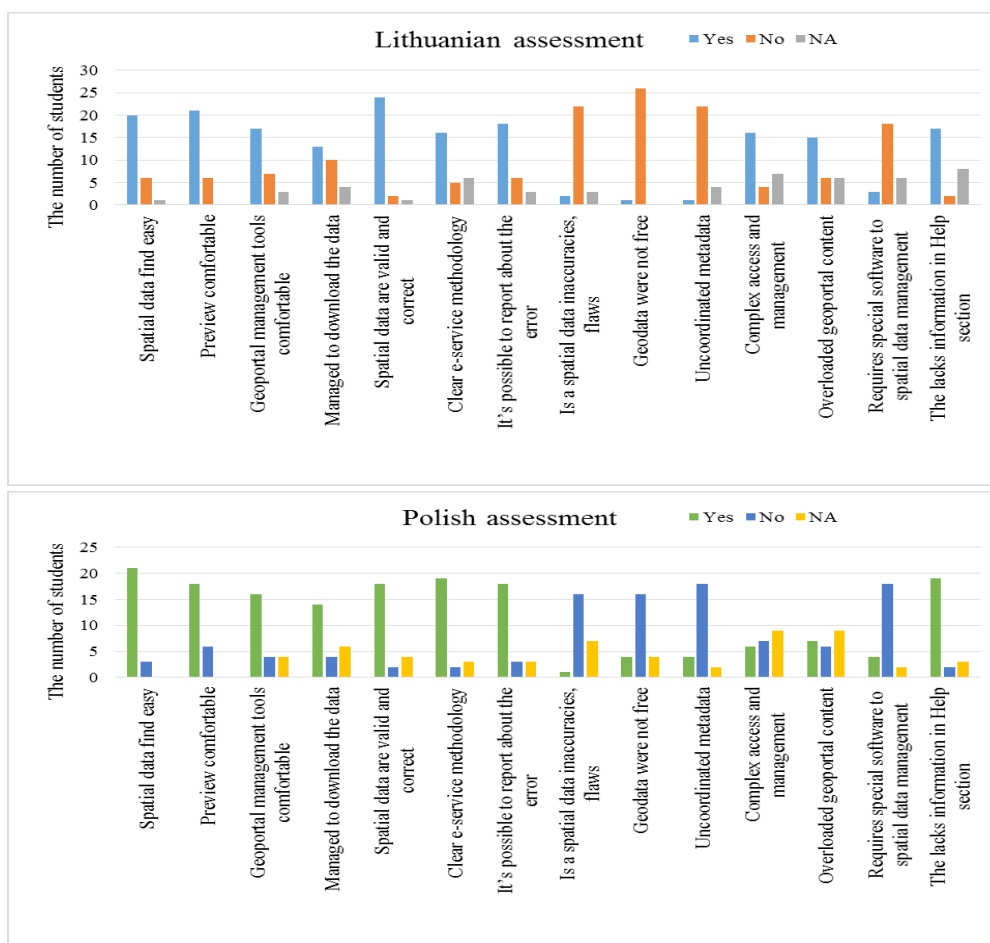

Fig.7 Criteria of Geoportal services quality assessment (Legend: Yes – I agree with criteria, No – I do not agree with criteria, NA – I have not opinion)

Summary of the results has showed that free spatial data services of the Lithuanian geoportal were positively evaluated by 48.68 percent of Lithuanian students, negatively - by 37.57 percent, 13.76 percent had no opinion. The quality of spatial data services by the Polish geoportal were positively evaluated by 50.30 percent of Polish students, negati-

vely – by 28.31 percent, - 14.81 percent of students had no opinion. It can be concluded that free public spatial data services are easily accessible to users, easily understandable, controllable, adaptable to students' practical activities, applicable in mapping and tackling of different spatial tasks.

CONCLUSIONS

1. The content of Lithuanian and Polish spatial information portals comprises spatial data sets regulated by the INSPIRE Directive.
2. The results of the theoretical study showed that in Lithuania and Poland application of spatial data in education / training process is active. Students use the free public services of geoportals and spatial data creating interactive maps, tackling various thematic mapping tasks.
3. The results of the questionnaire showed that free spatial data services provided by geoportals are evaluated positively. The quality of spatial data and services provided by the Lithuanian geoportal were positively evaluated by 48.68 percent of students, negatively – by 37.57 percent, 13.76 percent of students had no opinion. The quality of spatial data and services provided by the Polish geoportal were appreciated by 50.30 percent, negatively – by 28.31 percent, 14.81 percent of students had no opinion. It was noted that some information was missing in the Help section of both Lithuanian and Polish geoportals, students not always were able to download the data, and in different state registers data discrepancies were detected.

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