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## Innovativeness of Making Spatial Data Available as an Element of Building an Information Society

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# Innovativeness of Making Spatial Data Available as an Element of Building an Information Society

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**Abstract.** The economic development of the state is to a large extent dependent on the consciousness and knowledge of the society. It is in the government's interest to expand this awareness and knowledge through the administration. Modern computer technologies, the Internet and the development of information transfer and making available technologies create new opportunities for popularisation of the knowledge through e-administration. In the European Union countries, general rules for the development of the spatial information infrastructure have been defined in the Directive of the European Parliament and of the Council INSPIRE. The article presents the adjustment of the Polish spatial information infrastructure to the European Union regulations, principles of building an information society, websites providing geo-spatial data, implementation projects in this area and criteria for assessing the level of maturity of this type of services. The article also presents the possibilities of use of these data for commercial purposes and scientific research and the benefits to society obtained through the making these data available.

## 1. Introduction

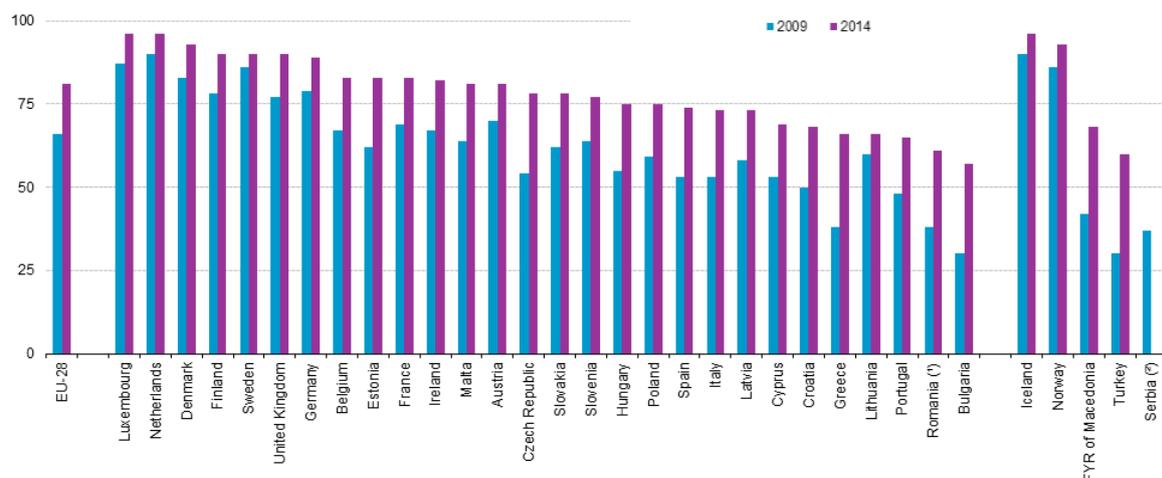
Development of computer and telecommunications technologies opens up for the society completely new possibilities for the acquisition of information. The abundance of information becomes the basis for activities carried out in various spheres of urban space and rural areas – social, cultural, spatial, economic and environmental. They generate changes in these areas and also promote globalization. The technological dimension of globalization is also important, because it is associated with the growth of dynamics of changes in the sphere of communication and information bringing about a phenomenon of "shrinking time and space" on a global scale. Stenkiewicz, Świeboda [1].

The most important way of obtaining information is the use of information technologies, which are characterized by coherence and compatibility, referring to various spheres of human activity. Thanks to these technologies, the process of exchanging and acquiring information characterized by a digital form is simplified. Most citizens now, without the need for specific skills, can have, thanks to new

technologies, access to information in a wide range, and this information can be derived from various sources, in various formats. As results from research carried out in the Scandinavian countries and Great Britain there are dependencies between the degree of e-administration implementation and the level of efficiency of the public sector and the well-being of society. The information society uses information technology, which facilitates the production, storage, transmission, downloading and use of information [2]. Governments and local authorities are responsible for meeting social needs, performing activities related to the implementation of social needs through the administration. A great facilitation for the work of governments is the ability to carry out many tasks through electronic administration (e-administration - e-government). E-administration means the use of information technology by administrative units associated with public activities to bring improvements to the delivery of public services, and to make them more accessible.

## 2. The economy based on knowledge - e-services

The second half of the twentieth century brought many inventions such as personal computers, Internet network, servers and dedicated software for these devices, and at the beginning of the 21st century, mobile communication became widespread. All these inventions have made citizens' lives better (more convenient). Nowadays, citizens are more and more willing to reach for information gathered in the Internet resources. This increase is illustrated by Eurostat's [3] research in the European Union countries shown in figure 1. This figure presents the percentage of households' access to the Internet in the countries of the European Union in the years 2009 and 2014.



**Figure 1.** Access to the Internet in the households, 2009 and 2014. (% of all households)  
source: Eurostat [4]

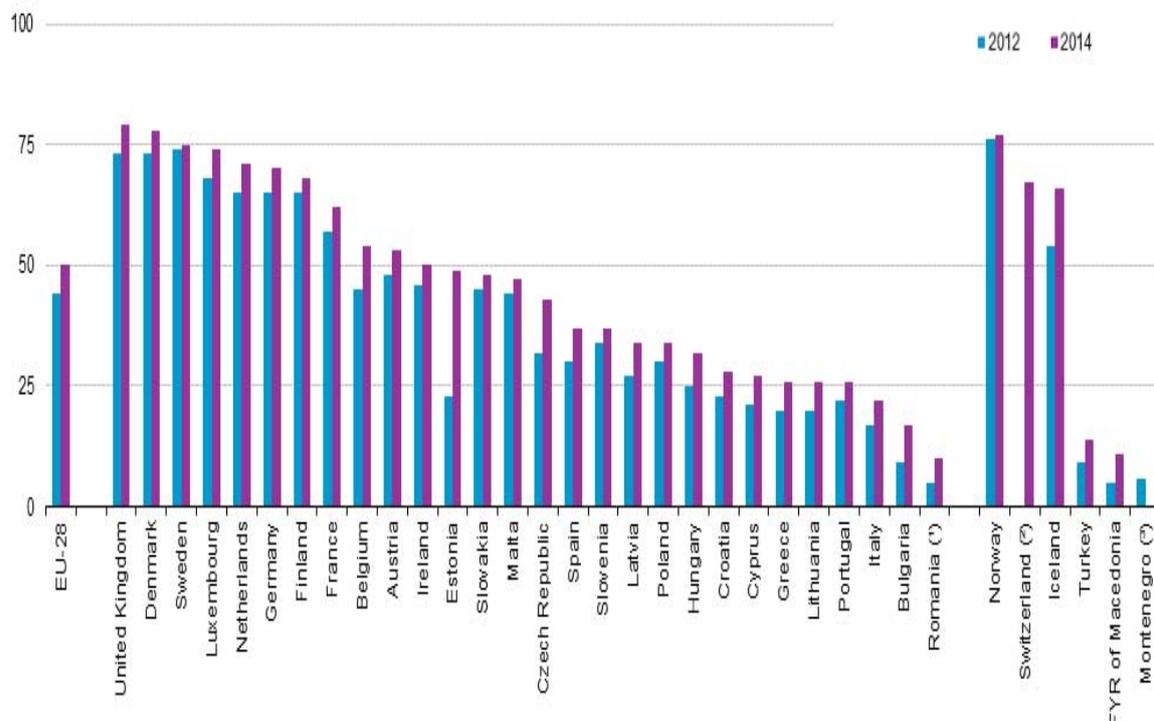
The increasing availability of advanced information and communication technologies for citizens makes the services sector undergo changes adapted to the growing needs of society in the area of services provided via the network. Information, education and entertainment services provided via the Internet are of particular interest (figure 2). Internet portals are more and more often used to run a business and deal with official matters. The platforms of electronic communication of citizens with the state via e-administration are a good solution for both the state and citizens. The development of this type of technology is one of the priority activities implemented as a part of the information society strategy in the European Union.

According to the information published by the Central Statistical Office [5] in 2014 in Poland, 92.4% of enterprises applied the e-administration services. The researches of the Central Statistical Office regarding the interest in individual e-services are presented in the table No. 1.

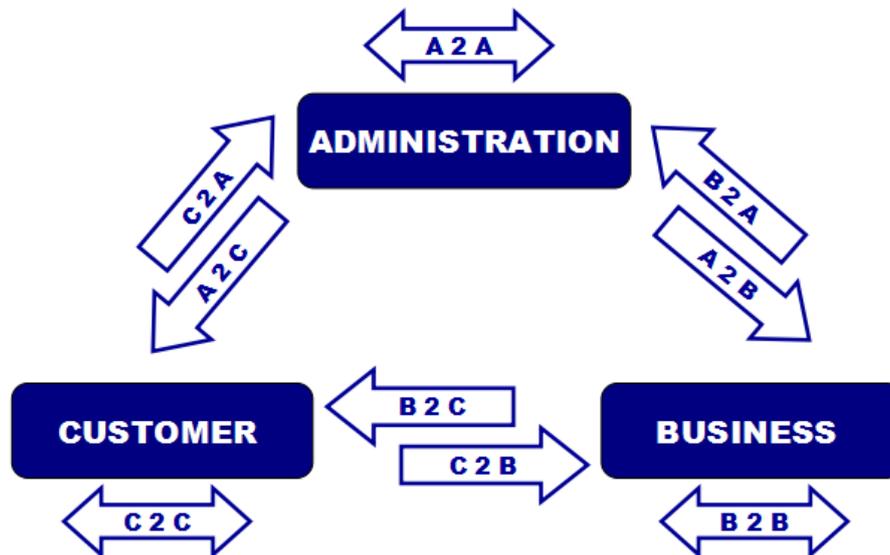
**Table 1.** Enterprises using e-government in 2012 and 2015 by purposes. Source: GUS [6]

Specification	2012	2015
- in order to:	[%]	[%]
Acquiring information	78.1	77.9
Downloading forms	80.6	84.9
Returning completed forms	86.2	93.5
Completely electronically handling administrative procedures	61.0	66.1

The development of e-services in the countries of the European Union is focused on building correct relations between the main subjects of social and economic life which are the citizens (Customer), business entities (Business) and public administration entities (Administration). These relationships are described as A2A, A2B, A2C, B2A, B2B, B2C, C2A, C2B, C2C. Diagrams of mutual relations are presented in figure 3.



**Figure 2.** Individuals who ordered goods or services over the internet for private use in the 12 months prior to the survey, 2012 and 2014 Source: Eurostat [7]



**Figure 3.** Model of e-services relations

The process of providing e-services is automated and remote. According to this concept, a public e-service is any e-service consisting in [Kaczorowska A [8]:

- sending and receiving data by means of IT systems in public telecommunications networks (e.g. in the Internet),
- offering by the supplier the individualized services, the provision of which is made at the request of the recipient,
- implementation of the service delivery process without the need for the presence of the service recipient and service provider at the same time in the same location.

The quality of these services can be described on the basis of the taxonomy of D. West [9] developed in 2005. The lowest level 0 means that the service is not provided electronically. Level 1 of this taxonomy means the possibility of obtaining information via an e-service. Level 2 services provide one-way interaction, while level 3 means two-way interaction. The highest, 4th level of the taxonomy means the possibility of making a transaction via an e-service. According to the information materials of the Central European Funds Information Point - „E-maturity” means the extent to which a case can be dealt with online. Currently in the European Union countries, the measurement of maturity is carried out according to a five-point scale. The scale was developed by Capgemini on behalf of the European Commission. The specification of individual levels is presented in the table 2.

### 3. The role of geodetic data in building an information society

The geospatial data provided by various information services constitute a significant role for the country's economic development. The most widespread information service available in the world that provides geospatial data is Google Maps. Within this service, in addition to the map information, we can get information about the intensity of road traffic, public transport, bicycle routes, terrain topography and satellite images. These data are widely used by the people for logistic, tourism and cognitive purposes.

**Table 2.** Levels of maturity of the e-services

Level	Level characteristics
1	Information: publicly available information about the public service
2	One-way interaction: the ability to download forms and applications
3	Two-way interaction: processing of forms
4	Transaction: handling transactions, making online decisions, providing services and handling payments
5	Personalization: organization of services for the needs of users

It is necessary to have more data for good management of the state economy. In the countries of the European Union, the principles of building a spatial information infrastructure are defined by the directive INSPIRE of the European Parliament and of the Council of 14 March 2007 [10]. Within the framework of this directive, the principles of cooperation and coordination in the field of databases are defined and in the field of spatial infrastructure, types of data collected and used in public administration and ways of sharing these data through services. The act of March 4, 2010 on spatial information infrastructure is a transposition of this directive to polish regulations [11].

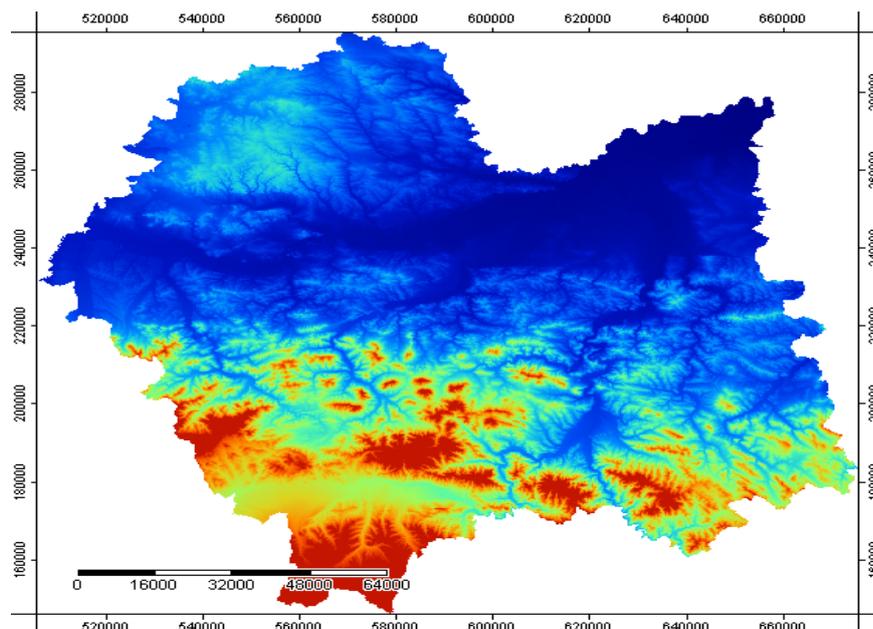
**Table 3.** List of selected services published as a part of the Geoportal2. Source: Prepared on the basis of information posted on the website [12].

The type of service	Service	Example data
WMS	INSPIRE	Cadastral parcels, Monuments of History, UNESCO World Heritage, register of archaeological heritage objects, a register of immovable heritage objects, administrative units, geographical names, Transport TBD
WMS	KIIP- Miasta KIIP- Powiaty	Data from: communal, district and voivodship geoportals
WMS	SDI	Local spatial development plans for Communes in the Massovian Voivodship
WMS	Mazowsze GDDKiA	Map of emissions throughout the whole day and special threats Map of proposed development directions Map of areas threatened with noise throughout the day
WMS	Other services	Upper Vistula - flood zones GZWP - Main Underground Water Reservoirs Internet Manager of Address Points Midas - deposits, mining zones and mining areas GDOŚ - Protected areas PIG - Areas of danger with floods of Data Bank about forests
WMTS	INSPIRE	Addresses, Cadastral parcels, Administrative Units, Geographical Names, Transport
WMTS	Domestic services	Cadastral data, Hypsometry, Shading, Topographic map, Orthophotomap. Visualisation: BDO, BDOT, BDOT10K
WFS	Geoportal	Cadastral data, State Register of Borders - addresses and territorial units, Register of Towns, Streets and Addresses, Visualisation BDO, The State Register of Geographical Names, Digital Terrain Model, Network, VMAPL2, transport TBD and BDO, administrative units

The project [geoportal.gov.pl](http://geoportal.gov.pl) [12] is the leading information service in Poland in the field of providing geospatial information. This project was created on the initiative of the Central Office of Geodesy and Cartography as a part of the implementation of the Sectoral Operational Program - Improvement of the Competitiveness of Enterprises 2004-2006. The aim of this project is to increase the knowledge and significance of spatial information, the development of entrepreneurship and increasing the innovativeness and competitiveness of enterprises on the market, streamlining decision-making processes, streamlining the work of public administration. Within this service it is possible to obtain, among other things, information of a cadastral nature, topographic maps and photogrammetric imagery. A summary of information made available through the [geoportal.gov.pl](http://geoportal.gov.pl) website is presented in the table 3. This information can be obtained through the Web Map Service (WMS) that is spatial data sharing on the Internet in the form of a raster and Web Feature Service (WFS) spatial data download services enabling downloading data files from the State Geodetic and Cartographic Resources.

Many governments around the world take the initiative under the name Open Government Data. Within this initiative, citizens are provided with information and data collected by public administration. The purpose of this availability is to create conditions for citizens to make accurate decisions, more effective business management and creating greater transparency of administration. The data available to citizens includes: finance, statistics, transport and geospatial data. In Poland, many institutions including: Head Office of Geodesy and Cartography, General Directorate for Environmental Protection, Central Statistical Office provide geospatial data. Within these accessibilities, it is possible to obtain free data on the topography of the terrain, topographic objects databases, cadastral data and information concerning environmental protection, reserves of nature, national and landscape parks etc.

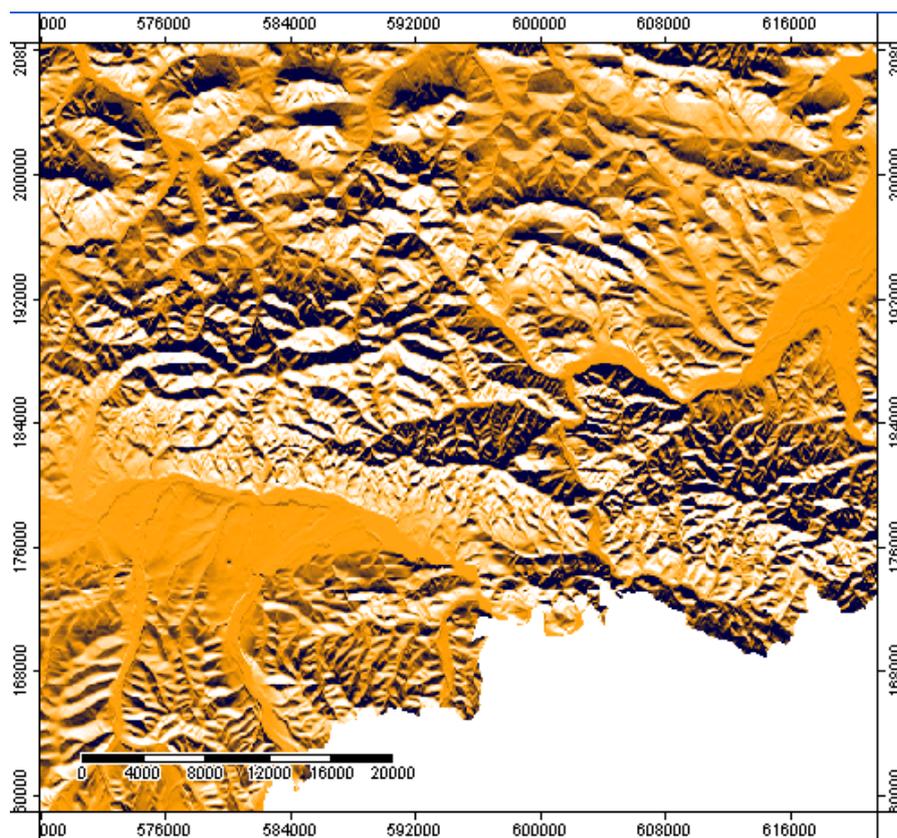
Figure 4 presents the layout of the Małopolska voivodship topography based on free data (NMT\_100) downloaded from Central Geodetic Documentation Center (CODGiK).



**Figure 4.** Map of the terrain of the Małopolskievoivodship.Source: developed basing on data from CODGiK [13]

The digital terrain model provided by CODGiK enables to make many, interesting simulations, which can serve both economic and scientific research purposes. Figure 5 presents the distribution of solar radiation in the part of the Małopolska voivodship, based on data from NMT\_100. Simulations of this type can be used to support pro-ecological activities such as determining areas with optimal solar exposure conditions for example, construction of solar farms. Bearing in mind the mountainous character of the southern part of the Małopolskie voivodship, thanks to the use of such simulation, we can also determine the optimal areas for the ski slopes – that is areas with minimal solar exposure.

Common access to data is important for the country's economic development. However, it is important to maintain the high quality and consistency of this data. Currently, many projects are being implemented in Poland to increase the use of geospatial data by the general public. These projects are implemented both from the state treasury and from the budgets of local governments. EU funds are a big support in implementing these projects. Within these projects, works related to the construction of new geo-spatial databases and to the improving the quality of data in existing databases are being carried out.



**Figure 5.** Map of the distribution of solar radiation in the part of the Małopolskie voivodship.

The appropriate quality of this data is essential for the correct harmonization of data from various sources, i.e. maintained by various administrative bodies. This harmonization is enforced by the provisions of the EU Inspire directive.

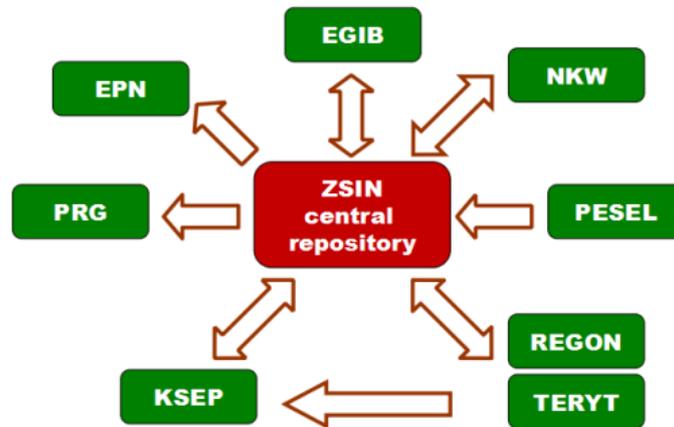


Figure 6. ZSIN project. Source: [14]

Among the programs particularly important for data harmonization is currently implemented project of building an integrated property information system (ZSIN). Within this project, data from various sources will be integrated, i.e. from: Land Registry (EGIB), Land and Mortgage Registers (KW), state register of boundaries and areas of territorial division units of the country (PRG), the national official register of the territorial division of the country (TERYT), the national official register of entities of the national economy (REGON), national system of producers' registry, records of agricultural farms and records of applications for payments (KSEP) (figure 6). The implementation of this system will increase the efficiency of public administration units. This efficiency will be ensured by creating solutions enabling ensuring consistency and timeliness of property data, and also by automatically databases updating.

#### 4. Conclusions – Summary

The economic development of the state is to a large extent dependent on the awareness and development of society. Contemporary society thanks to the development of modern technologies has the great potential for acquiring the knowledge and its practical use. This knowledge constitutes social capital and can be used in the investment process, for crisis management, environmental protection and many other economic purposes. These goals are implemented by the state through provided e-administration and e-services. The use of this type of solutions makes, that the transparency and efficiency of public administration are increasing and the administrative burdens and corruption are reduced.

Geospatial data made available to citizens free of charge contribute to the economic growth of the state. These data are used by citizens to plan investments, logistical goals, and environmental protection. Thanks to the dissemination of this data on the Internet, citizens manage their time better and the wealth of the society increases.

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