

INFORMATION SYSTEMS AND DIGITAL CARTOGRAPHY FOR SPATIAL PLANNING IN POLAND

Krzysztof Koreleski,

Faculty of Environmental Engineering and Geodesy, University of Agriculture in Kraków, Poland

Abstract

There are currently numerous all-country spatial information systems in Poland concerning: natural environment (e.g. state forests, monitoring of soils, waters and air; geology, meteorology and water management), agriculture (AIACS, agricultural productive areas), technical infrastructure (land and building cadastre, roads and bridges, gas, energy, water supplies, communication networks) and others (state statistics, historic monuments protection, etc.) and many local and regional information systems and databases. There are also plenty of cartographic studies concerning various aspects of the country's spatial development both in the traditional and digital form. SIS and digital cartography are becoming more and more popular instruments of spatial planning in Poland. The presently created, based on dispersed systems, National SIS will also serve the needs of state, regional and local planning.

INTRODUCTION

Spatial information systems (SIS) and digital cartography are becoming more and more popular instruments of land development – in concordance with the experience of management science proving that positive effect of the undertaken decision is in 80% due to information and only in 20% due to invention and intuition of a decision maker [Ney 1997]. The sources of spatial information comprise cartographic documents, digital photogrammetry documents, satellite data, various cartographic studies concerning spatial development etc.

In the last years in Poland, one observes a dynamic development of SIS (GIS and LIS) in the management and administration. Such systems enable conducting automatized analyses of any spatial data reduced to the numerical form. The advantage of these systems – as the tools supporting decisions – over traditional studies results from the possibility of current assessment of changes occurring in space in the automatized way.

These tools are used for working out the strategy of spatial development and environmental protection.

Nowadays, Poland is creating the National Spatial Information System (NSIS), on the basis of dispersed systems – for the needs of administration, spatial planning, land management and environmental protection.

The aim of the paper is to present in short: various existing in Poland SIS and databases, more important cartographic products, technologies of data obtainment, the concept of the NSIS (based on modern informatics methods), the range of necessary data for the needs of spatial planning.

MORE IMPORTANT POLISH SIS AND DATABASES

The more important systems of spatial information existing in Poland comprise [Koreleski 2003]:

➤ in the range of technical infrastructure:

- National System of Land Information based on land and building cadastre and numerical large-scale maps,
- Roads and bridges information system,
- Branch systems for management of gas and electric energy supplies, water, communication networks etc,

in the range of natural environment, its utilization and protection:

- Integrated information system “Environment”,
- Information system of state forests,
- System of environmental monitoring (soils, water, air), central basis of geological data,
- SIS for the needs of the Geological Map of Poland,
- Systems of meteorology and water management,
- SIS for the needs of hydrographic division of the country,
- SIS about swamps and grasslands,
- Soil cartography database,

- in other ranges:
 - Systems of public statistics (administration, population, enterprises),
 - SIS for the historic places protection,
 - Integrated system of agriculture control (IACS),
 - Integrated information system of agricultural productive areas, etc.

CARTOGRAPHIC DOCUMENTS, TECHNOLOGIES OF DATA OBTAINMENT

The basic documents used in the spatial management practice include studies in accordance with obligatory technical standards, concerning geodesy, cartography and national Land Information System (Geodesic and Cartographic Law of 1989 with later changes), such as:

- Basic (fundamental) large-scale maps,
- Topographic maps for economic purposes,
- Thematic maps (e.g. geological, hydrographic, etc.),
- Geodesic cadastre of terrain development net (infrastructure).

The most popular numerical data used in the planning practice comprise information concerning: soils, geology, climate, hydrology, environmental monitoring, processed aerial photographs and satellite images (numerical terrain models, land use), land development areas: protected, contaminated, threatened by droughts and floods [Koreleski 1997, 1999, 2001].

A good deal of information may be also obtained from the processing of various traditional (analogue) maps, atlases and other cartographic studies. The analogue maps demand processing to the numerical form (vectorisation). There are also many data of high information value without defining their geographic coordinates – which demand application of GPS technologies.

The obtainment of spatial information from cartographic documents bases on three essential methods:

- maps digitalization,
- maps scanning and vectorization,
- coding of maps contents with reference to fields of assessment.

Each of these methods has its defects and virtues and demands application of various special computer instrumentation for information files creation. The coding of map contents is often applied (in the assumed coordinate system) with regard to raster by the use of special identity codes.

Thematic maps with the small changeability of features are mostly processed by the use of digitalization or scanning and vectorization. Thus obtained vectoral image may be fitted into a raster structure of databases by the use of special software.

The great role is ascribed to new techniques of spatial information obtainment, such as development of numerical photogrammetry – creation of numerical terrain models and numerical orthophotomaps. The acquisition of data from the satellites (Landsat, SPOT, IRS, IKONOS) is also in use. More and more frequently, spatial planning in Poland bases on numerical data coming from various sources and formats, thus enabling decision taking on various levels of management, making use of appropriate text and numerical bases.

NATIONAL SPATIAL INFORMATION SYSTEM

The NSIS bases on the unified informatics principle, legal and organizational, which are supposed to guarantee its compatibility, information transfer between participants and users of the SIS, easy access to the output information, protection of information and responsibility for its reliability and relevance, as well as other characteristics of modern information systems – according to the EU standards. Its aim is to ascertain efficient service of various public tasks, supporting spatial – economic development and improvement of citizens service. The participants of the system are: governmental and self-governing administration of various levels and various entrepreneurs.

The information range of the NSIS consists of three levels. On the local level the system comprises:

- Administrative and branch division of the area, with registers of places and physiographic objects,
- Land and building cadastre,
- Information concerning spatial management and terrain functions,
- Information concerning technical infrastructure,
- Information concerning social infrastructure,
- Statistical data (economy, demography),
- Geodesic and cartographic information (geodesic matrix, basic maps, topographic maps).

Information range on the regional level comprises:

- Administrative and branch divisions of the voivodship,

- Information concerning land management,
- Information concerning natural environment,
- Technical and social infrastructure,
- Geodesic and cartographic information,
- Statistical data collected on the regional level.

On the national (all-country) level information comprises, for the sake of the supervising functions, administration of central level and connected with it determining development strategies of sectors and branches – mainly statistical and review data.

Polish (national) SIS is based on the dispersed structures - existing systems and databases. It joins features of GIS and LIS; while information for GIS comes from: numerical topographic maps, numerical terrain models and various specialist or branch GIS, whereas for LIS from numerical basic maps and numerical real estate cadastre.

The concept works concerning NSIS are carried out parallel to reform processes in economy and administration and adjusting Polish law to the EU standards. Therefore many solutions, especially of organizational, economic and legal character are proposed variantly.

The evolution of the NSIS is tightly connected with scientific – technical progress in informatics. It concerns methods of data storing and collection e. g. transition from the OLTP (On – Line Transaction Processing) databases to the OLAP (On Line Analytical Processing), integration of various programmes (applications) of useful character (the OLE: Object Linking and Embedding technologies, SWING: concerning the standard of geodesic information exchange system), as well as natural transfer of elements between applications (option “drop and drop”) etc.

The integrated NSIS on the basis of dispersed files opens new possibilities thanks to the easiness and operation speed, as well as information value of generated cartographic, graphic, numerical and descriptive data.

SPATIAL INFORMATION FOR PLANNING PURPOSES

Information scope of the NSIS includes three levels and therefore the information contained in this system will be useful also for drawing up local planning documents (study of conditioning and spatial development directions – diagnosis, opinions, final version of the study; local plan), regional and national planning studies – development strategies of economic sectors and branches in the range of spatial – economic state policy (review and statistical information). Spatial information is used in the study of conditioning and spatial management directions of the commune in topics concerning:

- Development aims,
- Conditioning of aims realization,
- Directions of spatial management,
- Directions of economic changes,
- Spatial policy of the commune.

The data in the range of spatial information are used in three phases of planning:

- Diagnosis of existing condition,
- Opinion giving (reviewing),
- Establishing of final version of the study.

While working up planning documents on the regional level the following information is taken into consideration: administrative and branch division, land use and management, natural environment, infrastructure, geodesic and cartographic data, etc.

The administration of the regional level uses also documents coming from the processing and generation of elementary data collected on the local level. On the central (national) level – planning is based generally on the data mainly of statistical and review character.

Generally speaking, the functioning of spatial planning means the properly acting model of databases connected with the numerical map, supplemented also by numerous analyses of descriptive and spatial kind.

FINAL REMARKS

Apart from the data coming from a direct query in offices, institutions and in the countryside – contemporary spatial planning in Poland widely uses the existing databases and information systems, various cartographic documents, aerial photographs and satellite teledetection documents. Hence appears the necessity of processing the analogue cartographic documents to the digital form, creation of modern SIS.

The NSIS being created in Poland, basing on the dispersed systems, fulfilling the required standards and conditions of spatial information, such as reliability, completeness, up-to-dateness and accessibility - will certainly facilitate processes of management and administration on various levels and will be an effective tool of spatial-economic and social development of Poland within the EU structures.

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BIOGRAPHY OF THE PRESENTING AUTHOR

Krzysztof Koreleski, born 1942, university professor.

- Education: MA in Geography, Jagiellonian University (1964), Ph.D. in Geography, Jag. Univ. (1971), D.Sc. (habilitation) in Agricultural Sciences, Agric. University in Krakow (1977).

Title of Professor of Agriculture (1986).

- Appointments: Assistant: 1965–1971, Senior Assistant: 1971–1977, Docent (Assoc. Professor) : 1977–1986, Professor since 1986; Vice-Dean of the Faculty of Rural Geodesy: 1978–1981; Head of Department of Rural Areas Planning, Organization and Protection, University of Agriculture in Krakow since 1980; Position of Ordinary Professor since 2000.

Scientific editor of the Scientific Papers of the University of Agriculture, series “Geodesy” since 1980; Deputy editor of “Soil Survey and Land Evaluation”, Norwich 1985–1990; Member of Common Agricultural Policy Forum University of Reading (1995–1998).

In the Polish Academy of Sciences: v-president (1992–1995) and president (since 1996) of the Commission of Geodesy and Environmental Engineering; member: Commission of Geographic Sciences, Committee for Spatial Management; Section of Spatial Information etc.

- Scientific interests: rural areas development – spatial management; protection, shaping and valorization of rural areas, thematic cartography, spatial information etc.

Author of over 200 scientific papers (including 6 academic manuals and four books), e.g. : “Types of Soil Degradation on Loess Near Krakow”, 1975; “Tentative Classification of Agricultural Land Evaluation Methods with Special Reference to Poland”, 1986; “Natural Bases of Agricultural Productive Land Utilization”, 1993; “Extra – Productive Functions of Forests and their Valuation”, 2000; “Large-Scale Soil Cartography as the Source of Spatial Information Concerning Environment” 2001.