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**THE DIGITAL DATABASE FOR THE COMMUNE
AND THE CITY OF EŁK
AND ITS APPLICATION IN ENVIRONMENTAL PROTECTION
AND SPATIAL PLANNING**

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Introduction

Digital database applications in environmental protection and space shaping processes have become prevailing in modern technology countries like Northern America, Japan, Western Europe. Applications of environmental monitoring wide systems in these countries (sources of huge amount of data), caused automatization of data collecting, transmission and processing. Results synthesis and conclusions formulation could be often impossible to implement with no computer technics application.

Some trials of computer technics applications have been experienced in Poland for several years. GIS have been applied for natural resources inventory and management. Two main directions of these systems development can be observed:

1. The first, mostly used till the turn of 80-ties, was based on the individual programs formulation, separately for specific needs; usually these programs were incompatible with other existing systems (examples: BIGLEB, IWIEP, SINUS);
2. The second, actually becoming more and more popular, is based on: worldwide applied packages of GIS (ARC/INFO, MapInfo, MIPS, Intergraph), usage of packages apprenticeships, eventually individual applications written in GIS programming languages. Usually there is a possibility of data exchange between these systems.

Considering integration processes of Poland with the European Community and necessity of our spatial data integration with other European data, we should definitely decide for the second case of GIS development in Poland.

Background of database establishment

The city of Ełk, located in the North Eastern Poland, in Suwałki voivodeship, has got the high recreational assets because of many big lakes and forests complexes in the neighbourhood, as well as function of a traffic function. Its neighbourhood plays a significant role in the environment of the "Green Lungs of Poland" functioning. Since the beginning of 1992 the program "Ełk – ecological City" has started to be implemented thank to local self-government activities. On many educational, scientific and investment activities. One of defined tasks was to establish digital spatial database for the commune and the city of Ełk. The aim of the database was to gather spatial data for the commune and the City of Ełk, which furthermore were planned to be completed with descriptive data in relation to the spatial objects. After the project was implemented this could be used for the spatial management for this very administrative units.

The database was established in order to the Department of Nature Protection in the Ministry of

Environmental Protection, Natural Resources and Forestry within the "Nationwide Nature Inventory General Program". In relation to this, information referring to the natural environment and its transformation has been more stressed than socio-economical data. Authors of the database have taken an advantage to determine standards and range of digital GIS for a commune natural environment.

Data sources and processing. Informatic description of the database

The database was made by the designing groups of the Market Group FIN SKOG Gdańsk – Department of Spatial Data Systems and Nature Projects under Mariusz Kistowski's supervision. Data sources consist of published and unpublished cartographic materials: 1:5000, 1:10 000, 1:25 000, 1:50 000 map scale as well as self-made mapping. The main source of data for the area of the City embraces maps made by M.Sc. Engineer A. Żelazny in 1988 for the general physiographical project. Topographical maps in GUGiK 1965 system, agriculture – soil maps, forests habitats maps and other branch projects have been used for the area of Elk commune. Self-made field works refer mainly to environmental deterioration mapping.

Processing maps to a digital form embraces two steps. Primarily, after thematic maps were drawn on tracing paper, they were scanned with the Hawlett-Packard scanner (format A-0 or A-4) and they were processed to the raster form of digital data. Secondary raster data has been converted to the vector form with use of PhD R.Siwecki's programs. Applied programs enable the scanned picture calibration. Its content changes, but first of all it gives an opportunity of vector conversion with features attributing to areas, lines, points. For the users level of informatic knowledge (among others officers from the Elk Municipality), price and planned applications as the environment for working with GIS data, MapInfo 2.0 for Windows has been chosen. The program is intended for IBM PC computers, at least 386, more recommended 486. It requires RAM of 4 MB. The minimum hardware memory is 80 MB, more recommended 170–250 MB. For the speed of getting access and data processing computer with a clock of 50 or 66 MHz are advantageous. 28 MB of hardware memory has been occupied by the database in an unpacked form.

The range of data in the database

The database embraces two basic groups of maps in relation to:

1. Area of the City of Elk within perspective borders, size of about 40 km²; data scanned from 1:5000 maps;
2. Area of the Elk commune with its direct surrounding, size of about 400 km²; data scanned from 1:25000 topographic map in the GUGiK 1965 projection. Geographical coordinates for these maps have been taken from the Institute of Geodesy and Cartography in Warsaw.

Database contains 18 maps.

For the City of Elk it embraces maps as follows:

1. Hipsometrical – bathymetric (with a section of 2,5 m);
2. Geological – land (it contains 9 classes – lithological composition of sediments data, their thickness and carrying capacity);
3. Hydrographic (it contains 6 classes - surface water, wetland, interior lowerings);
4. Groundwater first layer location (with a selection of 1,0 m);
5. Land use and management (58 classes);
6. The water system main sewers;
7. The sanitary system main sewers;
8. The storm drainage system collectors;
9. Gas pipelines;

10. Heat-pipes and air pollution point emitters (in 3 classes of emitter installed thermal power).

For the Elk commune database embraces maps as follows:

1. Hipsometrical – bathymetric (with a map section of 5,0 m);
2. Elementary landscapes (7 classes);
3. Surface geological sediments (21 classes);
4. Hydrographical division (more than 400 elementary catchment areas);
5. Hydrographic (3 classes – lakes, rivers, wetlands);
6. Features of the first exploited groundwater layer (depth of layer roof, layer thickness, yield and isolation);
7. Soil – biotopic with some elements of land use (31 classes);
8. Environmental deterioration (tourist facilities objects, workings waste dumps, air pollution emitters, sewage discharge points).

Database applications

Digital database "Elk" implementation has initiated further works on computerization of natural and socio-economical resources management processes in Elk and its neighbourhood. The database has created the framework of the future computer system. Its implementation has started with the computer network installation in the Municipality building next to the database establishment. Also network MapInfo packages for 5 stands were purchased. Two of them are located in the Municipality building, one in the Emergency Brigade Station, one in the Water and Sewage System Company and one in the Heat-Energy Company. Light pipe network connection of all the stands has been planned. The database, made by the Market Group FIN SKOG and handed over to Ek in the middle of 1993 after necessary amendments have been made. is applied among others for:

- natural and socio-economical resources inventories;
- natural resources management planning;
- antropogenic environmental hazards analysis;
- municipal technical infrastructure networks inventory and their functioning analysis;
- providing assistance for publications in relation to the city and its surrounding;
- spatial planning in the city and commune area.

The concept of the nature evaluation for the commune and the City of Elk has been made as the supplement for the database. This concept, based on data contained in the database, presents evaluation of open (green) city areas systems functions, assesment of housing location and recreation areas development. Detailed descriptions of algorithms contained in the supplement can be applied after appertinenceships for MapInfo formulation. Eg. area assesment for the diffrent forms of recreations has been made on the basic of the data as follows: land use, forests habitats, size of lakes, 2,5 m isobath extent in lakes, type of littoral zone use and slopes.

However the basic MapInfo abilities already enable some analysis and clasisification execution. Eg. classification of grounds carrying capacity for housing can be made on the basis of the geological-land map. Also the range of protection zone for the industrial works can be determined as well as analysis of their management correctness. In addition an analysis of the polluting (industry, transportation) and polluted (housing, services, surface water, farmlands, gardens) areas mutual location has been made.

Hazards caused by this kind of neighbourhood have been specified. The Municipal Water and Sewage Systems Company has started progressively implementation of system inventory in relation to technical parameters, bedding etc. The inventory has been made with introduction water and sewage system data into the database. Appertinenceships facilitating piping failures emergency repairs are planned to be implemented.

Textual base in relation to the open (green) city areas has been made in the Municipality on the basis of spatial data.

Graphics for Self-Governmental Informational Bulletin "MAZUR", have been made with use of database spatial data. Information about implemented city investments and areas planned for sales has been presented in this bulletin.

At the moment the city database tends in directions of geodetic applications. It is going to contain cadastral data as well. A database, in relation to sites and housing location in the City of Elk, has been made in the Institute of Geodesy and Cartography in Warsaw. This has been implemented in AutoCad system. After it was imported to MapInfo, this can work on the natural objects underlay. So this atabase is a perfect material for spatial planning and even urban planning in the area of the City of Elk.

PODATNOŚĆ EROZYJNA POWIERZCHNIOWYCH UTWORÓW GEOLOGICZNYCH W GMINIE EŁK

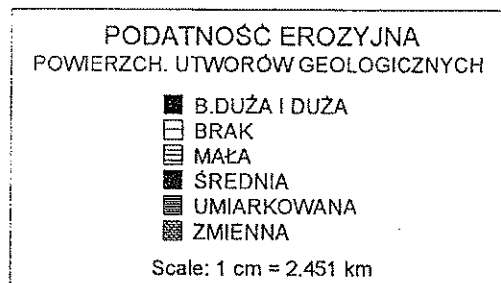
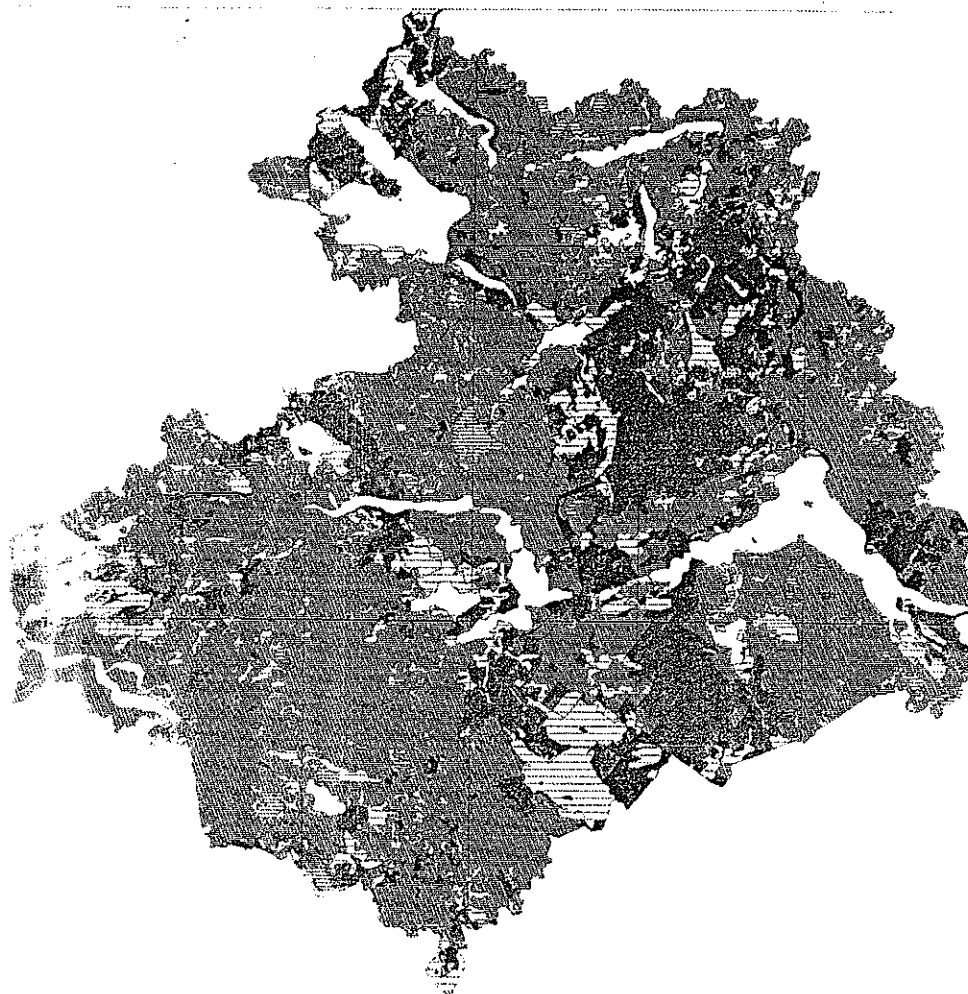


Fig. 1. Example of surface geological sediments classification according to erosion hazards in comune of Ełk.

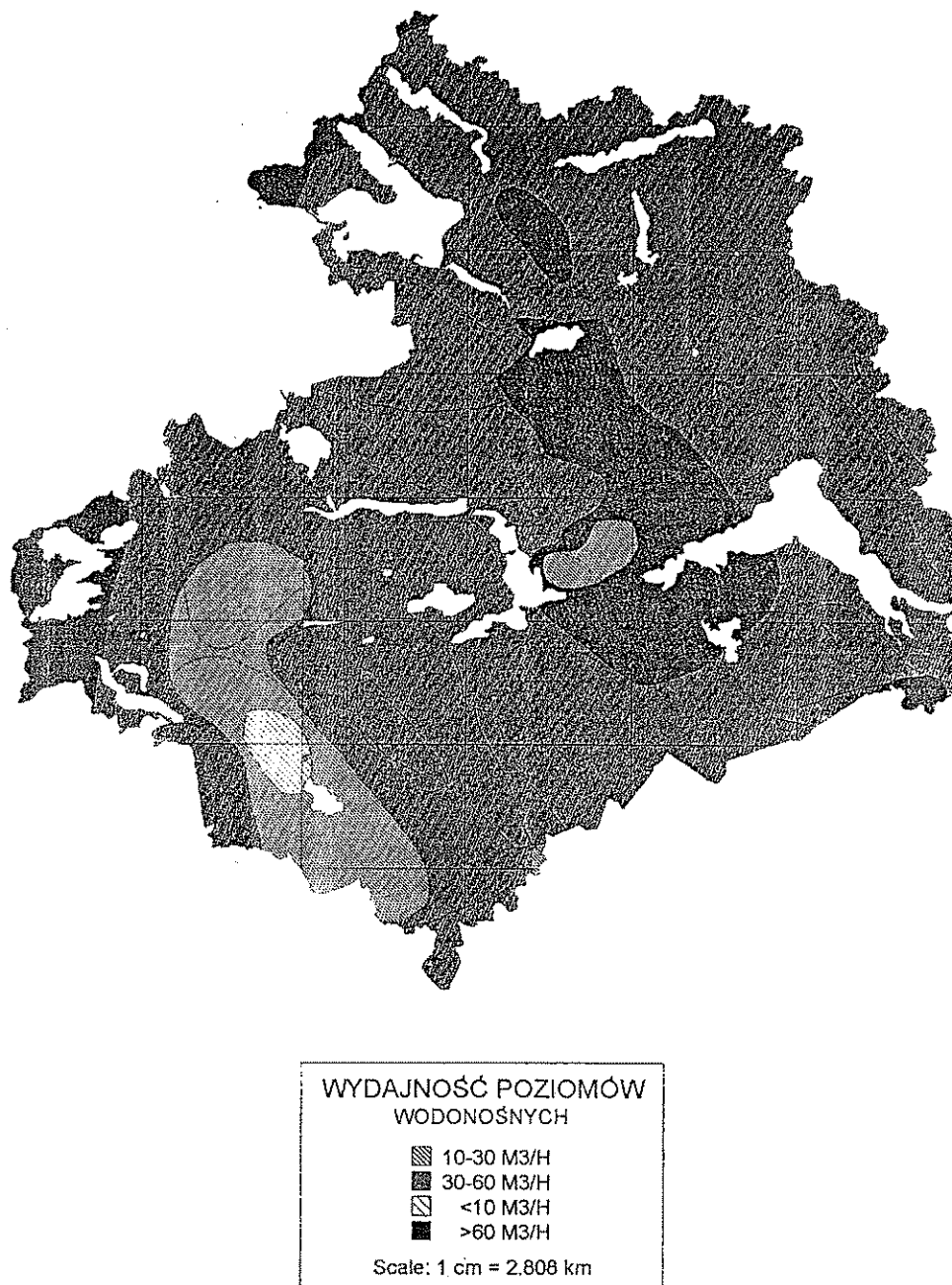
WYDAJNOŚĆ UŻYTKOWYCH POZIOMÓW WODONOŚNYCH W GMINIE ELK

Fig. 2. Example of hydrogeological map: groundwater layers yield in comune of Elk.