

## ACCESSIBILITY OF THE DIGITAL ATLAS OF KRAKÓW PROVINCE, POLAND AS A GIS DATA THROUGH INTRANET AND INTERNET

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### ABSTRACT

The idea of the Atlas of Krakow province was originated in the academic environment in 1995 and firmly supported by the Surveyor General of Krakow province. Intentionally, the Atlas is to be helpful for the spatial planning and environmental engineering - mainly for an environmental protection. The GIS concept of the Atlas was chosen to enable the use of data for analysis and decision support. Therefore, the Atlas can be regarded in extension as a database module of a geoinformative decision support system in future. As an assumption is that the atlas data are multi-thematic and users representing many different professions are interested in searching, retrieving, analysing and presenting data and processed products. The vector data with reference to attribute tables create basic model of Atlas data. The data structure is compatible with the Intergraph' s project MGE. That structure differentiates thematic categories and basic objects defined within a specified category. The following 13 categories of the Atlas data were chosen which could be compared to map thematic layers: basic map, DEM, land use, road and rail transportation, build environment, hydrology, geology, soils, vegetation, hydro-geology, geomorphology, climate, statistics. An accessibility of the product can significantly determine its applicability. Especially in the area of maps and geoinformation a wide spectrum of people is interested in the utilisation of such geodata for different purposes. Even the best geoinformation but not available at required time and place is worthless.

### 1 THE ATLAS OF KRAKÓW PROVINCE NEEDS, EXPECTATIONS AND REALITY

ATLAS – a book of maps. Such definition has been correct thousands years and may be correct even in future. However, a form of the ATLAS should be modernised and expanded to a computer environment. Therefore, our Atlas of Kraków can be an example of such modern e-Atlas.

#### 1.1 PRELIMINARY STUDIES

In 1995, the idea of the Atlas of Krakow province was originated in the academic environment (Pyka K, Stanislaw Staszic University (AGH) and Trafas K, Jagiellonian University). From the beginning the idea was firmly supported by the Surveyor General of Krakow province.

Two principal objectives were defined at the point of origin of the project. Intentionally, the Atlas is to be helpful for the spatial planning and environmental engineering - mainly for an environmental protection.

To fulfil expectations of potential users, the originators conducted an inquire through two parts questionnaire.

Part A concerned general topics as:

- I. Atlas as a set of maps or/and GIS database
- II. vector or/and raster type of GIS data
- III. interaction between Atlas and user' s system, defined software or standard
- IV. utilisation of Atlas for GIS analysing and decision support or visualisation and CAD edition
- V. User' s software GIS and CAD type presently in use.

Part B was detailed and it specified thematic range of Atlas by means of typical map layers on the level of accuracy relevant to a topographic map in scale between 1:50k to 1:300k depending on kind of contents.

There were 25 different types of geoinformation concerning such fields as waters, DEM, housing, roads, forests, borders, geology, geomorphology, hydrology, climate, soils, agriculture, industry and build environment, transportation, telecommunication, health service, education, culture and art, tourism and recreation, and others.

The feedback from an enquiry was helpful for the project organisation and co-operation with people interested in. Expectations of future users were some times opposite and differently prioritised however main requirements were specified.

All departments of the Kraków province office and many research, service and commercial institutions were inquired about their expectations and needs. Generally speaking, there was lack of appreciation about cost and levels of complication of geodata acquire, interpretation, processing, updating, distributing, analysing and managing.

## 1.2 GIS DATA PRINCIPLES OF THE ATLAS AND DATA CONTENTS

The GIS concept of the Atlas was chosen to enable use of data for analysis and decision support. Therefore, the Atlas can be regarded in extension as a database module of a geoinformative decision support system in future. As an assumption is that the atlas data are multi-thematic and users representing many different professions are interested in searching, retrieving, analysing and presenting data and processed products.

The vector data with reference to attribute tables create basic model of Atlas data. The data structure is compatible with the Intergraph's project MGE. That structure differentiates thematic categories and basic objects defined within specified category.

The following 13 categories of Atlas data were chosen which could be compared to map thematic layers: Basic map, DEM, Land use, Road and rail transportation, Build environment, Hydrology, Geology, Soils, Vegetation, Hydro-geology, Geomorphology, Climate, Statistics.

Above categories consist of two groups. The first one creates a database with query possibilities. The second one concerns the basic map, land use, climate and DEM, which offers data ready to display or print. Moreover, DEM can be modified into contours or slope map.

Finally, nine categories were defined for the Atlas (Tab.1).

*Tab.1 The Atlas Thematic Categories*

CATEGORY	OBJECT NAME
Transportation	Roads, railways, railway stations
Land use	Group buildings, single buildings, build environment
Hydro-geology	Water supply capacity, hydro-geological openings, h-g units
Geology	Deep forms, surface forms, deposits of natural resources
Soils	Soils
Vegetation	Real vegetation, potential vegetation, vegetation arranged
Hydrology	Rivers, wells, river survey points, surface waters, dikes & slopes
Geomorphology	DEM database, surface elements of relief, line elem. Of relief
Statistics	Absolute statistics 95, 96, relative statistics 95, 96

The location (or reference) map is arranged in such way that the objects are placed on given layers of a graphical file, though the objects are MGE objects without links to attributes' table. All objects of the location map have their names – identities - in the Atlas base. Therefore, it is possible to display them through an inquiry procedure. An organisation of the location map layers is given in Tab. 2.

*Tab.2 Basic map structure*

OBJECTS
Roads and railways
Rivers and reservoirs
Administration boundaries
City names
Village names
Mountains, valleys, reserves
Contours
Geographic grid
42 projection sheet layout in scale 1:50k
65 projection sheet layout in scale 1:10k

Significant parts of data are written as raster-cell mode (raster-grid maps). That data present independent thematic groups, as climate, or are as supplements to vector objects (Base and Basic map). A list of raster-grid maps is presented in Tab. 3.

*The Atlas Raster-Grid Maps*

NAME	CHARACTERISTICS
Base	Basic map – buildings, waters, forests; Colour communities map; B&W satellite photomaps – each map covers area of 1:50k map sheet in 1942 co-ordinate system; Colour satellite-aerial photomap of Krakow area
Land use	Land use map; Land use map legend
DEM	Digital elevation model – 50m grid; Hypsometric map – height zones with changeable interval; Slopes map; Relief
Soils	Soil map
Climate	24 hours maximum falls in 30 years period 1961-1990 [mm]; Yearly fall sum – average for 30 years period 1961-1990 [mm]; Average yearly temperature for 30 years period 1961-1990 [degrees C]; Vegetation length period – average for 30 years period 1961-1990 [days]
Morphology	Contents of geomorphologic map combined with contours base

## 2 EASY ACCESSIBILITY OF THE ATLAS DATA AS A BASIC REQUIREMENTS

An accessibility of the product can significantly determine its applicability. Especially in area of maps and geoinformation wide spectrum of people is interested in utilisation of such geodata for different purposes. Even the best geoinformation but non-available at required time and place is worthless. Therefore, the authors tried to consider an accessibility aspect as an important factor of proper utilisation of the Atlas.

### 2.1 THE ATLAS SOFTWARE TOOLS

The Atlas database was prepared with use of MGE Intergraph. To utilise the database fully it is necessary to have MGE software package consisting of *Base Administrator*, *Nucleus*, *Base Mapper*, *Terrain Analyst (Modeller)*, *Grid Analyst*, *I/RAS C (Image Analyst)*.

However, the software package GeoMedia can be use for the Atlas data review, edition, up-date and modification. There are some limitations concerning operations on DEM (1999).

### 2.2 THE SOFTWARE FOR THE INTERNET DISTRIBUTION

Today we have many software tools applicable for the Internet distribution. We have tested GeoMedia WebMap positively. Other software dedicated to similar tasks are as follows:

- ArcView IMS - ESRI
- SICAD IMS – SICAD
- Geomatics Map ObjectsIMS – ESRI
- MapXtreme NT Version – MapInfo
- MapXtreme Java Version – MapInfo
- MapGuide – Autodesk

## 2.2 POTENTIAL USERS AND DATA SAFETY

A variety of potential users of the Atlas suggest differentiated level of access rights for them. Generally three categories of users combined with three categories of access rights can be defined as:

I - The Kraków province office' s departments, researchers, and affiliated experts, highest rights, unlimited access;

R - Registered organisations, corporations and individuals, specified rights;

P – Public free unregistered access, limited rights.

A such mixture of users causes the necessity of standardisation of geodata parameters and sometimes combining data of different types and quality. The metadata describes characteristics of data components and can be helpful to estimate final product accuracy and level of confidentiality.

## 2.3 PRESENT AVAILABILITY MEANS INTERNET AND INTRANET ADVANTAGES AND LIMITATIONS.

Internet and Intranet are regarded as basic tools for remote or in house the Atlas geodata distribution and interactive access. Of course, on CD data delivery and exchange are also possible but at a higher cost. Services concern the following kind of tasks:

- 1) Map and raw data browsing, transfer, acquire
- 2) Query
- 3) Analysis and result presentation
- 4) Drawing map combination and compilation

At present level of data transfer speed there is no limitations within Intranet while some still exist for Internet. Fortunately, when a transfer protocol manages huge files in parts, practically there are not limitations too, except “ be patient” .

The main advantage of Internet and Intranet data is remote, non-contact access and transfer.

## 2.4 INTERNAL AND PUBLIC ACCESS TO THE ATLAS DATA, SAFETY PRECAUTIONS

All users of categories “ I” and “ R” are authorised individually and equipped with a personal identity and password. Public users read open license agreement and confirm to follow regulations of further use of maps and data according to copyright law.

Each enter to the Atlas database is signed by user through name, e-mail and contact telephone for verification purpose in case of any violation of the Atlas regulations. Safety measures require server certification of login procedures, user verification and coded transfers.

## 3 COPYRIGHT ASPECTS OF DATA ACCESSIBILITY

Searching, browsing and retrieving the Atlas data by differently authorised users is so easy as use of www pages. The front www page of the Atlas has references to main parts of the database. So it is easy for user to go in index and find interesting data. At present www pages are only in Polish because distribution part of project is still under construction and tests.

### 3.1 END AND ADDING USERS - COPYRIGHT ASPECTS

End users who capture any data from the Atlas for presentation, reference, general knowledge, should inform about source of data when it is relevant.

More complicated and delicate matter is to execute copyright law in case of use the Atlas data by somebody who continue processing of data captured, adds new own portion of data and outputs a product which is somehow a combination or compilation of imported, processed and added data. Our suggestion is to regard such situations under two cases:

- 1) Adding user intends to trade its product and gain profit
- 2) Adding user works on non-commercial base

First one requires estimating the profit and shares it with the Atlas data supplier at rate specified in the contract. It means that it is necessary signing the contract before the project commencement. A case of further re-processing conditions should also be specified in the contract. A honesty of users is very desired.

The second case of non-commercial users, mainly academics, is rather simple. The important issue is to keep data standard and avoid data degradation. Is it necessary to sign a contract in that case? We say yes. It guarantees quality of new product and the adding user fills responsibility for it.

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#### 4 EXAMPLE OF USE OF THE ATLAS DATA

To convinced potential users about the Atlas GIS database we have simulated different possible thematic applications with the use of the Atlas data. There were performed such examples like:

- a choice of the shortest transportation way,
- finding the best cellular net stations distribution,
- an environmental composition of planned buildings,
- a prediction of the flood propagation in Krakow, Poland.



Figure 1. Analysis presentation – situation around the Vistula river in Krakow during a simulated flood.

## 5 REMARKS AND CONCLUSIONS

- 1) The GIS concept of the Atlas of Kraków province was chosen to enable use of data for analysis and decision support. Therefore, the Atlas can be regarded in extension as a database module of a geoinformative decision support system in future.
- 2) Two principal objectives were defined at the point of origin of the project. Intentionally, the Atlas is to be helpful for the spatial planning and environmental engineering - mainly for an environmental protection.
- 3) The following 13 categories of Atlas data were chosen which could be compared to map thematic layers: Basic map, DEM, Land use, Road and rail transportation, Build environment, Hydrology, Geology, Soils, Vegetation, Hydro-geology, Geomorphology, Climate, Statistics.
- 4) An accessibility of the product can significantly determine its applicability. Especially in area of maps and geoinformation wide spectrum of people is interested in utilisation of such geodata for different purposes.
- 5) A variety of potential users of the Atlas suggest differentiated level of access rights for them. Generally three categories of users combined with three categories of access rights can be defined as unlimited, specified and public.
- 6) Internet and Intranet are regarded as basic tools for remote or in house the Atlas geodata distribution and interactive access.
- 7) End users who capture any data from the Atlas for presentation, reference, general knowledge, should inform about source of data when it is relevant.
- 8) Adding user who intends to trade its product and gain profit should estimate expected the profit and shares it with the Atlas data supplier at rate specified in the contract. It means that it is necessary signing the contract before the project commencement. A case of further re-processing conditions should also be specified in the contract.

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