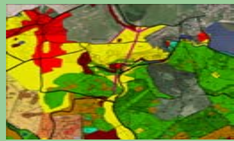
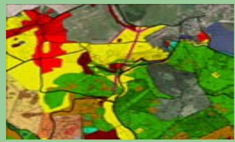


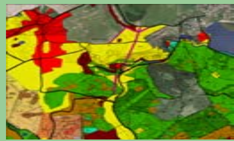
Logical data integration into digital landscape model 1

Jaromír Kolejka – Mendel University of Agriculture and Forestry in Brno



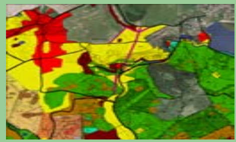
Lecture contents:

1. **Overview of geodata applicable in the modelling in the landscape.**
2. **Introduction into the models and modelling.**
3. **Classification of model to be used in the territorial research and management.**
4. **Examples of individual modelling tools and model classes.**
5. **Importance of modelling in the landscape.**



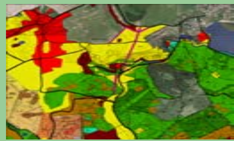
Introduction into present situation impacting geodata in GIS:

1. Latest GIS technologies are equipped with a wide range of special moduls dealing with specific purpose oriented data processing.
2. Progress in the technological aspect presented in the GIS development needs adequate quality and quantity of geodata.
3. Large amounts of geodata were collected in the past for varius purposes. It exists in different forms, coordinate systems, cartographic projection, scale, resolution, digital data formats and are available for purchasing or free of charge at many institutions.
4. The most of geodata processing technologies do not have any system testing the quality of input data.
5. The most special geodata processing modules require data input with defined parameters, including data source.
6. The main reason why the geodata processing technologies are employed is modelling of various phenomena and/or processes in the real world.



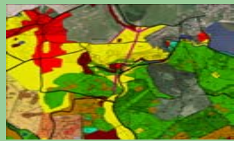
Purpose of models and modeling

Modeling is undestood as an aproximate reproduction of the most typical features of the original. Any object, process or phenomenon in the real world can serve as an original. Model is a simplified presentation of the reality compilled as a tool for synoptic presentation of its features. It is possible to model both the reality structure or state, and/or a selected process or consequence of proceeses and states inside the reality.



Purposes of models and modelling

- Information transmission using formalised language to another user.
- Description and reproduction of static or dynamic reality.
- Experimenting with variables incorporated into the model to get the information about the final number of states.
- Every day need of not only scientific communication (representation, explanation, description, etc.).



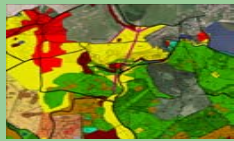
Classification criteria in modelling

Models simulating the time variability of reality:

- **1. Static modelling**
- **2. Dynamic modelling**

Modelling tools:

- **1. Numerical modelling (mathematical or statistical)**
- **2. Graphical modelling (symbolic)**
- **3. Verbal modelling (text, spoken language)**

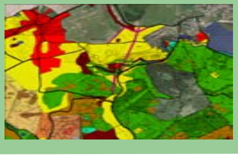


Graphical models

Represent the reality using symbols:

1. **commonly accepted presentation tools (visual copies of reality as same as possible)**
2. **cartographic legend elements as tools of cartographic language**
3. **abstract abbreviations of reality elements with explanations**

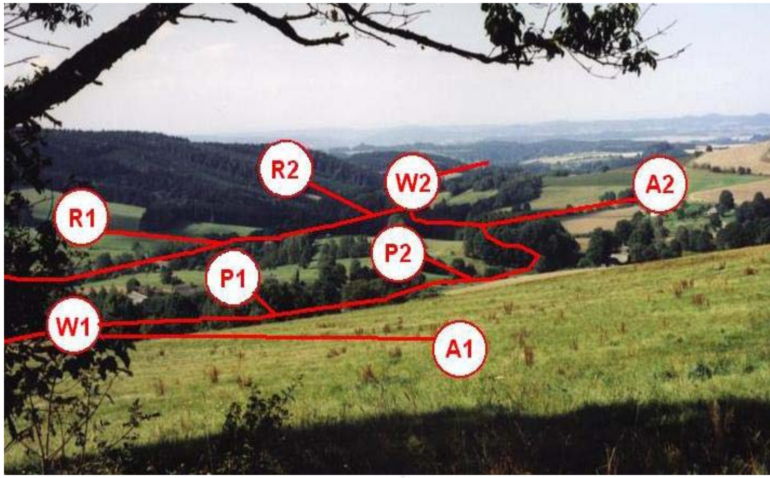
Typical examples: Iconical models – reality miniatures, abstract models - symbolical abbreviations of reality



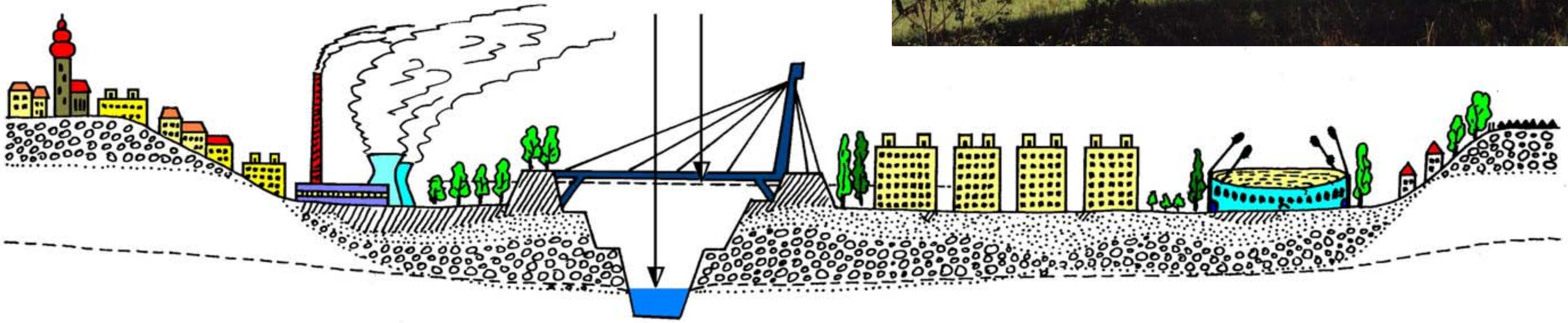
Iconical landscape models

Iconical models represent reality with maximally possible accuracy, they are usually nD semimicrosegments of landscape at any hierarchical level.

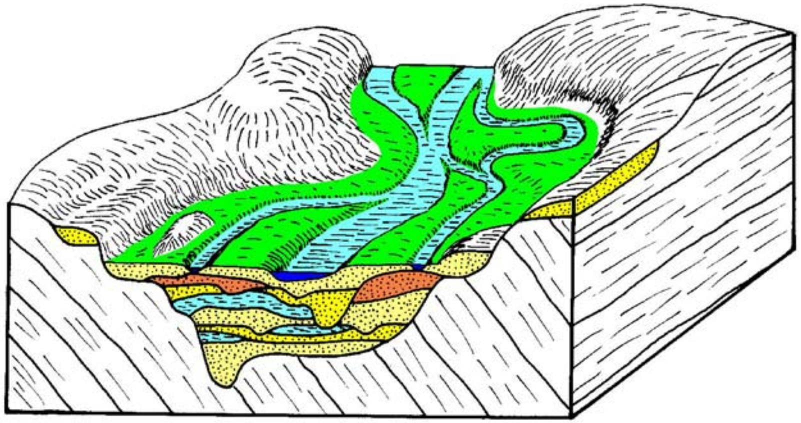
photography

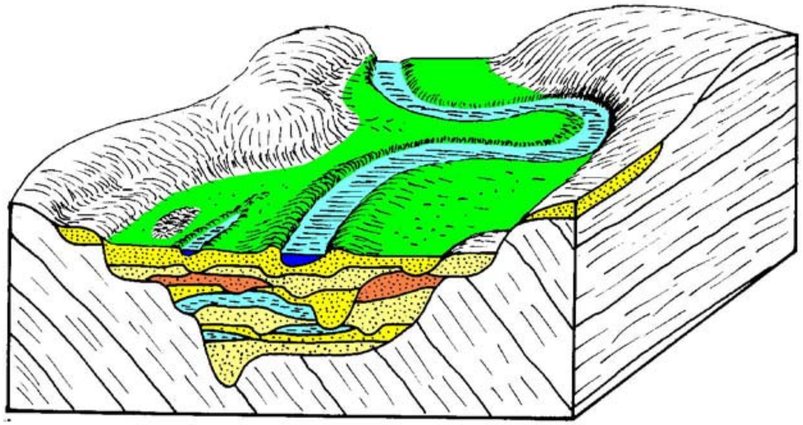


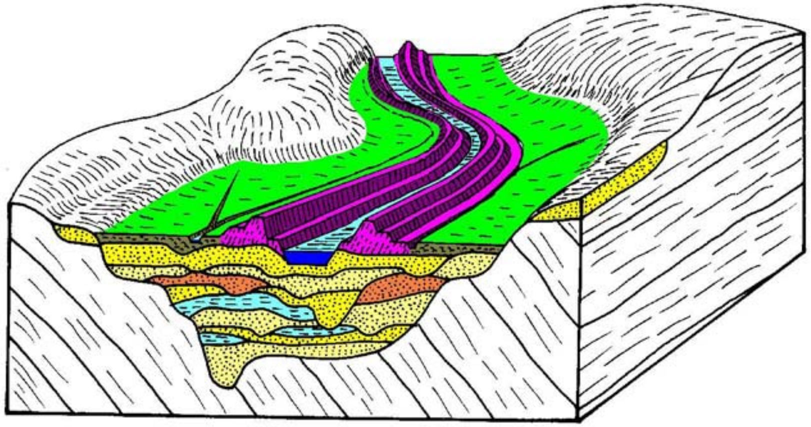
profile – cross section



Iconical landscape models





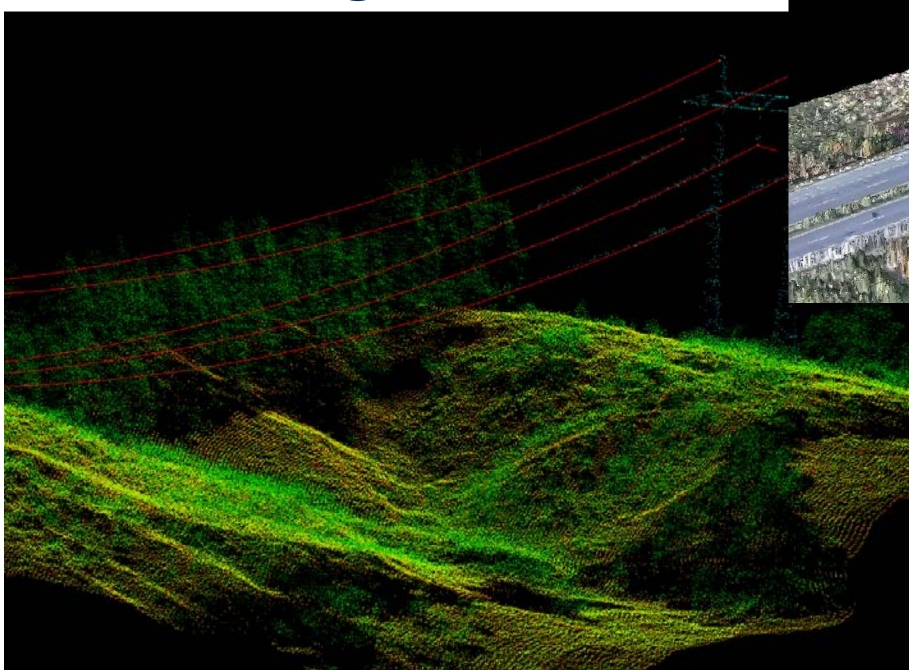


blockdiagrams

Iconical landscape models

Radar image

Laser image

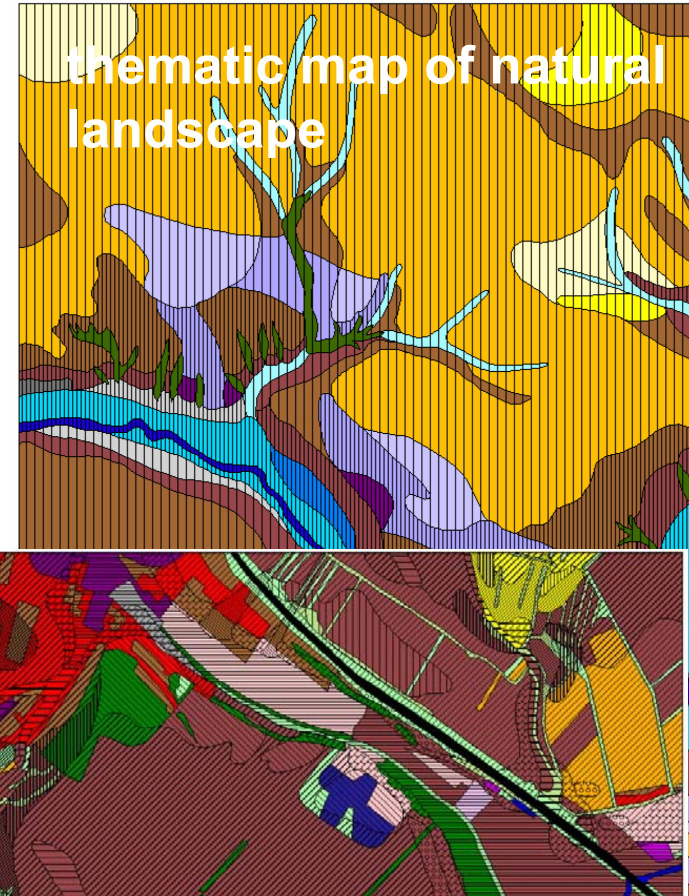


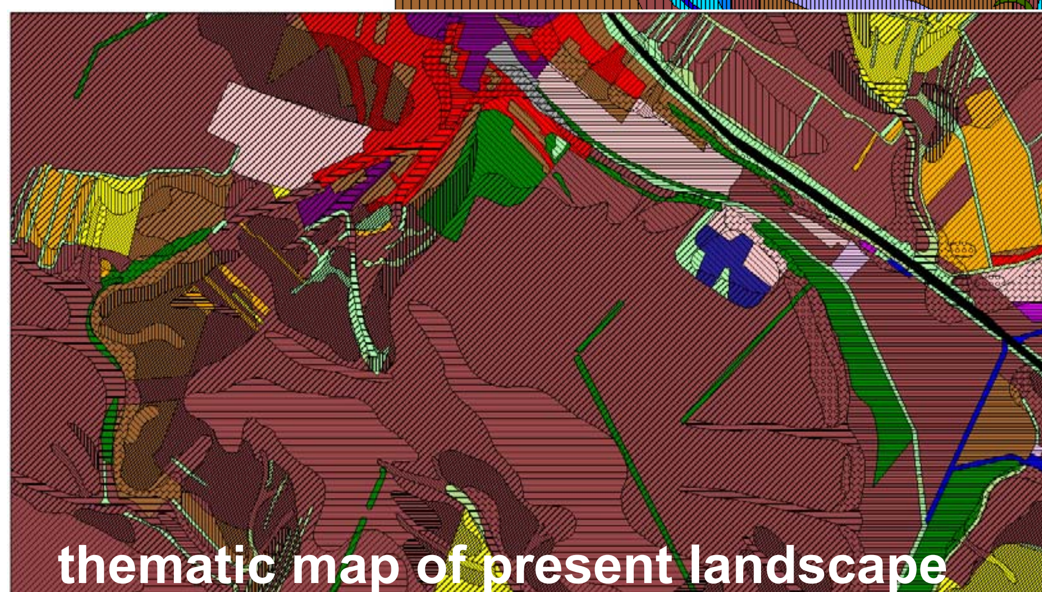
Radar image

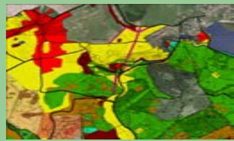
Iconical landscape models

ortophotomap

© Geodis Brno

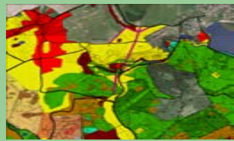






Landscape maps

- **<u>Landscape maps</u> present regularities of spatial differentiation and integration of the Earth`s landscape sphere, its changes from site to site and dynamic tendences.**
- **<u>Maps of natural landscape</u> demonstrate territorial distribution of integral natural territorial units (e.g. geosystems) and give synthetic view on the nature of given territory.**
- **<u>Maps of present landscape</u> additionaly provide information about various forms of human impact on the territory.**



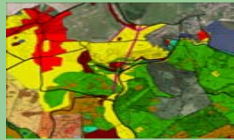
Landscape maps classification

Concept of LM:

1. **typological LM– show landscape units repeating in the time and space**
2. **individual LM – present regionalisation schems of landscape**

Scale of LM:

1. **topological - 1:5 000 to 1:10 000 (geotop, geomer, tessera, ecotop – elementar landscape units)**
2. **chorological - 1:10 000 to 1:1 000 000 (landscape)**
3. **regional - 1:1 000 000 to 1:10 000 000 (geome, biome)**
4. **global - more than 1:30 000 000 (landscape belts)**



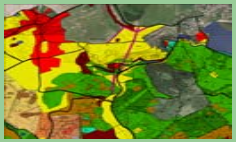
Landscape maps classification

Time in LM:

1. **landscape structure maps – present construction of the landscape and its view**
2. **landscape dynamic maps – inform about landscape forming autoregulative and/or evolutionary processes and function of landscape blocks (historical, present, prognostic)**

Compilation technology of LM:

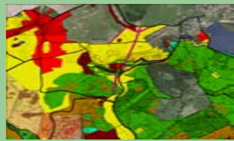
1. **analogue LM**
2. **digital LM**



Iconical landscape models

3D models

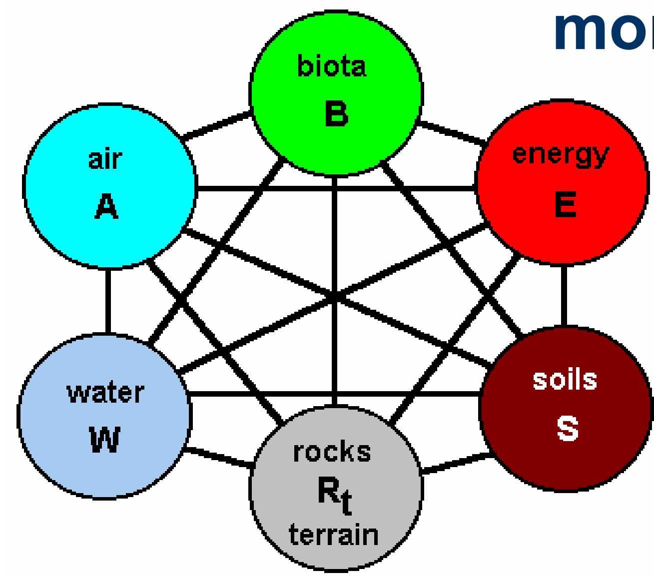
4D models



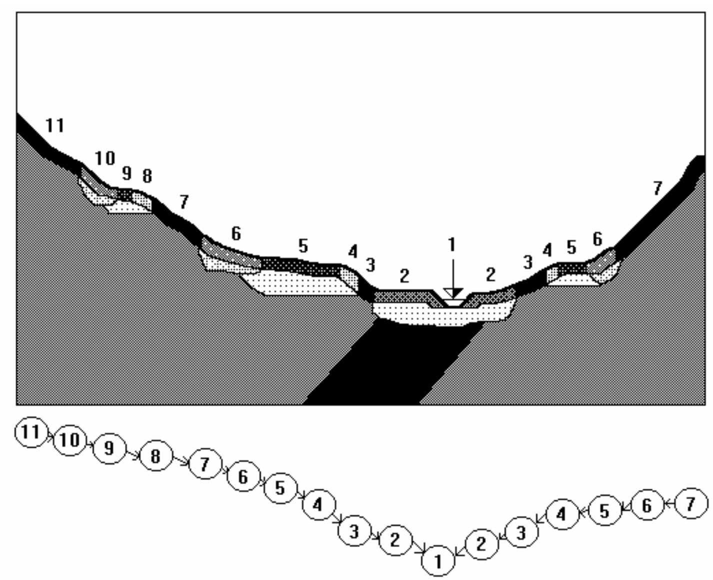
Abstract landscape models

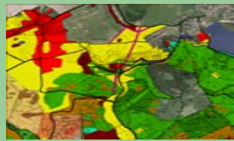
Abstract landscape models display foremost relationships between landscape components, elements, processes and other features or between landscape segments. Geometric or other pictures represent parts of models commonly without any location in geographical space.

monosystem model



polysystem model





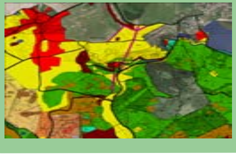
Abstract landscape models

Numerical landscape models (landscape features are represented in forms of mathematical or logical expressions, equation or operations, these models can be deterministic or stochastic).

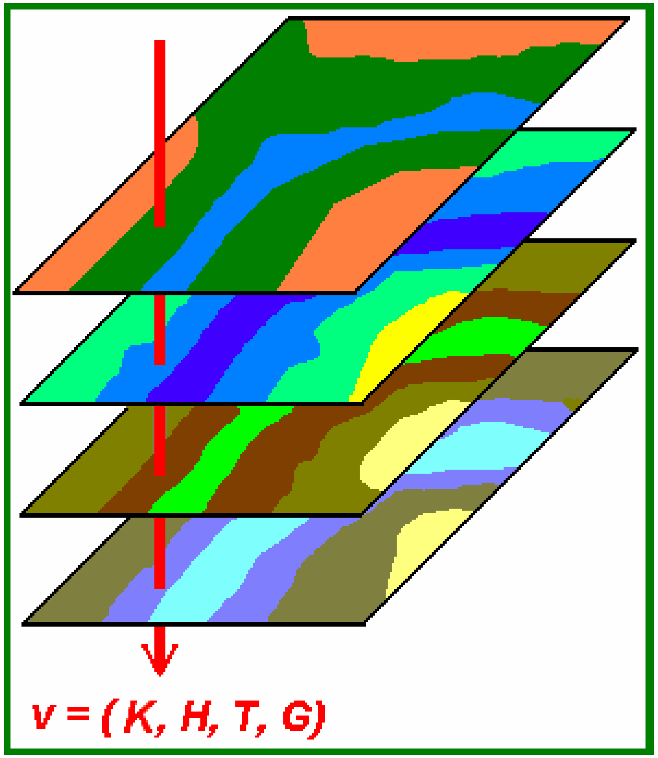
IF A=a1 AND B=b7 AND C=c43 THEN Z=z21

Mathematical expresion represents the starting point of the map algebra.

It is a product of the formalising the human thinking procedure.

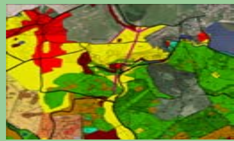


Recquirements for geodata to be used for modelling in the landscape



An integrated geodata base is necessary for any successfull modelling:

1. Every point, line and polygon have to be described in the same co-ordinate system.
2. All the analytic data layers have to be converted into derived ones with the same geometric features, including resolution.
3. Thematic relationships between analytic layers in all sites of polygons have to be the same as they are in the real landscape.



Conclusions about why is digital modelling in landscape usefull?

To document, reproduce and forecast various stages, phenomena and processes in the territory:

- **using formalised language understandable to another user – it is a communication requirement.**
- **to demonstrate past, present and future of the landscape.**
- **to experiment with integrated landscape data using sophisticated thematic models (for soil erosion and other risks assessment, flood forecasting, land slide modeling, runoff modeling, etc.).**

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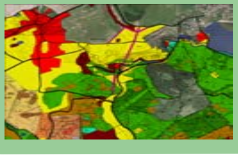

Other integrated geodata applications

Description
Simulation
Planning
Advertising