EDUCATION AND TRAINING STUDENTS TO MAKING DIGITAL THEMATIC ATLAS OF ENVIRONMENT OF COMMUNE

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Abstract
As a practice part of Thematic Cartography with Mapping of Environment students have to learn and make complex digital thematic atlas of environment of particular administrative unit – commune. Every atlas has 38 maps divided into eight thematic fields. They are:

1. *Administrative maps (3)*
2. *Maps complex of natural environment (10)*
3. *Maps complex of cultural diversity (3)*
4. *Maps complex of environmental pollution sources (6)*
5. *Maps complex of the commune environmental conditions (4)*
6. *Maps complex resulted from degradation of environment (4)*
7. *Maps complex of environmental protection (6)*
8. *Prognostic maps (2).*

On every map it has to be applied some of cartographic methods and different cartographic meanings. Prognostic maps have special significance for planning in environment.
Application of the appropriate method, technology and procedure will depend, first of all, on the topic by the appropriate map. Attention should be also paid to possibilities of the cartographic method itself.

Introduction

Cartography as a university subject has been teaching from the beginnings of Faculty of Geography (from 1838). Today, at the Faculty of Geography there is four Departments: Geography, Regional Planning, Demography and Environment. On the first year students study Cartography with Topography and on the third year Thematic Cartography. Students of course Environment, on the second year, have subject Thematic Cartography with Mapping of Environment.

Thematic Cartography with Mapping of Environment is consisted of following topics:

- Subject and method of Thematic Cartography,
- Definitions of thematic maps and plans,

- Types of thematic maps and plans,
- Cartographic meanings,
- Methods of thematic mapping,
- Structure of map content,
- Definitions of original map and derivated map,
- Semioscale Thematic Cartography,
- Digital Thematic Cartography,
- Complex Thematic Atlas in Environment,
- Composition of Thematic Atlas of Environment of Commune.

There are 25 students on the second year of course Environment. They have six hours lessons of Thematic Cartography with Mapping of Environment every week and every one of them has own time schedule for practical work in computer laboratory for every week during two semesters.

Digital Thematic Atlas of Environment

Atlases are generally considered a higher form of cartography, as in their production there is both an extra planning and an extra structural dimension. Atlases are intentional combinations of maps, structured in such a way that given objectives are reached. The analytical power of computers has given the atlas concept an extra dimension. An electronic atlas is a computerized GIS, related to a certain area or theme in connection with a given purpose in which maps play dominant role.

Two aspects of electronic atlases maintain the same overall importance as in traditional atlases: 1. Access and navigation and 2. Ability to compare. The ability to compare maps is one of the essential characteristics of atlases; by processing the spatio-temporal data, atlas editors see to it that individual maps can be compared to the other maps contained. These comparisons can be of a thematically/topical nature, of a geographical nature or of a temporal nature. [Kraak and Orweling, 1996]

The main task and purpose of elaboration of an Atlas of Environment is to show cartographically the sofa changes, present conditions and relations, as well as changing tendencies and trends in the environment. The Atlas should also show the internal links and relations, interactive of elements and processes, as well as of macrosystems and subsystems of the environment. The Atlas would show all the elements affecting the quality of environment (position as quality of deficiency in the environment quality, natural predisposition and correlation of the environment, economic and regional geographical bases of the environment quality). The Atlas has to satisfy all the needs of the scientific prognosis and to paid attention to “white spots” when the environment a concerned.

It should show both chronological and horological (spatial) conception of the environment. The chronological conception would cover three aspects: past, present and future of environment. The spatial conception would cover the regional differences and potential spatial differences.

The Atlas must also satisfy all the required scientific prognoses. The prognostic maps should be the basis for planning a series of actions in order to improve the environment quality. Atlas of Environment should have an educational role, too.

Application of the appropriate method, technology and procedure will depend first of all on the topic by the appropriate map. Attention should be also paid to possibilities of the cartographic method itself. The applied cartographic method which is also the essential scientific method in this project understands and enables:

1) Spatial determination of elements of the human environment which is realized through:
a) Localization of phenomena and processes of the human environment through clearly defined position of the same in the geodetic and geographic space. The spatial determination is the basic advantage and the feature of the cartographic method so that every map of environment can also be defined as the spatial indicator of arrangement of phenomena, elements and components of the environment. Thus the highest form of informativeness - the spatial informativeness of the map is achieved. First of all, the spatial determination is achieved through a geographic co-ordinate system, which exist on every map.
b) The reciprocal spatial determination of phenomena and processes in the environment is achieved by the spatial correlation.

2) The chronological determination of phenomena, elements and components of the environment is achieved in these ways:
a) By linking certain components of the environment to the term, time or period.
b) The time determination of phenomena in a time-measuring system and giving the age determination to phenomena and processes (for example geological determination of age, time determinations of duration of emissions and imissions, etc.).
c) Establishing the time series of changes in the character of the environment components thus achieving the determination of time development and evolutiveness of phenomena and processes of environment.

3) Real (substantial) determination of environment is achieved by codification of quantitative and qualitative properties.
a) Quantitative codification is achieved by the established scale of values which can be found in the map legend, then in the form of numerical indexes showing the size of phenomenon. The quantitative determination can be also achieved by the size of the symbol or cartographic sign.
b) Qualitative determination of the process and phenomenon of environment is fulfilled through establishing of differences. This can be achieved by means of a legend but also through an overall cartographic display of reality.
c) The functional determination is achieved through presenting of functions of the environmental components by a cartographic procedure. [Ikonovic, 1994]

Structure of Digital Thematic Atlas of Environment of Commune

As a practice part of subject Digital Cartography with Mapping of Environment students have to learn to make complex digital thematic atlas of environment of particular administrative unit - commune. Every atlas has 38 maps divided into eight thematic fields. They are:

1. Administrative maps
1.1. Administrative map of Serbia
1.2. Administrative map of region
1.3. Administrative map of commune;

2. Maps complex of natural environment
2.1. Maps of geodiversity of the environment of the commune
2.1.1. Geological diversity
2.1.2. Geomorphologic diversity
2.1.3. Water diversity
2.1.4. Climatic diversity
2.1.5. Pedologic diversity;
2.2. Maps of biodiversity in the commune
2.2.1. Vegetation map
2.2.2. Zoo-geographical map
2.2.3. Commune ecosystem map;

3. Maps complex of cultural diversity
3.1. Population in commune
3.2. Settlements and infrastructure systems
3.3. Religion, education and health;

4. Maps complex of environmental pollution sources
4.1. Map of environmental natural degradation
4.2. Agricultural production degradation map
4.3. Industrial degradation map
4.4. Traffic degradation map
4.5. Tertial activities degradation map
4.6. Hazard map;

5. Maps complex of the commune environmental condition
5.1. Air quality condition map
5.2. Water quality condition map
5.4. Noise endanger map
5.5. Radiation map;

6. Maps complex resulted from degradation of environment
6.1. Greenery degradation map
6.2. Ecosystem degradation map
6.3. Cultural values degradation map

6.4. Health consequences map;

7. Maps complex of environmental protection
7.1. Natural inheritance protection map
7.2. Natural disaster protection map
7.3. Accident protection map
7.4. Air protection map
7.5. Water and from water protection map
7.6. Power sources pollution map;

8. Prognostic maps (2).

Every student makes his own database for chosen commune. All databases than will be united in general database of Republic Serbia. They make maps at scale 1:25 000 in AutoCAD. Their connection and further processing is realized in ARC/INFO.

On every map it has to be applied some of cartographic methods and different cartographic meanings. Prognostic maps have special significance for planning in environment.

The semiotics has tremendous potential as a tool for systematizing our approuch to maps as representations and for developing logical systems of and transformations among representations. A semiotic perspective offeres a structured way to consider the interaction of the explicit and implicit meanings with which maps are imbued.

Maps of change environment can have dual character: analytic and synthetic. Analytic maps comprise one component of the space or one indicator of mapped phenomenom and they provide notion of a certain thematic. They have a simple legend suitable for easy reading of conditional signs. Synthetic maps deal with more complex thematic. A quality of map depends mainly on the range of available information on the environment conditions. The aim of mapping is to determine the level of environmental suitability of the mapped territory for human protection and activity.

Legends are naturally indispensable to most maps, since they provide the explanation of the various symbols used. It should be cardinal rule of the cartographer that no symbol that is no self-explanatory should be used on a map unless it is explained in a legend. Furthermore, any symbol explained should appear in the legend exactly as it appears on the map, drawn in precisely the same size and manner. Today it is generally conceded that the contents of the legend are more important than its outline, so the outline, if there is any, is usually kept simple, and the visual importance is regulated in other ways.

The selection of legend for environment maps can be viewed as a compromise between the complexity of the chartered issue and efficiency and perception of map itself. To exceed this problem, it is a practice to produce a set of analytic maps, concerning e.g. water quality, pollution sources, air conditions etc. Finally, in synthetic map the selection of symbols is made to ensure that all important characteristics of environment are described in particularly and for defined basic space units or areas, according to map scale.

Conclusion

The last decade of the 20th century will witness a renaissance of cartography and cartographic visualization will be a leading factor in this process. The concept of “mapping” is already being extended into areas well beyond those with which cartography has traditionally been concerned. As Hall said: ”The act of mapping, when it expands beyond its usual terrestrial and scale constraints, plays a critical role in the process of scientific research and that mapping and visualization, which are by nature non-linear, help to explain what is essentially a non-linear world in new ways”.

By using cartographic method supported by certain software, spatial bonds and relations of environmental elements can be identified with the greatest possible accuracy and reliability. That is enables coming to scientific conclusions about environmental complexity and also futher environmental researc and apprehension.

Today, with increasing speed of technological change, Thematic Cartography (Digital one) will help students to get easier into twenty first century, which would be century of computer communications and virtual reality in many different fields of science, business and life itself.

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