

## **I. RESEARCH OBJECTIVES**

I have been comparing two European Union countries (France and Hungary) to understand the processes of map communication in relation to EU regulations.

The first objective of my research has been the examination of how far the harmonization of map communication has been achieved in the European directives, particularly concerning water-related directives.

Secondly, to the extent that harmonization has not occurred, I have investigated into the reasons why this has happened and whether there are any solutions to this issue.

Effectiveness of map-based communication is closely related to uniform data systematization. This is why I have endeavored to discover and develop a harmonization-helping system for visualization.

Finally, I have examined whether, in this legally-regulated research environment, there is the possibility of innovative rather than traditional map representations.

The dissertation consists of five parts. The first part (Chapter 2) presents the European water-related directives and projects, which determine the legal and scientific background of map-based communication. I have emphasized those requirements and executive sections of the directives where spatial data and maps have a significant role.

The second part (Chapter 3) is about forming an examination system based on the thematic-cartographic traditions in both countries.

The third part is a comparative analysis of the similarities and differences in the implementation of the Water Framework Directive (WFD) and its influence on maps in both France and Hungary.

In the fourth part (Chapter 5) I write about the communication process in the environment of water directives.

In the fifth part I have systematized visual variables of maps from the perspective of GIS and made suggestions for forming map types in conjunction with the Water Framework Directive.

## **II. ANTECEDENTS**

Water, which is one of our most important natural resources, stops at neither political nor artificial boundaries. This is why it is necessary to treat it globally instead of the present situation, where water is managed nationally and regionally.

A possible solution for this is an international unified water management system, and effective information is a key requirement for this to happen. Maps contain visual information which is independent of language, and map visualization is an important tool of communication.

The questions/issues connected with international environmental protection are regulated by European directives. Creating thematic maps is not the main objective of the directives, though it is a significant requirement. Maps determined by the directives were being formed almost simultaneously with the present work, therefore not many people have worked on them so far.

Reports on directives published at certain times contain thematic maps.

I believe that not only the comparability of different countries but also the comparability of time-series should be built into uniform and harmonized map communication.

Following my university years I acquired scientific job experience in Hungary, to which I added further experience gained in France. I had the opportunity to observe the different attitudes to thematic cartography in university education and every-day practise in both countries. In this investigation, I have managed to synthesise the results of the different cartographic traditions, whilst relating these to the different scales of the two countries.

### **III. METHODS**

My jobs and my thesis consisted of three main processes: information collection and inquiry in the topic, the examination of the information obtained, and finding solutions.

In the first phase I collected relevant documentation and I contacted the French and Hungarian water management authorities. During this phase I got to know the French points of view – formerly less known to me – and I determined the problem areas.

In the second phase of my work the objective was to form an analysing method which could merge the classification differences of French and Hungarian thematic cartography. To this end, I created a complex examining system with common criteria.

I analyzed the maps of the Water Framework Directive with the help of common examining conditions which I developed. In this way, I concluded the consequences from the point of view of harmonization and communication.

In the third phase I created a communicative model; this was respectively a classification based on GIS, and it made some suggestions for new type of visualization of the criticised maps.

### **IV. THESIS**

1. I pointed to the mapping requirements from the perspective of the following two European water directives: INSPIRE (2007/2/EC); and the Water Framework Directive (2000/60/EC). Moreover, I summarized all initiatives of map-based visualization. I gave an overview of the European directives and projects, and I examined the relations between them. At the same time I determined the role of the cartographer concerning the directives.

2. I created an examining system based on the rules of the French and Hungarian thematic cartography. The thematic cartography of the two countries has different backgrounds and use different terms. My research aimed at the harmonisation of the meaning of the visualizing method and system. As a result, I created a new analysing method, which originated from a comparison of visualizing classes and geometric elements, based on GIS, and any visualizing method can be deduced from it.
3. I made certain that the directives are necessary but not sufficient conditions of harmonized map communication. The necessary condition of this is a uniform and harmonized system of thematic data. The administrative water-management order – which depends on the size of countries – is different. Accordingly, uniform map communication is not possible because of the difference in scales and meaning, in several cases.
4. I verified that the maps created by existing processes do not meet the claims of the three different user circles aimed at by the WFD. If you want to fulfil the users' demands you have to take the map scales into consideration. Thus a single map cannot fulfil the three different group types (decision-makers, experts, and the general public).
5. I created my own communicative model for maps associated with water after studying Robinson-Petchenik- and Koláčny's communicative models. I took into consideration every element of map-forming, which may have an influence on the decision made based on the map. I defined and designed a new model to describe the scientific environment related to water, based on the following three criteria:
  - a. All parties interested in map communication
  - b. Phases of map design
  - c. Every element of the map creating process, which may influence communication.

6. I deduced and put into a new system the elements of visualization based on the objects of GIS. I pointed that visual variables observed by users can be deduced from object-structure. With this result I gave a new approach of the system of visual variables.
7. I developed innovative prototypes for certain types of WFD maps to the general public and decision-makers. The introduction of new visual variables and conceptions can support the decision-making and inform the general public

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## **VI. SCIENTIFIC WORKS RELATED TO THE SUBJECT**

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