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STUDYING ENVIRONMENTAL PROBLEMATICS AND HAZARDS WITH HELP OF INFORMATICS APPLICATIONS (SEPHIA)

Bogdan CIORUȚA*, Mirela COMAN, Andrei-Alin CIORUȚA***

*Faculty of Science, North University Center Baia Mare, Technical University of Cluj-Napoca

**Faculty of Mineral Resources and Environment, North University Center Baia Mare, Technical University of Cluj-Napoca

Abstract: *During recent decades the stirring up of the processes of globalization, practically in all spheres of present day civilization, has aggravated and brought numerous problems resulting from nature-society interactions. To overcome these problems, it is necessary to develop and adopt new concepts and techniques to study and evaluate the changes occurring on the earth ecosystem. For this, application of information technology via Environmental Information Systems is the best option. Much more, understanding this complexity through interactive applications will develop new strategies and ideas to manage and protect ecosystem. This paper deals with new and interactive approach to process, analysis and synthesis of environmental systems using various models and IT applications, so we could underline that environmental science and technology are therefore a vital component of productive knowledge and thus a high priority for the mankind sustainable fraternity with nature. Since years, environmental scientists and computer experts are working on different and innovative computer-based modeling techniques to study the environmental problematic and hazards system and to provide the maximum accuracy in decision making or in elaborating sustainable strategies of community development. This kind of innovative techniques, some of them exemplified in the present paper (GeoGebra, AutoCAD, G.S. Surfer, ArcView GIS etc), can become the answer to question in those cases where the early warning, maximum accuracy in prediction and emergency is taken in account.*

Keywords: *Environmental Informatics, IT applications, innovative*

1. INTRODUCTION

The modern society (information society) in accordance with the actual changes and preoccupations in the environment domain has provided various types of informatics resources (tools, methodologies, procedures) to manage and support the ideas and actions related to the environmental issues.

Population grows over time as well as the modern technology implication in everyday life. Informatics become essential for all the

fields related to technology and environment protection. Informatics resources are becoming nowadays more and more important for environmental management, planning and decision-making. An exhaustive analysis of the environmental hazards in terms of physical, chemical, biological, geological, hydro-meteorological processes and their interactions is becoming critical, and not so extraordinary made without the support offered by the environmental information systems (EISs) and environmental informatics.

2. ENVIRONMENTAL INFORMATICS METHODS AND TECHNIQUES

Nowadays, significant efforts are required to analyze relevant data and environment information, simulate related processes, evaluate resulting impacts or scenarios and generate viable decision alternatives.

The informatics resources developed in the last 3-4 decades have enabled and help us to investigate the complex interactions between the natural systems and engineered ecosystem, and also to search for sustainable strategies for a harmonious development.

In figure 1 are mentioned the general steps necessary to define, analyse and solve the problems related to obtaining environmental information with help of EISs.

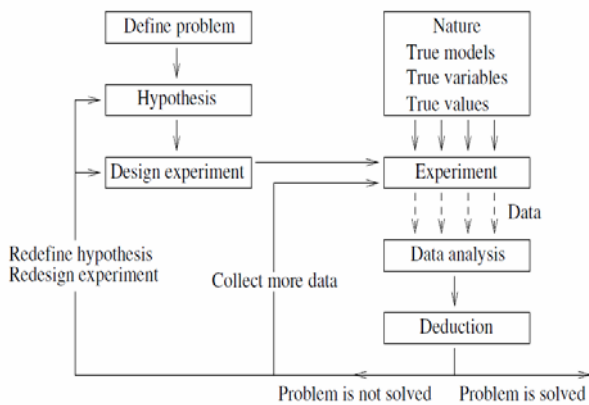


Fig. 1. Specific steps for developing EISs and obtaining environmental information

There can be mentioned a few important scientific contributions in the domain of informatics applied to environmental sciences (known as Environmental Informatics) as:

- traditional mathematical simulation models - tools for the forecasting of environmental phenomena;
- optimization techniques - used in the field of environmental pollution control and management;
- environmental evaluation applications;
- modeling systems for different environment study regimes.

All the resources presented above are used for defining environmental problems, archiving and processing environmental data with obtaining environmental information and adequate enviromatics knowledge.

The advent of the informatics systems had affected the access of the public to large and diverse environmental databases.

Collecting, storing and retrieving environmental data performed thanks to database techniques, make the processing of environmental data to the field of modeling very interesting: data are used to generate information, and information to generate knowledge. Figure 2 present in this sense the specific steps for obtaining adequate environmental knowledge starting from environmental data.

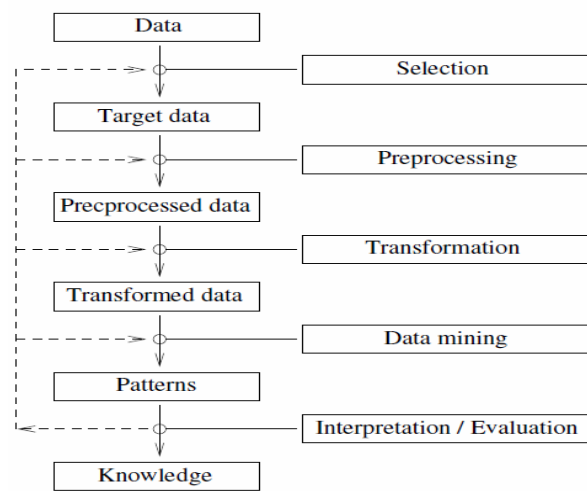


Fig. 2. Specific steps for obtaining adequate environmental knowledge using EISs

As we mentioned above, the techniques developed in the environmental informatics field are implemented and find their incarnation in an array of different software tools, platforms and environments (data storage software, data processing software, end-user applications etc).

The main tools that facilitate the environmental data storage are databases, which contains scientific the results of observing (monitoring) natural phenomena.

Environmental data that are stored in environmental database are different from other data because they have a specific attribute: spatio-temporality.

Figure 3 illustrate a specific way for getting information and knowledge (data output - maps and reports) using EISs from data that are spatio-temporally referenced (data input).



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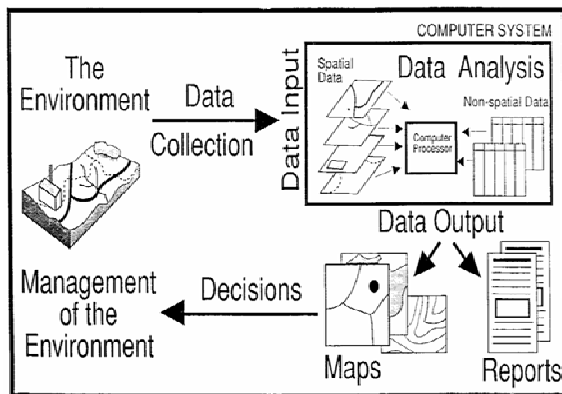


Fig. 3. A specific way for getting information and knowledge using common environmental info-interactive applications or EISs

This particularity give a different meaning and let us to define Environmental Informatics and Environmental Information Systems by the expression "info-diversity in ecological diversity".

Figure 4 illustrate according to the last 3-4 decades the perception related to development timeline phases of the info-diversity resources considered to be an integrated part of the Environmental Informatics.

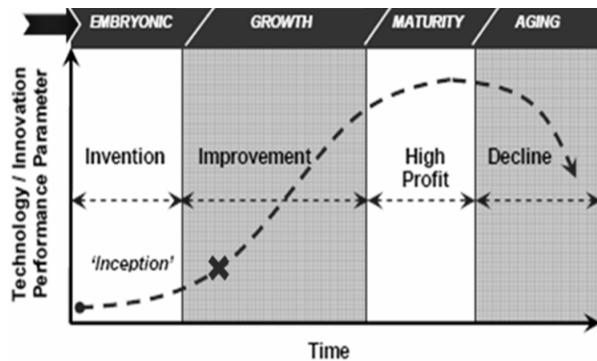


Fig. 4. Environmental Informatics - delimited by the technology-time scale

As we observe Environmental Informatics delimited by the technology (software development) and time scale is still in the 2nd

phase (growth) were improvement measures and strategies are necessary.

The traditional environmental systems - models, technologies, methodologies and applications - have been challenged by the difficulties in handling dynamic and uncertain features of real-world environmental systems. Conditions for environmental management will keep changing with time, demanding periodically updated decision support.

Advance in information technology area has been in extraordinarily rapid pace. There will be continuous attempt to apply new techniques and tools to environmental management, also to use the environmental informatics resources associated with artificial intelligence techniques to promote the long-term viability of the environmental informatics and connected applications in everyday's environmental-society problems.

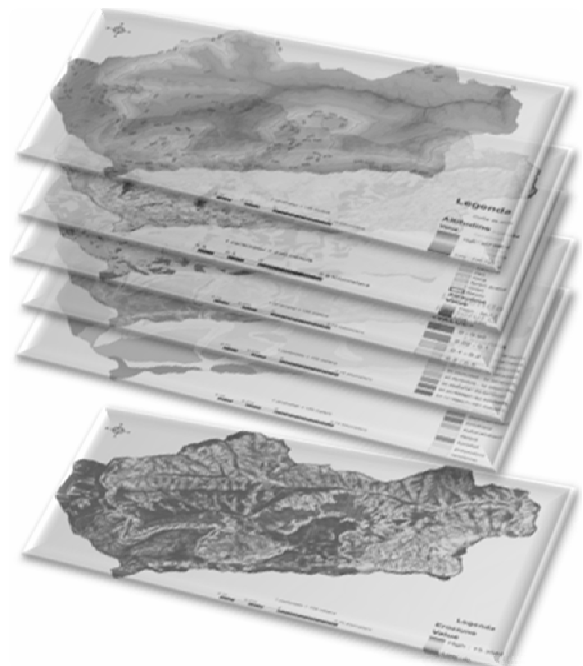


Fig. 5. The perspective of getting multidisciplinary information using as EISs the GIS products

Figure 5 introduce a new methodology perspective of getting multidisciplinary information (as multi-thematic maps) using for example the GIS products as an EIS.

The magnitude universe of informational activities, many forms of expression, diversity of instruments and information environment technologies have produced major changes in the way people communicate, learn, do business, solve various problems and to relate to others and the environment. With the recent vision we have formatted and gained from studying the multi-disciplinary area of Environmental Informatics and Environmental Information Systems, we consider that in near future in all the countries are imperious necessary informatics systems for environmental research and protection.

3. CONCLUSIONS

Information and communications technologies have produced unprecedented changes in society in all its aspects. Nowadays, Artificial Intelligence via interactive computational applications plays a specific and well defined role in all areas or activity domains: production, service, management, monitoring, research, public involvement in decision making, and in almost all countries.

Environmental systems are based on the above considerations binding instruments in environmental science, can be defined as a collection of packet data and information, described by a series of specific indicators relevant for studying, monitoring and exhaustive exploration of the field and environmental issues.

As a conclusion, it can be said that modern data analysis methods are useful tools in environmental informatics and environmental statistics. Good methods are understandable for the environmental scientists and at the same time reliable, robust and helpful for discovering important relationships in the data. In cooperation between environmental scientists and information scientists, what makes the relationship flourish is the

knowledge of both sides about their field and efficient communication concerning the specific needs of a certain problem and the properties of the methods. Without these ingredients, the results of cooperation projects may not be satisfactory.

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