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## ENVIRONMENTAL INFORMATION SYSTEMS: SOLUTIONS AND EMERGING CHALLENGES FOR MODERN STRATEGIC DEVELOPMENT OF ROMANIAN LOCAL COMMUNITIES

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**Abstract:** Ever since "the environment" gained its place in the public international and national agenda, if we refer to the environmental legislation, sustainable development concept or even disaster, resources and waste management, it has been bundled with data, information, knowledge and very powerful multi-integrated informatic systems known, in the scientific literature, as Environmental Information Systems. In order to find new possibilities or solutions for solving the complex problematic covered by the research, engineering and environmental protection fields, more and more people are preoccupied to know how to use the Environmental Information Systems (EISs); in this sense, we understand that EISs are considered to have a major role in environmental protection, planning, management and decision making, for international and national threats, as well as for regional and local communities problems. In the actual development context, we try to give a brief and non-exhaustive description of how could EISs help at the strategic development of Romanian local communities. The present paper explores the typology of EISs and examined the common definitions of them in the light of following major issues: the concepts of data, information and knowledge in EISs, the connection between EISs and EI, the problems and obstacles to the development of EISs and finally, the emerging demand for public access via EISs and EI to environmental information and environmental protection, engineering and research.

**Keywords:** local community, strategic development, environmental challenges, modern vision

### 1. INTRODUCTION

Science is at the base of everything that mankind has accomplished for the last century. Nowadays society would have had probably another development background without human considerable scientific activities. As time went by a numerous scientific revelations helped reshape our culture and society progress throughout the world. Scientific knowledge of the world has developed gradually through small steps and giant steps. Thus over time many successive scientific discoveries have contributed to the

cultural heritage and progress of the local or regional communities.

Most scientific elements are listed in the archives of humanity as routine observations and records contained in research reports and communications, each with its own importance in the mechanism of human knowledge.

The importance of discoveries (such as Artificial Intelligence or Environmental Information Systems) is evaluated by its impact on the economic situation of the states or by the benefit that brings for a large number of people by fulfilling their challenges.

One of the greatest challenges in our industrialized and informative societies has remained the development of our communities in accordance with the protection of our environment. This challenge is addressing politics, economy as well as information, technology and research. In these case it is more than evident that the various problems in environmental protection, environmental planning, research and engineering can be only solved on the ground of a comprehensive and reliable information basis.

Because the state and dynamics of the environment are described by biological, physical, chemical, geological, meteorological, or social-economic data, and all this data is time and space dependent, it seems that the processing and the production of meaningful information on the environment needs innovative and sophisticated applications. Therefore environmental problem solving is mainly an information processing activity handling a wide range of environmental data.

## **2. ENVIRONMENTAL INFORMATION SYSTEMS - CONCEPT AND CHARACTERISTICS**

Due to the facilities offered by new information and communication technologies in all sectors of society and in all activities undertaken were imposed phrases such as "information society", "information age", "communicational society", to refer in fact at one and the same reality, but from a different perspective, a new existential reality that prevails access to information and environmental information culture formation.

In today's society, defined by this new reality, the success and survival of many communities, many categories of institutions or individuals with political or social responsibilities depend on their ability / efficiency to locate, analyze and use effectively information resources.

The efficiency to which we refer is directly related to achieving the goals of information, documentation or knowledge, and the existence of specific situations making certain

decisions, optimize processes and application of methodologies for others.

Living in a context of modernization of all aspects of daily life, the time and space in their social dimensions are not insurmountable obstacles, I got to deal with a multitude of socio-economic aspects of life and not only issues generates documentation needs of increasingly particular and also becoming more complex, more accurate. Users by intrinsic need documentation always requires a far wider range of sources of information and documentation resources.

In agreement with the extraordinary development of the means of access to information, training documentary lies in the center of the global movement to form a "culture of information" regardless of the area of interest. Formation documentary, even the specific environmental sciences and individuals closely involved in this vast area, targeting use and better understanding of the tools and techniques of information and documentation. Moreover, the formation documentary was defined as "learning techniques of gathering documentation integrated into a set of steps of research procedures".

Since the Stockholm Conference (1972) in which were laid the foundation of the United Nations Environment Programme - UNEP (conference that coincided, moreover, with the entry into the international agenda of the term "environment") - became increasingly evident that the collection and analysis of environmental data are of vital importance for humanity:

"We have to rely on science and technology, in their contribution to economic and social development, to detect, avoid or limit the hazards that threaten the environment and to solve environmental problems posed for the good of humanity; It is essential to provide education in environmental issues both younger generations and adults, taking due account of the less fortunate in order to develop the foundations necessary to establish public opinion and give individuals, institutions and sense of local responsibilities regarding safeguarding and improving the environment in all his human size; Will be



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encouraged in all countries, especially developing countries, scientific and technical activities in the context of environmental problems, national and multinational. In this regard will be encouraged and facilitated the free movement of the latest information and experimental data to help solve environmental problems...".

### 3. FROM EISS TO THE PRACTICAL PERSPECTIVE OF THE STRATEGIC DEVELOPMENT OF ROMANIAN LOCAL COMMUNITIES

Following the development of spectacular science information, including artificial intelligence, on the one hand, and environmental sciences, on the other hand, appeared at the confluence of two science of human-environment with IT&C, generically called "Environmental Informatics" (EI).

It has become unimaginable impulses which paved the way for unexpected perspectives, raising and restoring the current, on a higher plane and with a more comprehensive environmental issues that need appropriate solutions today.

Classifications and definitions are objective requirements of any science, including Environmental Informatics, which often have reviewed and updated periodically. Classification and definition of concepts related to SIM and IM were conducted early in the study of environmental systems using computing environment, reflecting general level of knowledge about the subject matter at a time and purpose during research.

In this respect, the first classification criteria were based on the structure and role of different types of card, how IT environment could be employed and supported various research areas specific environment. Some of

the EISs definitions abound in cascade, are presented below, exposing and source for complete examination and exhaustive exploration of the subject.

"Environmental Information Systems is an umbrella term for all related systems: Monitoring, data storage and access, description and response to disaster assessment studies environmental impact reports on the state of the environment, planning and environmental strategies, simulation, modeling and decision making. "

*(International Symposium on Environmental Software Systems)*

"Environmental Information Systems are computer systems using a variety of tools and technologies to facilitate the management and use of environmental data and information".

*(ESSA Technologies)*

It is therefore apparent from the above definitions that there is a wide range of SIM Information Processing Systems Environment that can be differentiated due to the nature of information processing, according to which we have the following typology / taxonomy:

- **monitoring and control systems (MCSs)** - interact closely with environmental processes, such monitoring systems are used to perform automated measurements and control regarding water quality, air and soil, respectively noise and radiation exposure, while control systems aimed at directly involved in industry in monitoring and evaluation of working conditions and the evolution of technological parameters;
- **conventional information systems (CISs)** - are of interest for entry, storage / storage, structuring, integration, saving and presenting various types of environmental information in terms of documents, formal, semi-formal and

informal, such as environmental regulations and reference literature;

- **analysis and assessment information systems (AAISs)** - environmental supports data processing methods making use of complex mathematical and statistical analysis and modeling techniques specific. This category includes, among others, various scenarios and forecast of the evolution / dynamics of environmental factors;
- **planning and decision support systems (PDSSs)** - directly supports the decisions taken by third parties by offering alternatives evaluation criteria and justification of decisions viability, assuming schemes and eco-management audit;
- **integrated environmental information systems (IEISs)** - can not be uniquely associated with a single class of simple systems, demonstrating an affinity towards multidisciplinary. Integrating a whole an impressive variety of concepts, issues and computer components specific purposes latter category serves as varied as they are many, enjoying such great appreciation for distributed systems environment.

Starting with the '90 was born a new research area for studying and developing new and competitive card, known as Environmental Informatics, a universally accepted definition of Environmental Informatics can be seen as follows:

"Environmental Informatics is the field of research that deals closely with the development and management of Information Systems Environment" as a shortened version of the definition given by Avouris and Page in 1995: "Environmental Informatics is a special field of applied computer science which develops and uses information processing techniques for the protection, research and environmental engineering ... all the basic methodology and specific applications across an extensive and complex issues and aspects, including monitoring, databases and information systems, GIS, software modeling, environmental management systems,

knowledge-based systems and data visualization environment..."

#### 4. THE CONTOURING OF THE ENVIRONMENTAL INFORMATION CULTURE

Information and communications technologies have produced unprecedented changes in society in all its aspects, comparable perhaps with transformations of the invention and widespread use of pattern, tending towards a transformation of economic life, social life and cultural transformation, mentality and, not least, the daily life of each individual, information mediated by new information technologies has penetrated directly, with or without our will.

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.

Educational institutions are designed to provide graduates and minimal luggage not only knowledge and information skills that enable them to be efficient labor market and integrate professional and social information society. Regarding environmental specialists working in this or related fields, we can say that they need a large number of information and knowledge at each stage of the management and evaluation of specific processes. Also to develop a project and its implementation, they need to know and understand the conditions under which these processes take place.

Analysis should be based on the best data and methods available techniques (BAT) and the knowledge gained from personal experience or come from other specialists.

Traditionally, this kind of information and knowledge are obtained, as required by time, by direct access to databases, reports and documents, the transfer of information and knowledge between professionals (managers, practitioners, researchers, teachers) and through contacts at rates training, workshops, congresses, conferences and symposia.



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One of the modern trends of education in general and the protection and environmental engineering in particular, is to address training of future specialists in environmental matters and legal system based on domain-specific policies so that future professionals can make decisions and action based on knowledge and experience.

To improve management capabilities and environmental assessment specialists is necessary to be able to manage and implement concepts for effective and efficient environment that can be achieved through information software environment. Also must have knowledge and access to current information enabling them to take the best decisions. Given the above, information technologies act as fundamental and indispensable support for all components of basic and applied scientific research in the field of environmental protection, using the numerical simulation of complex interdisciplinary processes for monitoring and process control experimental laboratory facilities, and and all applications in information transmission environment.

Environmental Informatics applies methods and information technologies for the collection, analysis, interpretation, distribution (dissemination) and use of the information environment. It also includes a wide range of disciplines that can be used to understand the specific problems related environment: artificial intelligence, neural networks, geographic information systems, global positioning systems, remote sensing, surveillance and mapping services, data storage technologies (databases), software engineering, mobile technology and the Internet.

In Romania, although the activities to highlight the subject of informatics leaning

towards the environment are just beginning, it is noted interest alignment with international standards in the field, have set up a computer lab in the Faculty of Environment Energy - University Politehnica of Bucharest and purchased a computer system at the Western University of Timișoara, where the specialists, closely interested by the Environmental Information System development want to create an Institute for Environmental Advanced Research.

All this effort, worth appreciated, are dedicated to building understanding and application of information technology to solve possible environmental national problems.

The main goal of Environmental Advanced Research Institute in Timisoara is the creation of a research infrastructure strategic excellence to international standards to ensure the following requirements related to the integration of research projects in key areas of academic and research activities:

- environmental sciences;
- computer sciences, chemistry, biology, mathematics and physics with related fields of research;
- social and human sciences.

Research carried out in the Laboratory of Environmental Informatics focuses on the monitoring and determine the impact it has on human health, have as main objective the implementation of new approaches, innovative problem solving targeted focus using information systems environment.

## 5. CONCLUSIONS

Each decade brings new challenges and new problems in the environmental protection politics and community development.

Solutions to our environmental problems and local community development strategies

are strongly dependent on the quality of accessible information sources.

Certainly, qualified information is a very critical factor in making decisive political actions and in changing people's attitudes on the environment. This information on environmental aspects is just as important for decisions on actions in environmental protection as for gaining knowledge in environmental research.

Nowadays, artificial intelligence systems particularized by EISs in the environmental research, protection and engineering plays a specific well defined and vital role in the lives of people all around the world, in all areas of activity: production, service, management, monitoring, research, public involvement in decision making, and in almost all countries.

It has revolutionized, in a practical sense, the way we are used to live. Now, it has made its mark on every fact of the world one cannot, now imagine a world without computers, without information technology, when in fact every field of human activity, may it be his daily life, official life, everything is how influenced under the cover of Information Technology. It made things happen really wonderful. It gave a virtual world itself, where there are no barriers for communication, information sharing, idea sharing etc.

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