

15th INTERNATIONAL CONFERENCE
MANAGEMENT AND SAFETY

M&S 2020

November 13th, 2020 • ONLINE CONFERENCE

INFORMATION SYSTEM MANAGEMENT AND SAFETY

PROCEEDINGS CD 1



THE EUROPEAN SOCIETY
OF SAFETY ENGINEERS

EUROPEAN
SAFETY
ENGINEER

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**PROGRAM CYCLE:
MODERN MANAGEMENT CONCEPTS AND SAFETY**

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Ana Šijaković

Editor

Josip Taradi
josip.taradi@european-safety-engineer.org

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Vesna Nikolić, Chair of the International Program Committee
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ORGANIZER

THE EUROPEAN SOCIETY OF SAFETY ENGINEERS

<http://www.european-safety-engineer.org>

ms2020@european-safety-engineer.org



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vesna.nikolic@european-safety-engineer.org

Miran Pavlič, Slovenia
Chair of the International Organizing Committee
miran.pavlic@european-safety-engineer.org

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Dejan Vasović, Vesna Nikolić, Goran Janačković

ENVIRONMENTAL INFORMATION SYSTEMS: CONCEPTS, TRENDS AND FUTURE CHALLENGES

Abstract

Environmental information systems represents the essence of the efficient environment quality management process, and a prerequisite for the adequate, responsible and timely information of the all stakeholders. Nowadays, environmental management became increasingly complex system dependent on akquisition, processing, organizing and visuelization of significant amounts of relevant data. Administrative regulators, interested public and the scientific entities have high expectations regarding the accuracy, transparency, integrity and availability of environmental-related informations. In this sense, the aim of this paperwork is to analyze the specifics of existing environmental information systems, their genesis, evolution and modification, as well as current trends in the field and future challenges. A detailed analysis of characteristic examples of the use of such systems is also provided. The main conclusion reflects the improvements generated by the implementation of environmental information systems.

Key words: environmental information systems, genesis, experiences, trends.

INTRODUCTION

Information and communication systems have reformed, in a revolutionary and almost unimaginable way, all spheres of human life and work. The increasing and rapid technological changes, demographic expansion, intensive urbanization, ecosystem service changes, emerging types of natural and tehnogenic hazards, coupled with global political turmoils, as well as challenges in effective usage of limited resources, lead to intensive improvement of the process of environmental quality monitoring and reporting, primarily in the field of informing the relevant stakeholders. [1] According to [2] environmental information systems are the core of contemporary urban environment management systems, and a prerequisite for the proper, timely information of the public. In [3] many areas are covered and connected with the environmental information system usage, like:

- Computer Modeling,
- Data Management,
- Data Mining,
- Environmental Analysis,
- Geographic Information Science,
- Remote Sensing,
- Risk Assessment,
- Sustainability.

At the other hand, many authors [4] stressed the importance of conceptual framework for the environmental information systems implementation. Within the European Union, information and communication systems are recognized as the main factor influencing economic growth and innovation, and among the seven leading initiatives of the economic strategy Europe 2020, is the Digital Agenda for Europe, which indicates the importance of information and communication systems in development modern economies. [5,6]

The environmental information system is an organized set of knowledge about the environment that aims at appropriate behavior towards it. On the basis of this information system, it is possible to forecast future changes in the environment, to create forecast and dynamic models. The environmental information system is important for establishing legislation and monitoring the state of the environment, because control of the state of the environment is possible if information on the state is available, and

environmental management is possible only if the subject of management is known. The task of the environmental information system is to provide access to environmental, economic, demographic, health and social data, with the aim of harmonized sustainable development. [7]

METHOD

For the purposes of research, the existing environmental information systems on national and international scale were analyzed. The syntetic report of identified characteristics are provided within result part of the paperwork.

In that sense, the basic types of information and communication systems are:

- radio connections,
- fixed telephony,
- mobile telephony,
- internet communications,
- Geographic Information System (GIS),
- television and radio stations,
- data warehouses,
- enterprise resource planning,
- enterprise systems,
- expert systems,
- search engines,
- global information system,
- office automation.

An environmental information system represents a formal, sociotechnical, organizational system designed to collect, process, store, and distribute environmental-related information (often in form of aggregate indicators or indexes). Within a sociotechnical perspective, all information systems, even those in the environment are composed by four components:

- task,
- people,
- structure (or roles), and
- technology.

Environmental information systems provide information on environment and related subject areas to researchers, academicians, policy planners, environmentalists, scientists, engineers and the general public, while shaping what people see in the environment, and how they collaborate to deal with environmental problems. [8]

RESULTS

Information and communication systems in national frameworks of importance for efficient risk management in the environment and society are:

- information system of the Republic Hydrometeorological Institute,
- information system of the Environmental Protection Agency,
- information system of the Ministry of Interior,
- information system of the Ministry of Health,
- information system of the Ministry of Defense,
- seismological information system, and
- GeoSerbia geoportal, etc. [7]

Information and communication systems in an international framework of importance for effective risk management in the environment and society are:

- Global Monitoring System (GEMS) - enables organized monitoring of the state of the environment, through 25 main global monitoring networks, each of which has an appropriate database, and the data are comparable,
- International Environmental Information System (INFOTERRA) - is the main channel for international exchange of environmental information supported by a global network of governmental and non-governmental actors,
- Global Resource Information Database (GRID) - is a global network for georeferenced environmental data, which is used to archive, collect and transmit digital information

downloaded from maps, satellite images, statistical tables and other sources within and outside the United Nations system,

- Global Knowledge Management Portal for Disaster Reduction (PreventionWeb) - is a key portal for defining user needs and exchanging information relevant to disaster prevention, as well as developing tools that support working in a collaborative environment. Contains information related to the design and development of projects in this area, and
- European Network for Environmental Information and Monitoring (EIONET) - is a basic tool for cooperation between the EEA (European Environmental Agency) and its member states. [7]

Global Monitoring System (GEMS) was inaugurated in 1975, and it monitors weather and climate changes around the world, as well as variations in soils, the health of plant and animal species, and the environmental impact of human activities. GEMS operate in over 142 countries. GEMS networks monitor air pollution, including the release of greenhouse gases and changes in the ozone layer, and air quality in various urban center; they also gather information on water quality and food contamination in cooperation with the World Health Organization and the Food and Agriculture Organization of the United Nations. [9] GEMS had a strong focus on water resources, which is noticeable from its databases, like GEMSat. That database contains more than 4 million entries for rivers, lakes, reservoirs, wetlands and groundwater systems from 75 countries and approximately 4000 stations. Overall, data is available for the time period from 1965 to 2017 and about 250 parameters.

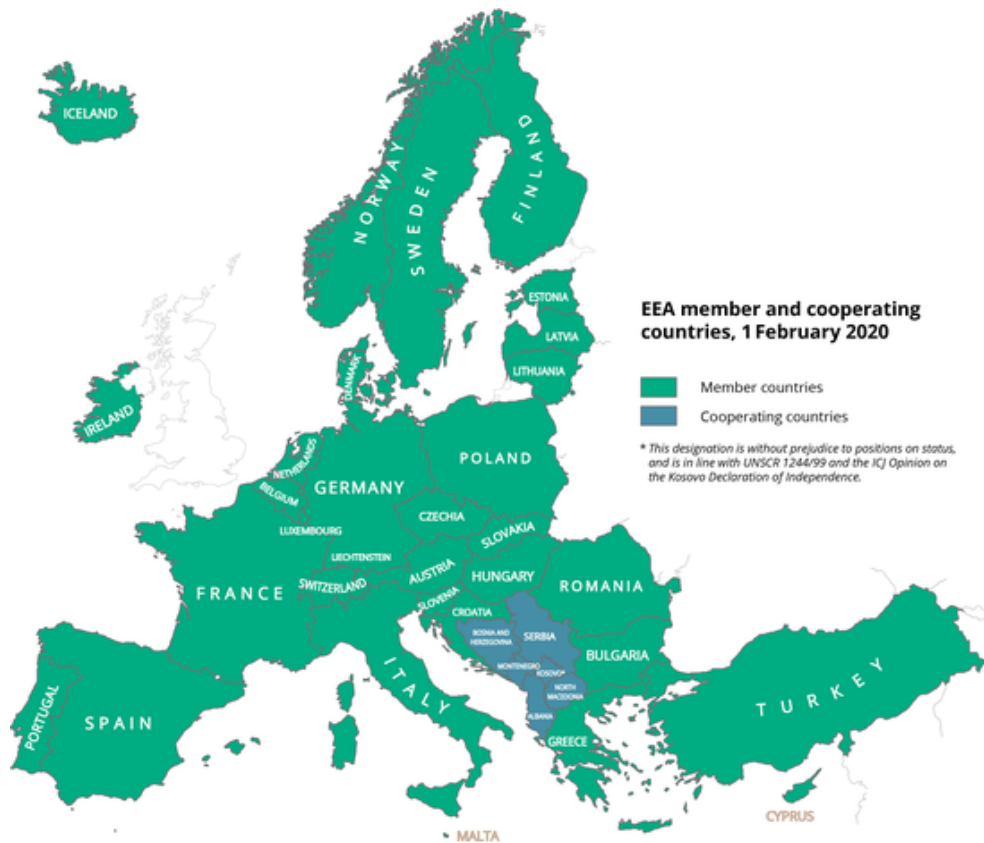
International Environmental Information System (INFOTERRA) was created by the United Nations Environment Programme following the United Nations Conference on the Human Environment held in Stockholm, Sweden, in June 1972. Nowadays, INFOTERRA has become one of the world's largest environmental information system.

Global Resource Information Database (GRID) is dedicated to making environmental information more readily accessible to environmental analysts as well as international and national decision makers. Its mission is to provide timely and reliable georeferenced environmental information and access to a unique international data service to help address environmental issues at global, regional and national levels. It was established in 1985 under UN Environment Program (UNEP) in order to integrate the scientific understanding of earth processes and sound management of the environment at national, regional, and global levels.

PreventionWeb is a collaborative knowledge sharing platform on disaster risk reduction (DRR), managed by the UN Office for Disaster Risk Reduction (UNDRR). The site offers a range of knowledge products and services to facilitate the work of DRR professionals. [10] It was launched in 2007. under the Hyogo Framework for Action (an UNISDR initiative focusing on disaster risk reduction).

European Network for Environmental Information and Monitoring (EIONET) is a partnership network of the European Environment Agency (EEA) and its 38 member and cooperating countries. The EEA is responsible for developing Eionet and coordinating its activities together with National Focal Points (NFPs) in the countries, as shown in Figure 1. [11]

Figure 1. EEA member and cooperating countries



Source: European Environment Agency [11]

The regulation establishing the EEA was adopted by the European Union in 1990. It came into force in late 1993 immediately after the decision was taken to locate the EEA in Copenhagen. Taking up its work in 1994, Eionet has become a well-known and trusted provider of high-quality data, information and assessments for Europe. [12]

DISCUSSION

Developed information system in the society - environment system is the key for achieving:

- functional distribution of information on the state of the environment and society,
- two-way communication, and
- robustness in case of emergencies.

Information and communication systems in regular circumstances must be adapted to the needs of users at a given time. In the event of an emergency (accidental pollution substance release, increased air pollution level, an unusual trend of ionizing and non-ionizing radiation...), response plans should allow for the integration of most existing communication systems into a single system.

The possibility of transferring information at a lower technological level is also important, e.g. by courier or direct contacts. On the other hand, large telecommunications companies (mobile phone operators, etc.) can be part of an information system for:

- popularization of responsible management of the environment and society protection through the development of applications for visualization of environmental components for the dominant operating platforms: iOS, Android, Windows mobile, and
- popularization of safety culture, *itidem*.

In terms of communications, the characteristic of emergency situations is:

- increased flow of information, often unnecessary and
- reduced information transmission capacity, which can lead to possible congestion that endangers or disables line services.

Information system for emergency situation communication and management is also very important from the aspect of environmental protection. In this paperwork its significance is only partially treated, while such a system due to its complexity should be the subject of some future research. [13]

CONCLUSION

What is most important from the aspect of environmental quality management is answering the question of how environmental resources are managed. The answer to this question implies an understanding of all information and relevant data related to an environmental resource. At the other hand, understanding stakeholders needs, as well as opportunities and limitations in environmental resources, is essential for efficient resource management. This requires the dissemination of modern scientific knowledge, as well as the establishment of a dialogue between individuals and responsible institutions. With relevant data, properly disseminated throughout reliable environmental information system, appropriate development strategies can respond in the right way to the challenges of resource availability and sustainability, then the challenges of distribution, access, rights of use, and so on. Effective communication between different users and different levels is the key to successful environmental resource management. Only in the case when the needs are clearly defined, resources can be managed in an acceptable way, i.e. sustainable way.

REFERENCES

- [1] Janačković, G.: **Models for integrated safety system management based on collaborative work**, Ph.D. dissertation, University of Niš, Faculty of Occupational Safety in Niš, Niš, Serbia, 2015.
- [2] Karatzas K. et al. **Environmental Information Systems and the Concept of Environmental Informatics**. In: Scharl A. (eds) Environmental Online Communication. Advanced Information and Knowledge Processing. Springer, London, United Kingdom, 2004.
- [3] Information Resources Management Association (IRMA). **Environmental Information Systems: Concepts, Methodologies, Tools, and Applications (3 Volumes)**. IGI Global, 2019.
- [4] Hřebíček, J. et al (Eds.). **Environmental Software Systems - Frameworks of eEnvironment**. Proceedings of the 9th IFIP International Symposium ISESS 2011, Brno, Czech Republic, 2011.
- [5] Information society development strategy in the Republic of Serbia until 2020. Official Gazette of Republic of Serbia, No. 51/2010.
- [7] Indić, D., Terzić, M., Ivanković, N.: **Informacioni sistemi u upravljanju rizicima u životnoj sredini**. Vojnotehnički glasnik, 61 (1), 2013.
- [8] Fortun, K.: **Environmental Information Systems as Appropriate Technology**. MIT Press Journals, Vol. 20, No 3, 2004.
- [13] Vasović, D.: **Hybrid model of environmental capacity management**, Ph.D. dissertation, University of Niš, Faculty of Occupational Safety in Niš, Niš, Serbia, 2016.

Internet

- [6] Digital agenda for Europe, <https://www.europarl.europa.eu/factsheets/en/sheet/64/digital-agenda-for-europe> (accessed 26.05.2020.)
- [9] <https://www.encyclopedia.com>, (accessed 24.05.2020.)
- [10] PreventionWeb, <https://www.preventionweb.net/about/aboutpw>, (accessed 20.05.2020.)
- [11] European Environment Agency, <https://www.eionet.europa.eu/>, (accessed 21.05.2020.)
- [12] The European Community and Associated Institutions Library Co-operation Group, <http://www.eurolibnet.eu/3/72/&for=show&tid=7929>, (accessed 22.05.2020.)

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BIOGRAPHY OF THE FIRST AUTHOR



Doc. dr. Dejan Vasović

University of Niš, Faculty of Occupational Safety in Niš
Niš, Serbia
dejan.vasovic@znr fak.ni.ac.rs

Dejan Vasović, PhD, is an assistant professor of the University of Niš, Faculty of Occupational Safety in Niš, Republic of Serbia. He is member of the Department for Working and Living Environment Quality Management. He is the author or co-author of several book chapters, and over one hundred scientific papers published in scientific journals and proceedings of scientific conferences. He took part in the realization of three national and one international research projects. With no less importance is his experience within teacher's mobility programs, such ERASMUS+ and CEEPUS. He was a member of organizational and program boards of several national and international scientific conferences. He peer reviewed a number of scientific and professional papers published in the proceedings of national and international conferences and scientific journals. His research interests include: environmental protection in general, water protection and sustainable water resources management, environmental safety and security issues, emergency management, etc.

DATA ON CO-AUTHORS

2)

Vesna Nikolić, PhD

University of Niš, Faculty of Occupational Safety in Niš
Niš, Serbia
vesna.nikolic@znr fak.ni.ac.rs

3)

Goran Janačković, PhD

University of Niš, Faculty of Occupational Safety in Niš
Niš, Serbia
goran.janackovic@znr fak.ni.ac.rs