

## Challenges of SEIS and SISE: Integrating Environmental Knowledge in Europe

Jiří Hřebíček<sup>1</sup>, Rudolf Legat<sup>2</sup>, Michael Nagy<sup>2</sup> and Werner Pillmann<sup>3</sup>

### Abstract.

There is shortly introduced the *eEnvironment* (Electronic access to Environmental information) as a part of *eDemocracy* (the use of electronic communications technologies such as the Internet in enhancing democratic processes within a democratic state or representative democracy) and tools for its implementation: the *Shared Environmental Information System* (SEIS) and a *Single Information Space in Europe for the Environment* (SISE). The *eEnvironment* fully supports the principles of *eDemocracy* and its new trends are discussed in the paper together with topics of prepared conference “Towards *eEnvironment* (Challenges of SEIS and SISEE: Integrating Environmental Knowledge in Europe)”, which will be held on March 25.-27.3.2009 in Prague during the Czech Presidency of the Council of the EU and will be focused for finding of answers on above challenges from scientific, organisation and political point of view.

### 1. Introduction

The *Ad hoc Committee on eDemocracy of the Council of Europe* (CAHDE) was established by decision of the Committee of Ministers of EU and started its work at September 2006. The committee CAHDE is primarily an intergovernmental body, whose members are delegated by all Member States of the Council of Europe, and by relevant international organisations (e.g. EU, OSCE) and authors of the paper participate in the expert group of CAHDE. The main goals for *eDemocracy* are being: strengthening the participation, initiative and engagement of citizens in national, regional and local public life; improving the transparency of the democratic decision-making process and the accountability of democratic institutions; improving the responsiveness of public authorities; fostering public debate and scrutiny of the decision-making process.

The *White paper of eEnvironment* (Electronic access to Environmental information) was presented at the second CAHDE plenary meeting (Nagy/Legat/Hrebicek 2007), which was held in Strasbourg on 8 and 9 October 2007. Its fundamental ideas were prepared during discussions on the workshop *Seamless Access to Environmental Information in the EU - Building an Integrated Information Space for the Environment* of the 21. International conference EnviroInfo 2007 in Warsaw (Pick 2007), (Hřebíček 2007). The *eEnvironment* basis is the Aarhus Convention, which is implemented in the European Community and supported by the EU Directives: 2003/4/EC (Public Access to Environmental Information); 2003/35/EC (Public Participation); 2003/98/EC (Re-use of Public Sector Information) and 2007/2/EC (INSPIRE: Infrastructure for Spatial Information in the European Community). The *eEnvironment* is going to be one of

---

<sup>1</sup> Institute of Biostatistics and Analyses, Masaryk University, Kamenice 126/3, 625 00 Brno, Czech Republic,  
e-mail: hrebicek@iba.muni.cz, web: <http://www.iba.muni.cz>

<sup>2</sup> Umweltbundesamt GmbH, Spittelauer Lände 5, 1090 Wien, Austria, e-mail: rudolf.legat&michael.nagy@umweltbundesamt.at,  
web: <http://www.umweltbundesamt.at>

<sup>3</sup> ISEP International Society for Environmental Protection, Bechardgasse 24/12, A 1030 Wien, Vienna, Austria  
e-mail: pillmann@isep.at, web: <http://www.isep.at>

the fundamentals of *e*Democracy. More details about the *e*Environment are possible to find in (Nagy/Legat/Hrebicek 2007) and (Hrebicek/Legat/Nagy, 2008).

The Communication of Commission of the European communities COM(2008) 46 final: *Towards a Shared Environmental Information System (SEIS)* will provide the basis for any citizen to be informed about environmental matters and to use this information for active participation in decision making. Further it will be a development of a *Single Information Space in Europe for the Environment (SISE)* specified by Schoupe, (2008). The SISE together with SEIS will provide some sort of an integrated information space in which environmental data and information will be combined with knowledge for decision support of environmental protection and sustainable development.

The prepared conference “Towards *e*Environment (Challenges of SEIS and SISEE: Integrating Environmental Knowledge in Europe)”, which will be held on March 25-27,2009 in Prague during the Czech Presidency of the Council of the EU, will try to find answers on above challenges from political, organisation and scientific point of view. Thus, *e*Environment fully supports the principles of *e*Democracy and its new trends will be further discussed in detail in this paper together with topics of Prague conference, as the official event of the FP7 project ICT-ENSURE - European ICT Environmental Sustainability Research (coordinator: K. Tochtermann and participants: W. Pillmann, W. Geiger; see also the paper Tochtermann et al. in this proceeding volume).

## 2. The role of the SEIS in *e*Environment

According to the Communication COM(2008) 46 final the SEIS will provide the knowledge base required to design, implement and evaluate the environmental and other policies that are needed to achieve sustainable development and are underpinned by reliable, scientifically sound, up-to-date and generally fit-for-purpose, data and information covering all elements of the DPSIR (Driving forces, Pressures, State of the environment, Impacts and Responses) framework. This is the first step in creating an integrated environmental information system in the European Union.

On-going activities at European, national and regional level need to be reinforced and co-ordinated in line with SEIS. Within the Commission, priority will be given to the implementation of the INSPIRE directive (2007/2/EC) and the continued development of the *Global Monitoring for Environment and Security (GMES)* initiative<sup>1</sup> as a basis for improving the sharing of environment-related data and information within Europe and the provision of services to policymakers and citizens. The GMES initiative represents a concerted effort to bring data and information providers together with users, so they can better understand each other and make environmental and security-related information available to the people who need it through enhanced or new services. The success of both of these activities will be carefully monitored in order to assess whether complementary initiatives need to be launched. This is to ensure that SEIS, INSPIRE and GMES will be mutually supportive. The general objectives of the SEIS are:

1. to secure a clear political agreement around a set of principles on which the SEIS is to be based;
2. to continue rationalising the knowledge base through the assessment and streamlining of existing reporting requirements within environmental legislation while implementing information and communication technology solutions for electronic reporting;
3. to establish and implement data and information sharing agreements in addition to an efficient ICT infrastructure to facilitate the discovery, assessment, access and sharing of environment-related data and information;

---

<sup>1</sup> The GMES initiative represents a concerted effort to bring data and information providers together with users, so they can better understand each other and make environmental and security-related information available to the people who need it through enhanced or new services (<http://www.gmes.info/>).

4. to reinforce and, where necessary, establish monitoring infrastructures and surveys for the collection and archiving of fit-for-purpose environment-related data that are cost effective and flexible but can be sustained over the long term.

A key step in implementing SEIS and reaping its benefits will be to modernise the legal provisions on the way in which information required by environmental legislation is made available. This will be done by revising the *Standardised Reporting Directive* (91/692/EC), which needs to be updated and brought in line with the SEIS principles.

The European Environment Agency (EEA) has a crucial role to play in implementing SEIS. As its mandate is to provide timely and reliable environmental information, it is essential that EEA continues make SEIS the centre of its strategy. EEA will coordinate the implementation of the SEIS with the help of its *European environment information and observation network* (EIONET). The EIONET<sup>1</sup> is a network of some 900 experts from over 300 national environment agencies and other bodies dealing with environmental information in 37 European countries, as well as five European Topic Centres (ETCs) of EEA working on specific environmental themes. Based on input from the EIONET partners the EEA has identified a set of priority annual data flows. These data in the areas of air quality, air emissions, inland waters, marine and coastal waters, contaminated soil, nature conservation and land cover, are used to update the core set of environmental indicators, which form the basis of EEA reports and assessments.

The Reportnet<sup>2</sup> is EIONET's infrastructure for supporting and improving data and information flows and has helped modernise the collection of information and reporting systems (Pillmann/Geiger/Voigt 2006). The system integrates different web services and allows for distributed responsibilities. The Reportnet has initially been mainly used for reporting environmental data to the EEA, but is now also hosting some of the Commission's environmental reporting information. The open system also allows for deliveries to be made to other national and International organisations. However to date the information is often uploaded in the form of reports in word processing or spreadsheet format and not structured in connected databases. This makes it difficult to efficiently retrieve, integrate and analyse the information in order to efficiently inform policy and decision making.

As part of the Reportnet, EEA has created since 1998 a *Reporting Obligations Database*<sup>3</sup> (ROD) and a *Central Data Repository*<sup>4</sup> (CDR). There are our experiences with Reportnet tools: Hřebíček, Pitner and Ráček (2005) developed environmental data models for reporting obligations of the Czech Republic to the CDR, as well as they analysed how these obligations are met in practice ROD information tools of the EEA. We could see that the EEA's Reportnet tool needs to be taken up fully by all EEA member countries and will need to be progressively adapted with the new SEIS principles.

In 2008 the Commission will draw up with Member States and the EEA a detailed implementation plan for achieving the objectives outlined in the Communication. This implementation plan will provide details on how SEIS will be put in place, taking into account its associated costs and benefits. In addition to more technical aspects this plan will cover issues of a legal, financial, organisational, and procedural nature and a business model to the extent they are not already satisfactorily addressed.

EU financial support to complement national and regional financing to implement SEIS will come from the Research Framework Programmes, the LIFE Programme, the Competitiveness and Innovation Programme (CIP) and the Structural Funds.

---

<sup>1</sup> <http://www.eionet.europa.eu/>

<sup>2</sup> <http://www.eionet.europa.eu/rn>

<sup>3</sup> <http://rod.eionet.europa.eu/index.html>

<sup>4</sup> <http://cdr.eionet.europa.eu/>

### 3. The role of the SISE in eEnvironment

The objective “ICT-2007.6.3: ICT for Environmental Management and Energy Efficiency” of EU’s Seventh Framework Programme<sup>1</sup> (FP7), introduced a *Single Information Space in Europe for the Environment* (SISE) in which environmental institutions, service providers and citizens can collaborate or use available information without technical restraints. (Schoupe 2008). This will be a platform also for eEnvironment.

The aim of the SISE is: an ICT research vision for real-time connectivity between multiple environmental resources which would allow seamless cross-system search; as well as cross-border, multi-scale, multi-disciplinary data acquisition, pooling and sharing. Furthermore, it would allow for service-chaining on the Web, thereby stimulating data integration into innovative value-added Web services.

The workshop “Towards a Single Information Space in Europe for the Environment (SISE)”<sup>2</sup> was organised by the ICT for Sustainable Growth Unit of the Commission’s Information Society and Media Directorate-General and took place in Brussels on 15<sup>th</sup> February 2008. The goal of the workshop was to provide an outline justification and prioritisation of future research or innovation actions with clear European added value. The overall target was to support an integrated information space and market place for effective environmental management in Europe.

There are recommendations that came from the workshop, and the conclusions that they came to for the prioritisation of future work towards a SISE were reported by O’Flaherty (2008). The following main themes of SIS were identified:

1. *SISE Application and Services*
  - SISE Services
  - Process Chaining and Uncertainties
  - Real-time Mapping and Modelling
  - Thesauri
  - Open Standards and Open Source Software
2. *SISE Open Semantics and Standards*
  - Standardisation and Framework Projects
  - Standardisation and Community Knowledge
  - Semantic Web Technologies for the SISE
  - Ontologies
3. *Data Interoperability and Web Communities*
  - Web 2.0 Technologies
  - Data Provision in the Semantic Web
  - SOA/Web Services and Model Driven Communities
  - Social SISE
4. *Data Visualisation and Modelling including Risk Assessment*
  - Visualisation of Environmental Data
  - SOA and Semantic Web Services
  - Simulation and Modelling
  - Complex 3D/4D models
  - Chained web services and legacy systems
5. *SEIS Deployment Models*
  - From Framework Projects to Market Deployment
  - Project’s Knowledge Loss
  - Regional Application of European Interoperability Standards
  - SISE and Business Models

---

<sup>1</sup> <http://cordis.europa.eu/fp7/ict/>

<sup>2</sup> [http://cordis.europa.eu/fp7/ict/sustainable-growth/workshops\\_en.html](http://cordis.europa.eu/fp7/ict/sustainable-growth/workshops_en.html)

- Environmental Information Service Economy

The following prioritisation of topics in future Calls from the ICT for Sustainable Growth Unit in the FP7, CIP and other instruments (such as Calls for Tender) were identified to progress future research and innovation actions on the SISE:

1. *Flexible chaining of distributed environmental services*
  - Methods and protocols for service discovery and chaining
  - Automated data fusion, services and quantitative quality assessment
  - Semantics, thesauri, ontology services and standardisation
  - Chaining of models, predictive tools, including the characterisation of the propagation of uncertainty in chained models
  - On-demand distributed geo-processing and services
  - Interactive, Web-based 3D/4D analysis and visualisation tools
  - Integration of heterogeneous geo-spatial sources, Web 2.0 collaborative community and semantically enhanced services.
  - Tools for interactive usable and useful contextualised user interfaces.
2. *Smart wireless monitoring networks*
  - Sensor Web
  - Mobile devices and portable sensors
  - Massive deployment of low cost miniaturised sensors
  - Integration into EO and distributed environmental services with user-driven on-demand real-time results.
3. *SISE - Sustainable Deployment Models Support Action.*

#### 4. Towards eEnvironment conference

The European conference of the Czech Presidency of the Council of the EU “Towards eEnvironment (Challenges of SEIS and SISE: Integrating Environmental Knowledge in Europe)”, which will be held on March 25.-27.3.2009 in Prague, is dedicated to information exchange among scientists, public administrations, environmental agencies and institutions involved in environmental information processing as well as environmental informatics end-users. The conference will be a meeting place for experts from leading edge technologies, fostering information flows in Europe and beyond, standardization, necessary for a sustainable development. Driving topics for the conference will include best practices of European Member States in the implementation of the Shared Environmental Information System (SEIS) and research towards the development of a *Single Information Space in Europe for the Environment* (SISE). The conference is organised by Masaryk University Brno, Czech Republic with the Ministry of Environment of the Czech Republic and the close collaboration with the Commission (DG INFSO, DG ENV) and EEA. The conference chair was appointed prof. Jiří Hřebíček by the organisers of this conference.

The forthcoming conference will cover the specialised scope of environmental informatics. It will show the state-of-the-art at research, development and implementation of SEIS and SISE, with a special focus on the main topics:

- *ICT research towards SISE and building the European Research Area in the field of ICT for environmental sustainability.*
- *SEIS best practices of environmental data and information processing and dissemination.*
- *Environmental modelling of air pollution, global climate change, energy efficiency and security to support decision making in environment protection.*

This conference will be open to scientists, academicians, managers, politicians, businesses, public administration and decision makers in the field of environmental information, experts from ICT industry, governmental institutions, international and intergovernmental organisations, environmental agencies and

networks, specialists of theoretical and applied informatics, consultants, students and the concerned public. Conference motto is *Integrating Environmental Knowledge in Europe*.

#### 4.1 Sessions:

- **ICT research towards SISE and building the European Research Area in the field of ICT for environmental sustainability**

This session will address the challenge of building - in the context of a digital Europe - a dynamic and collaborative space in Europe, not only for seamless data access to public authorities, businesses and the public at large, but also for interoperable environmental services. This is the aim of the "Single Information Space in Europe for the Environment": an ICT research vision for real-time connectivity between multiple environmental resources which would allow seamless cross-system search, as well as cross-border, multi-scale, multi-disciplinary data acquisition, pooling and sharing. Furthermore, it would allow for service-chaining on the Web, thereby stimulating data integration into innovative value-added Web services. Typical topic for this session will include ICT research for Environmental application and services, open semantics and standards, data interoperability and Web communities, data visualisation and modelling including risk assessment, SISE deployment models, and the consolidation of a existing networks to build a European Research Area in the field of ICT for environmental sustainability.

- **SEIS best practices of environmental data and information processing and dissemination**

This session will promote a building of the Shared Environmental Information System of Member States of EU under the coordination of EEA. There will be the efficient European exchange of knowledge and information about best practices of European, national and regional environmental data and information processing and dissemination. This follows from the COM(2008) 46 final "Communication Towards a Shared Environmental Information System". This session will cover, in addition to the more technical aspects, issues relating to legal, financial, organisational, procedural and business model aspects of SEIS development to the extent that they are not already being satisfactorily addressed.

- **ICT for modelling of air pollution, climate changes, energy efficiency and security to support decision making in environment protection**

This session will be dedicated to methods and ICT systems for modelling environmental factors including weather, climate changes, air pollution, etc. One of the important topics will be the interaction between wide range of environmental models (deterministic, stochastic etc.) and complex systems used in industry, transport and policy making. Contribution of the ICT to energy efficiency of energy-intensive systems, products and processes will be also discussed.

#### 4.2 Workshops:

- **GMES as an important tool of harmonisation of environmental data for end users**

There will be discussed a concerted effort to bring environmental data and information providers together with users, so they can better understand each other and make environmental and security-related information available to the people who need it through enhanced or new services:

*GMES and in situ monitoring:* What is and where is GMES (GMES structure, GMES services, Recent development) GMES "in-situ" component, Integration of in situ monitoring into GMES, Demonstration of GMES operational services.

*GMES serving new member states: GMES as tool for urban management (environmental problems of suburbanisation, Prague and its urban management, case studies from other CEE cities – Warsaw, Vienna, Bratislava, Budapest..., GMES services for urban management).*

- **European ICT Environmental Sustainability Research – Networking National Research Programmes**

The EU Programme ICT-ENSURE will organize its 3<sup>rd</sup> Regional Workshop. The special focus is inter-linking ICT applications and initiatives within national research programmes, relevant for environmental and sustainability research. The project “ICT for Environmental Sustainability Research (ICT-ENSURE)” is to strengthen the network of national and international ICT/ environmental/sustainability interdisciplinary research programmes. The workshop aims to communicate ICT application knowledge and ideas between program managers of National research programmes, high level manager of industrial programs and FP6-FP7 EU program participants. In presentation slots, the Workshop offers information on the state of the art of Environmental Informatics and the results of EnviroInfo conferences of this scientific community.

The Workshop provides an opportunity to include contributions for further discussion in the EnviroInfo Berlin conference in September 2009 and in recommendations for a “Single Information Space in Europe for the Environment”. Conference participants are very welcome to join and enrich the European network of the Environmental Informatics Community and to contribute with their experience and ideas to the European research landscape and the European Research Area ERA. The workshop is supported from the DG INFSO & Media unit 4 “ICT for Sustainable Growth” of the European Commission.

- **eEcoRA – Information Technologies in Ecological Risk Assessment**

Workshop will summarize current methodology of ecological risk assessment (EcoRA) in view of most common problems with data accessibility and processing. Complementary practical session will provide basic overview of information and communication technologies used in EcoRA including overview of available Internet databases and applications. Main part of the workshop will be focused on processing and modelling of complex abiotic and biotic data entering EcoRA and their aggregation according to rules given by problem to be solved. All issues will be supported by practical case studies working with real data from bio-monitoring of fresh waters and soil ecosystems.

- **eEnvironment terminology**

In order to assure alignment with existing definitions and usages of multilingual environmental terms, experts in workshop will discuss existing definitions from various available resources and views. There will be included dictionaries, thesauri, legal directives and the like. Further inputs will give relevant experts at the European Environment Agency. For easier collaboration within the designated group these various definitions were all entered into a Wiki based web site<sup>1</sup>.

## 5. Conclusions

The development of the SEIS together with new FP7 research projects for the SISE will provide some sort of an integrated information space in which the connection of eEnvironment with eDemocracy will support of environmental protection and sustainable development.

We can count on the conference Towards eEnvironment, and especially on its resulting resolution and conclusions to further develop the eEnvironment agenda at European level. These resolution or conclusions from the conference would call/allow for additional steps forward to implement SISE and SEIS.

---

<sup>1</sup> <http://www.ag.bka.gv.at/index.php/Portal:EN>

## Acknowledgements

The paper is supported by the Ministry of Environment of the Czech Republic (project No. SP4/i2/26/07), further by the Ministry of Education and Youth (project INCHEMBIOL, No. MSM0021622412).

## References

- Hřebíček, J., Pitner, T., and Ráček, J. (2005): Development of National Environmental Reporting System. In 19st International Conference Informatics for Environmental Protection EnviroInfo 2005 - Networking Environmental Information. Brno, Czech Republic: Masaryk University, pp. 718-723.
- Hřebíček, J. (2007): Public Access to Environmental Information in the Czech Republic Building an Integrated Information Space for the Environment. In EnviroInfo 2007. 21st International Conference on Informatics for Environmental Protection. Environmental Informatics and System Research. Volume 2. Workshop and application papers. Warsaw, Poland: Shaker Verlag, pp. 139-142.
- Hrebicek, J., Legat, R., Nagy, M. (2008): Current Trends in eEnvironment and its Role in eDemocracy, iEMSS 2008 International Congress on Environmental Modelling and Software (to appear)
- Nagy, M., Legat, R., Hrebicek, J. (2007): Electronic Access to Environmental Information – an Important Fundament for E-Democracy and Environmental Protection, CAHDE 23 E.  
[http://www.coe.int/t/e/integrated\\_projects/democracy/02\\_activities/002\\_e-democracy/](http://www.coe.int/t/e/integrated_projects/democracy/02_activities/002_e-democracy/), 2008/05/31
- Pick, T. (2007): From Aarhus to INSPIRE: Putting Environmental Information on the Map. In EnviroInfo 2007. 21st International Conference on Informatics for Environmental Protection. Environmental Informatics and System Research. Volume 2. Workshop and application papers. Warsaw, Poland: Shaker Verlag, pp. 159-166.
- Pillmann, W., Geiger, W. and Voigt K. (2006): Survey of environmental informatics in Europe, *Environmental Modelling & Software*, 21(11), 1519-1527.
- O'Flaherty, J. J. (2008): Towards a Single Information Space for the Environment in Europe. Experts Consultation Workshop – ICT for Sustainable Growth – Brussels 15 Feb 2008.  
[ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/sise-workshop-report-08\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/sise-workshop-report-08_en.pdf), 2008/05/31
- Schouppe, M. (2008): Towards a Single Information Space for the Environment in Europe. Concept and purpose. Expert Consultation Workshop, European Commission Information Society & Media Directorate-General, Unit ICT for Sustainable Growth. Brussels, 15. February 2008.  
[ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/workshops/workshop-20080215-mschouppe\\_en.pdf](ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/workshops/workshop-20080215-mschouppe_en.pdf), 2008/05/31