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“European Information and Communication Technologies for Environmental Sustainability Research”

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<td>Amendments, conclusion</td>
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<td>4</td>
<td>2009 04 21</td>
<td>Amendments, single contributions</td>
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Executive Summary

The workshop ICT for Environmental Sustainability was organized on March 26, 2009 in Prague as the third regional event in ICT-ENSURE. The scope of this meeting was to select fields for sustainability research, gather information on national research programs for the European Research Area, develop a better understanding for the implementation of SISE, the Single Information Space in Europe for the Environment, and to stimulate an interdisciplinary discussion between the participants.

This workshop originally was planned as a regional event, where dissemination of environmental informatics knowledge should be taking place in the Eastern part of Europe. The long standing contact with Prof. Jiri Hrebicek (Masaryk University, Brno) opened the opportunity to organise the workshop in the framework of the “Towards eEnvironment” conference. With the main topics “Shared Environmental Information System” (SEIS) and information exchange among public administrations, EU institutions, environmental agencies, scientists and businesses, the conference provided an excellent platform for the ICT-ENSURE workshop.

In general the workshop contributions can be classified under the following issues

<table>
<thead>
<tr>
<th>Shared environmental information</th>
<th>SEIS &amp; SISE (Hrebicek, Pillmann)</th>
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<tbody>
<tr>
<td></td>
<td>Access to Environmental Information (Pick)</td>
</tr>
<tr>
<td>National information portals:</td>
<td>Slovakia (Benko)</td>
</tr>
<tr>
<td></td>
<td>Germany (Keitel et al.)</td>
</tr>
<tr>
<td>Environmental information</td>
<td>Sweden (Sivertun)</td>
</tr>
<tr>
<td></td>
<td>Water Information (Bilouris)</td>
</tr>
<tr>
<td></td>
<td>Legal mapping (Peters, Woudenberg)</td>
</tr>
<tr>
<td>Transnational environmental information</td>
<td>Danube River Basin (Höbart)</td>
</tr>
<tr>
<td></td>
<td>Partnership for Environmental Research (Brown)</td>
</tr>
<tr>
<td></td>
<td>Green Chemistry (Voigt)</td>
</tr>
<tr>
<td>Interim results from ICT-ENSURE</td>
<td>Literature and research information system (Geiger et al.)</td>
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<td></td>
<td>ICT in Energy consumption (Coroama, Hilty)</td>
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<td>ICT for Health and Environment (Wirt)</td>
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The whole conference “Towards eEnvironment” provided the 384 participants, coming from 33 countries, with high level political information from the European Commission (DG INFSO, DG Enterprise, EEA, JRC, Eurostat) and from the Ministries of the Czech Republic. Scientific information related e.g. to SEIS, SISE, energy efficiency, GMES, environmental terminology and FP7 projects (NESIS, GI-GAS) were documented on the 692 pages in the proceedings volume, including the ICT-ENSURE Workshop contributions http://www.e-envi2009.org/?proceedings.

This workshop report provides a summary of the 22 presentations and the subsequent discussions. The presentations made by participants are available on www.ict-ensure.eu/ under →Results →Research Network. The workshop agenda and a list of the 23 speakers and the 64 registered participants (in total) are completing the report.
Table of Contents

Executive Summary ........................................................................................................................................ iii
Table of Contents ......................................................................................................................................... v
1 Introduction .............................................................................................................................................. 1
2 Workshop Synopsis .................................................................................................................................. 2
  2.1 Objectives and Key Areas of the Workshop ......................................................................................... 2
  2.2 ICT ENSURE Workshop embedded in the Towards eEnvironment conference ......................... 2
  2.3 Workshop participants and integration of young researchers ......................................................... 3
3 Workshop Report ................................................................................................................................... 4
  3.1 Morning presentations and discussions ............................................................................................ 4
  3.2 Afternoon presentations and discussions ......................................................................................... 11
  3.3 Final discussion and conclusion ....................................................................................................... 14
4 Speakers/ Participants List ..................................................................................................................... 16
5 Workshop Agenda .................................................................................................................................. 17
References ................................................................................................................................................... 20
Abbreviations ................................................................................................................................................ 20
Impressions from the conference “Towards eEnvironment” ................................................................. 21
1 Introduction

Within the program ICT-ENSURE four regional workshops are foreseen in distinct European locations, in order to extend the network of environmental informatics. The tasks of the research workshops are the dissemination of environmental informatics knowledge, bringing together established researchers with participants from the local area. For the third workshop, a venue in Central Europe was proposed. An excellent opportunity was found at the occasion of the Czech Presidency of the European Union in Prague.

From March 25-27th 2009, the conference “Towards eEnvironment”, organised at the Corinthia Hotel in Prague was an optimal venue and formed the perfect framework for this workshop. The main topic of the “Towards eEnvironment” conference was the synthesis of SEIS and SISE and the fostering of ICT research for the benefit of the environment. The sub-title of the conference was “Opportunities of SEIS and SISE: Integrating Environmental Knowledge in Europe”, a thematic orientation that is absolutely conform to the subject matter of ICT-ENSURE. In a very early phase of conference organisation, the conference organizer Prof. Jiří Hřebíček agreed with the WP3.3 leader to include the ICT-ENSURE workshop “ICT for Environmental Sustainability” as W2 in the conference organisation. The ICT-ENSURE consortium wishes to thank Prof. Jiří Hřebíček and his team for hosting the ICT-ENSURE Workshop in the framework of their conference.

A total of 23 speakers coming from 10 European countries, including five promising young scientists from the Czech Republic, were involved in the workshop.

The final workshop schedule can be found at the end of this report. The final conference programme is available at http://www.e-envi2009.org/Program.pdf

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1 SEIS Shared Environmental Information System (COM(2008) 46 final)
SISE Single Information Space in Europe for the Environment (from the terminology of DG-INFSO)
2 Workshop Synopsis

2.1 Objectives and Key Areas of the Workshop

During the third ICT-ENSURE regional workshop the present status of SEIS and SISE was analysed and presented. Moreover a number of country reports on ICT in the field of environmental sustainability research, and first initiatives of transnational environmental information systems were described. In presentation slots, several branches of application areas relevant to the combination of environment and ICT were addressed. The planned lectures included:

- country information on SEIS and SISE activities
- information systems and portals, relevant for environmental sustainability
- regional and transnational environmental information sources and
- a presentation of the ICT-ENSURE consortium on the project progress

The following questions were discussed:

- Which environmentally relevant specific areas should be primarily envisaged for integration?
- Which similar activities and/or national research programs do exist in European countries?
- What are the key points hindering the integration of national information sources?
- What recommendations can be given from the participant’s perspective, to implement a “Single Information Space in Europe for the Environment” (SISE), anticipating ICT development?

In addition, it was the aim of the organizers to invite the Prague workshop participants to join and enrich the European network of the Environmental Informatics Community and contribute with their experiences and ideas to the European research landscape.

2.2 ICT ENSURE Workshop embedded in the Towards eEnvironment conference

The conference “Towards e-Environment” was held at the Corinthia Prague Hotel, Kongresová 1, 140 69 Prague 4, in the Czech Republic. The conference organizer was GUARANT International spol. s r.o. Opletalova 22, 11000 Praha 1. The scientific organizer was Prof. Dr. Jiří Hřebíček, from Masaryk University, Kamenice 126/3, 625 00 Brno (http://www.iba.muni.cz).

The ICT-ENSURE workshop provided an opportunity to include contributions for further discussion in the EnvirolInfo Berlin conference in September 2009 and gave recommendations for a “Single Information Space in Europe for the Environment” (SISE). The workshop was supported within the FP7 Programme by DG INFSO & Media unit 4 “ ICT for Sustainable Growth” of the European Commission.

“Towards eEnvironment” was an event planned and organised by Masaryk University Brno in close cooperation with the European Commission, the European Environment Agency, the Ministry of Environment of the Czech Republic, the Czech Environmental Information Agency and the Czech Space Office. The main idea of the conference was of course ‘Integrating Environmental Knowledge in Europe’. One of the main topics was ICT research towards a Single Information Space in Europe for
the Environment. Another main topic of the conference was The Global Monitoring for Environment and Security (GMES) and its European dimension. At total of 97 paper contributions and presentations were given on thematic issues like ICT for monitoring and control of energy efficiency and security, modelling of air pollution, climate change, decision making support for policy makers and SEIS as a backbone for eGovernment environmental services.

2.3 Workshop participants and integration of young researchers

In the workshop preparation the organisers were able to attract persons from research institutes, universities, from administration, environmental agencies, NGO’s, SME’s, and participants in FP7 programs.

All “Towards e-Environment” conference participants were very welcome to participate in the workshop and in fact the interest was considerable. In cooperation with the “Towards eEnvironment” conference organizer Prof. Jiří Hřebíček had the idea to involve young scientists in the workshop. In three presentations research results coming from Masaryk University (Brno) were offered by Jaroslav Urbanek, Jaroslav Ráček, and Jan Pavlovic which enlarged the group of presenters to young and ambitious scientists, collecting experience in presenting to an expert audience. Moreover, two more young scientists coming from the Czech Academy of Science were invited by the ICT ENSURE project to join the conference and attend the workshop.

In addition, five members of the Technical Committee “Environmental Informatics” of the German Informatics Society were present in Prague.

Due to the great number of persons coming from the “Towards eEnvironment” conference to attend the workshop finally a representative group of about 58 environmental scientists could be attracted.

After the event, the contacts collected provided an opportunity to invite participants to attend the annual EnvirolInfo conferences and integrate new members in the already established community of ‘environmental informatics researchers’ for continuous information exchange.
3 Workshop Report

Rapporteur: Elisabeth Mrakotsky
(Workshop Agenda p. 18-19)

3.1 Morning presentations and discussions

After a short informal networking, Werner Pillmann (Chairman of the International Society for Environmental Protection) welcomes the workshop participants, presents the agenda, gives an introductory overview of the workshop topics and highlights some key points of discussion. He explains that ICT-ENSURE is a support action to the European Commission with regard to ICT research for ensuring environmental sustainability.

Jiri Hrebicek clarifies the concepts Single Information Space in Europe for the Environment (SISE), as well as the Shared Environmental Information System (SEIS), and describes their historical development. He goes further into detail, informing about the scope and principles of SEIS and SISE, including their role to link distributed information and to bring innovation to eReporting. He quotes the EU Directive by saying “Information is currency of democracy” and highlights the Aarhus Convention as a legal basis for eEnvironment. The conference “Towards eEnvironment” was organised to put particular emphasis on incorporating related fields such as eGovernment and eParticipation.
Finally, he stresses that “SEIS needs additional legislation to go forward”. The i2010 initiative shall contribute to modernise the legal provisions. At this level, the European Environment Agency (EEA) is encouraged to play a crucial role. In their paper “SEIS and SISE: Antipodes or Associates?” the authors J. Hrebícek and W. Pillmann appeal to join forces, and encourage institutions such as DG Environment, EEA, Eurostat or JRC to contribute together to the Single European Information Space.

Prof. Hrebícek introduces the “Memorandum of the Czech Presidency on SEIS” open for discussion of the conference audience and invites all participants to actively contribute to improve this memorandum by giving feedback.

As the first speaker following the introduction, Thomas Pick from the Ministry for Environment and Climate Protection of Lower Saxony, Germany talks about “Access to Environmental Information in a Shared Environmental Information System - Survey on the Implementation of Directive 2003/4/EC”. First, he points out that Environmental Information (EI) is an essential element of democracy. If it is provided on a timely and innovative basis it can raise awareness, increase transparency, and enable much more public participation in decision making processes. And finally, EI is a keystone in the policy making process.

However, it turns out that 42% of European citizens feel poorly informed about environmental issues and would like policy makers to improve environmental legislation (Source: Eurobarometer 2008). Thom Pick shortly sketches SEIS and SISE principles and dimensions and shows a slide on the development of environmental directives since 1992 (Rio Declaration).

Then he goes into detail on the survey performed under the ICT-Ensure - WP 7.1.: ‘Survey of the state of implementation of the Environmental Information Directive in the member states’; its focus is put on “Public Access to Environmental Information”, not on INSPIRE. The study is performed by internet studies of national websites and by Member State Report Cards. At the time of the presentation, there are some preliminary results based on responses coming from 9 MS so far. During the survey, a database on Ministries of Environment including the relevant contact-addresses is created as well as a record on EID relevant legislation in the MS since legislation information systems are not common. Mr. Pick stresses that the distribution of information is made mainly through web-sites (mostly bilingual), and that there are only two countries using special tools for implementation of 2003/4/EC (Germany: Portal U; Bulgaria: Environmental Data Catalogue). There are many tools for thematic problems presented on domain specific portals, often connected to GIS. The final results of the survey will be presented in the EnviroInfo conference Berlin 2009 and reported on the website of the ICT ENSURE project.

The next speaker is Vladimir Benko from the Slovak Environment Agency (Slovenská agentúra životného prostredia, SAZP) giving a “Review of Slovak ICT Research Activities on SISE and SEIS” being the National Focal Point of the EEA in the Slovak Republic. He reflects that the informatisation of public administration in the Slovakia is co-ordinated by the Ministry of Finance mainly with the objective to fulfil their reporting obligations, whereas research activities are co-ordinated by the Ministry of Education. This endeavor is undertaken together with partners from university, the Academy of Sciences and NGOs. Mr. Benko qualifies the lack of smooth processes and of readiness to collaborate and share information as main challenges in his country. The budget share reserved for science and technology is, compared to other European countries, very low. The research plan (2007-2015) foresees to establish Centres of
Excellence and to improve infrastructure of universities. The future plans include the creation of an “Enviroportal” including models, simulation and scenarios with user-friendly access. Finally, Mr. Benko indicates several useful links to Slovak websites, but he informs that most of them are in Slovak language only.

In this context, he specifically mentions the Environmental Signal Series of the European Environmental Agency (EEA). In the ensuing discussion, the lack of holistic approaches and the difficulty of introducing new indicators for political and other reasons are being noted. ‘Best’ in terms of environmental impact is not necessarily the optimum solution in terms of sustainability, if social, cultural and economic factors are not considered.

In his talk about “ICPDR Information Systems”, Alexander Hőbart from the Secretariat of the International Commission for the Protection of the Danube River (ICPDR) (http://www.icpdr.org) states that the Danube River Basin englobes 19 countries, 81 Mio. inhabitants and that it covers a surface of 9% of Europe. After the signature of the Danube River Protection Convention in 1994 the ICPDR was created to become a platform for coordinating the implementation of the EU Water Framework Directive in the Danube River Basin. In 2009 an ambitious River Basin Management Plan, including Programmes of Measures has been started which includes inter alia the identification and mapping of protected areas as well as monitoring networks and results and specific environmental objectives and exemptions. A list of competent authorities and contact points to obtain background information is also available.

The ICPDR structure includes delegations of contracting parties, like the River Basin Management Expert Group, the Pressures and Measures Group, the Monitoring and Assessment Group and the Flood Protection Group, the Information Management and GIS Expert Group, the Public Participation Group, etc.

ICPDR Information Systems include Public Websites (ICPDR, Danube Day, Danube Box, Joint Danube Survey), databases (Water Quality Monitoring with datasets recorded since 1996, Emission Inventories, Investment Projects) as well as Geographical Information Systems (Danube GIS as an Expert WebGIS) and Internal Information Systems (Danubis: expert working areas for documents, etc.; AEWS: Danube Accident Emergency Warning System). Most of the information is available in English and in national languages, the language versions are subject to extention.

ICPDR Trans National Monitoring Network (TNMN) with a multitude of measurement stations.

The Danube GIS (www.danubegis.org) is a harmonised, multi-thematic, web-based geographic information system (GIS) covering the Danube River Basin. It serves as a data collection tool for DRB Management Plan, supports map making and prepares maps for Public WebGIS. Moreover, it has a query and analysis
functionality for experts.

Moreover, the ICPDR is organising many events to inform citizens about the Danube and increase awareness of the population for environmental issues, like the “Danube Day” organised on June 29, or the Danube Box, an information box for teachers to educate children aged 10-12 years about the importance of the river for people and wildlife.

In the ensuing discussion, it is highlighted that the ICPDR is one of the first initiatives in Europe to bring together several countries in order to take joint action in water protection.

In the last presentation before the morning break Mikko Hynninen from the Finnish Environment Institute (Division of Geoinformatics and Land Use) gives an impressive overview of the very sophisticated Finnish Environmental Portal comprising three Information Systems which are interlinked and already in place (www.environment.fi):

- Environmental Information System (Hertta, in situ)
- Environmental GIS (spatial data, OIVA portal, with > 600 ArcGIS users connected)
- Earth Observation (EO products, www.environment.fi/syke/remotesensing)

The Finnish Environment Institute (SYKE) is integrating expertise from a wide range of disciplines producing information and solutions promoting ecologically sustainable development. Data collection has started in the early 1970ies, including nation-wide datasets going even back to the 1850ies, data is collected, stored and maintained by one entity. All of the about 2200 employees in environmental administration are able to view and use spatial data via Web Map Service built in-house.

Earth Observation data offer time series for calibration/validation with in-situ data, e.g. for sea surface temperatures or snow coverage.

Environmental information and spatial data service (OIVA portal, www.ymparisto.fi/oiva), which is mostly for professionals and in Finnish language, contains most of the data and information systems of SYKE:

- The Environmental Information System (Hertta)
- Spatial data download service
- Web map application
- The Compliance Monitoring Data System (VAHTI)

Spatial datasets are updated regularly (four times/year), Data content of information systems is updated automatically daily from production databases, and new themes can be added if requested. Data access is free with the only restriction of non commercial use. OIVA has more than 1000 registered users, since 2007 the retrieval of datasets is subject to payment. Mikko Hynninen sees the future challenges for the existing systems in the adaptation to new standards and in interface development to connect to other national systems.

After the morning break Rob Peters from University of Amsterdam expresses his opinion by saying “Maps are better than words when it comes to eParticipation and visualising issues of environmental legislation”. He reports about the “Flevoland Case of Legal Mapping”. Flevoland is a Dutch Natura 2000 bird migration area for which a historical map for land use planning was
elaborated in three languages as an eParticipation decision support tool (http://feed-dev.public-i.tv/).
The Flevoland platform allows users to choose a theme of interest or click on a region of interest on a map. This platform supports citizen’s influence on their surroundings, but also professionals or government officials.

Rob Peters wins the 2nd prize in the ‘best paper award’ of the conference.

**Mike Brown** from the PEER – Partnership for European Environmental Research (http://peer-initiative.org/html/) consisting of 7 large European research centres (ALTERRA, CEH, CEMREF, JRC-IES, NERI, SYKE, UFZ) with the aim of a joint strategy, to build capacities and avoid duplicity informs about their latest activities. In the framework of a workshop organised in January 2009 in Wallingford on the issue “Towards Shared Environmental Information in Europe: Opportunities and Challenges for Integrated Research” a number of R&D priorities are formulated. The main conclusions of the workshop were the following:

- We need clearly defined drivers (e.g. political, scientific) to share information and develop information management infrastructures
- A major cultural change is needed to actively manage, maintain and promote data curation
- Platforms like PEER can substantially contribute to this change process with their experience in managing multidisciplinary collaborative research across borders
- Quality of information in SEIS can be improved by addressing standards and data collection practices.

The presentations from the Wallingford workshop sessions are available at http://www.ceh.ac.uk/SEIS/PEER-EEA-AGILEworkshop.html. In the following discussion, a key sentence of the workshop is reformulated by Mike Brown “Technical issues are solvable, but cultural issues – e.g. to give away data – are crucial”. A closer co-operation between the PEER group and the ICT ENSURE consortium is envisaged.

**Åke Sivertun** of the Swedish National Defence College reports about Information Science and Environmental Information Systems in Sweden. Due to a strong military background the spatial data infrastructure in Sweden is very advanced with a focus on environment and crisis management. Due to a strong historical development, GIS are widely implemented as methods and tools to integrate, analyze and model information about complex phenomena like environment, sustainable development, and environment and health.

Mr. Sivertun references the use of remote sensing, GIS and UAVs in local and regional emergency management as a core information system. Data sources from many diverse sources have been combined, including e.g. also health registers. Risk management, e.g. in the area of flood protection and prognosis, in the area of contaminated land, polluted areas, and noise exposure is quite sophisticated and equipped with rich mapping and data sources. The development of new analytical approaches like the analysis of cascade and domino effects as well as the identification of facilities at risk in case of flooding has been fostered. The so-called Top Eye MK II LiDAR Technology is used for environmental inventories and forestry. In the area of earthquake monitoring, the Defence Meteorological Satellite
Program (DMSP) allows e.g. to identify population in isolated areas or population cut off by damaged infrastructure (roads, bridges, etc.) to be aided by aerial rescue operations. In the area of environment and health reliable mortality and cancer registers together with population registers on individuals in the Nordic countries allow studies on health related to space and time. In the ensuing discussion, Mr. Sivertun admits that an abundance of available data series of individual data is not accessible due to privacy issues. With this data large-scale studies on health-related risks could be performed (e.g. relation between childhood leukemia and radon in soil). However, the Swedish approach to privacy issues can be considered much more liberal compared to other European countries. Another opportunity for improvement is the inconsistency of data sets in mapping (road maps with interrupted tracks, etc.). Mr. Sivertun also references the importance of the eSDI-Net project, a thematic network of the European GI community with the aim of making geographical information available on a European scale.

Ivica Ruzic from Rudjer Boskovic Institute, Division for Marine and Environmental Research in Zagreb, gives a “Review of Croatian ICT Research Activities on Sharing Environmental Information”. He reports on the field of investigations spanning from the Adriatic Sea to the Danube river basin, participating in the ICPDR since 1998, but with activities starting already back in 1991. A focal point in this context is the introduction of a 'River Information System' with the national river information services CRORIS and HURIS. Temporal and spatial presentation of the Danube waterway was implemented in a web application, e.g. for river navigation surveillance.

In 2002 the Croatian Environmental Agency (CEA) was founded as an independent public institution with the aim of building up a national environmental information system as an open platform for interconnection with other European information systems (http://www.azo.hr/Default.aspx?sec=275). Important projects of CEA include establishing National Reference Centres (NRCs), setting up the national Environmental Information System, the preparation of the State of the Environment Report, the creation of a Croatian environmental projects database, of a risk installations database and of a waste management system.

Dimitrios Bilouris from the consultancy company SADL/Geosolutions reports on the “WISE – Water Information System for Europe” (http://www.wise-rtd.info/wpis/wise.html), a GIS based system for visualisation of water information from all over Europe. The main target of WISE is to provide background information on EU legislation, on water pollution and on the status and monitoring of water resources. The European Commission requires this information mainly to check compliance with the requirements of specific articles of the Water Framework Directive (WFD; http://ec.europa.eu/environment/water/water-framework/_index_en.html), to assess the water situation in the MS, to compile statistics and to inform the public. During the submission of data to WISE a number of practical obstacles were encountered such as

Incomplete or not submitted data, variable format of the provided datasets and often the data did not comply with the GIS guidance.
The quality of the information submitted by Member States is very diverse and often difficult to read, validate and process. This might be due to the fact that there are often differences between Member States in the interpretation of the GIS guidance as well as the resources they provide for the assimilation of this information.

Kristina Voigt from Helmholtz Zentrum München, Institute for Biomathematics and Biometrics, talks about “Networking Environmental Informatics in Europe with Respect to Sustainability”. First, she gives several definitions of sustainability in environmental informatics, like e.g. in the ecological context the ability of an ecosystem to maintain ecological processes, functions, biodiversity and productivity into the future. Or, on a broader scale, the Brundtland Commission’s definition "[to meet] the needs of the present without compromising the ability of future generations to meet their own needs" (1989). Then she addresses the Ecological Footprint (Mathias Wackernagel): The land area that would be required to provide the resources (grain, feed, wood, fish, and urban land) and absorb emissions (CO₂) of the global society. This capacity was in 2004 already 20% above the global carrying capacity. Humanity was last at sustainable levels in the 1980ies, therefore it must substantially reduce its ecological footprint.

Kristina Voigt quotes the examples of Green IT (study and practice of using computing resources efficiently) and Green Chemistry (reduce the use of hazardous materials, maximize energy efficiency during product lifetimes, and promote recyclability and biodegradability of defunct products and factory waste) as perfect opportunities to reduce the ecological footprint. Some of their principles may be directly deferred to Environmental Informatics. Then Mrs. Voigt enumerates several existing societies and groups in the area of environmental informatics and chemistry like e.g. the group Environmental Informatics: Informatics for Environmental Protection, Sustainability and Risk Management founded in Germany in 1986 (http://www.iai.fzk.de/Fachgruppe/GI/welcome.eng.html), with more than 22 annual conferences and more than 3,000 publications up today. Another is the International Environmetrics Society (TIES, http://www.environmetrics.org/ ) funded in Cairo in 1989 with 20 conferences worldwide which fosters the development and use of statistical and other quantitative methods in the environmental sciences and is also a member of ISI, the International Statistical Society. The next organisation quoted by Mrs. Voigt is the “Partial Order in Environmental Science and Chemistry”. Partial order is a discipline of discrete mathematics, the society goes back to 1998 in Berlin. Another group is the “Chemoinformatics” group (http://www.gdch.de/strukturen/fg/cic.htm) also called CIC, Chemistry-Information-Computer - A division of the German Chemical Society with early developments back in the 1960ies which is studying the application of informatics methods to solve chemical problems. “Chemometrics” is a foundation of the International Chemometrics Society in 1986. Chemometrics is the chemical discipline that uses mathematics, statistics, and formal logic to obtain knowledge about chemical systems.

All these single societies and interest groups are aiming at more sustainability, and all of them are engaged in the area of chemical sciences.

The American Chemical Society Green Chemistry Institute defines “GREEN CHEMISTRY” as “the design, development, and implementation of chemical products and processes to reduce or eliminate the use and generation of substances hazardous to human health and the environment. It is an innovative, non-regulatory, economically-driven approach towards sustainability.”

Therefore, Kristina Voigt definitely and clearly claims for an intensified networking of environmental Informatics disciplines in Europe with respect to sustainability, englobing all areas of research men-
tioned above. She closes with a quote of Berthold Brecht who says “It is not the aim of science to open a door to indefinite wisdom, but to put a barrier to the indefinite error”.

3.2 Afternoon presentations and discussions

Werner Geiger from Forschungszentrum Karlsruhe, Institute of Applied Informatics, reports about activities in two specific areas of the ICT ENSURE project (May 2008 – April 2010) dedicated to the provision of information on national research programmes and on a literature information system. The key objectives of the ERA support activity ICT ENSURE are the following:

- Establishment of European expert network in the field of ICT for environmental sustainability
- Support of creation of a single information space in Europe for the environment (SISE)
- Provision of information on national research activities in Europe in the field.

The web-based information system on national research programmes will be compiled and maintained by national experts. A data model characterising the research area is already developed, system architecture and software was selected, a first user interface and navigation prototype is already available. The completed information system with all data sets will be available in April 2010.

The literature information system will comprise papers since 1993 from the international conferences of the Expert group “Environmental Informatics” of the German Society of Informatics. They will be integrated in a meta-information system in pdf format and will offer a search and navigation functionality. The literature information system will be available by September 2009.

Next speaker is Andrée Keitel from the Agency for Environment, Measurement and Nature Protection who reports about the “Framework Conception for the Environmental Information System of Baden-Württemberg (Germany)”. The area of Baden-Württemberg, one of the 16 states of Germany with about 36,000 km² and about 10,7 Mio. inhabitants is to a certain extent comparable to the parameters of the Czech Republic. The government with high environmental responsibility elaborated in 2006 a Framework Conception for Environmental Information directed by the Ministry of Environment which became obligatory for the whole state administration. An inventory of 75 special applications and 18 services was created, including technical design, data administration, issues of privacy and economy, and recommendations for implementation were given. The areas of water, air pollution control, soil, waste and occupational safety and health (WIBAS) and nature conservation (NAIS) are covered. The directives for data storage and interchange are described in detail in a Data Catalogue (WIBAS-OK). In addition, RIPS is an important element of the spatial data infrastructure of Baden-Württemberg (GDI-BW) according to the INSPIRE Directive. Moreover, a public Environmental Portal Baden-Württemberg is available Common englobing all public institutions in BW, which are obliged to offer environmental information, according to the EU Environmental Information Directive. It is tightly coupled with the German Environmental Portal (PortalU). Furthermore, web mapping services are offered,
according to OGC standard (WMS) ([http://www.uis.baden-wuerttemberg.de/servlet/is/32291/](http://www.uis.baden-wuerttemberg.de/servlet/is/32291/)), which are presentable also with Google Maps and Google Earth (e.g. protected water catchment areas, etc.). So, all requirements of the Framework Conception will be implemented step by step.

Vlad Coroama and Lorenz Hilty of the EMPA St. Gallen (Technology and Society Department) give an overview of a study prepared under the ICT ENSURE project on the issue of "ICT in Energy Consumption and Efficiency", considering the whole life-cycle starting with production, over the lifetime until the time of recycling. The study will provide information on ICT energy consumption (Moore’s law on history of computing software) but as well on ICT potential for energy efficiency, reflecting the current situation but also looking out to future developments (mostly to be collected in expert interviews). As an add-on the study will report on existing research projects on ICT and energy efficiency. Generally, optimisation potentials in energy efficiency are mostly expected in the areas of manufacturing, transport and buildings. But there is also energy saving potential (by 2020) in the specific areas of smart electricity grids (smart metering, intelligent networks), buildings and neighbourhoods (public lightning), logistics incl. supply-chain-management. Results of the study will be available at the ICT ENSURE website ([http://www.ict-ensure.eu/](http://www.ict-ensure.eu/)).

In her talk about “ICT for Health and Environment”, Charlotte Wirl from the Health Institute Austria sketches the Austrian Health Information System (ÖGIS, interface for free data: [http://regis.oebig.at](http://regis.oebig.at)) that integrates all available health-related data (mortality statistics, cancer registry, hospital admissions, traffic accidents, health interview records, etc.) into one system. Moreover, exposure data from air pollution, water pollution, radon exposure risk, and radioactivity is available. In case of person-related data the data sets have been anonymised with a personal identification number. There is a high spatial resolution for all data sets, periodical updates are performed and the linkage between environment and health data is implemented. The developed tool is easy to use, stable and highly used by professionals, data linkage allows identifying ‘hot spots’ and ‘health priority regions’. It allows a so-called “Public Health action cycle” suggesting policy decisions and offers at the same time the opportunity to evaluate policy measures. The main fields of application of ÖGIS are health reporting, monitoring, health care planning, benchmarking and data analysis on demand. At best, this kind of reporting could lead to a European-wide “Public Health action cycle” based on tools of ICT for Environment and Health. In her concluding remarks, Charlotte Wirl voices the need for linkage of health and environment since there is a high potential of implementing ICT driven systems. For this aim we need a network of leading experts in the field of Environment and Health.

Eduardo Veas from Technical University of Graz talks on “HYDROSYS”, an on-site monitoring and spatial analysis system offering a variety of applications, like with landslides, debris flows, wet snow avalanches or permafrost degradation. In his application-related presentation he shows that new
methods including overlay functionalities could substantially improve conventional on-site monitoring. HYDROSYS provides a better view of the global situation before, during and after an event with the image transmission and "overlay" functionalities. Moreover, it brings a saving in time and expenses doing on-site online analysis. It allows managing environmental processes by sharing information mounted to the system with other participants. Mr. Veas demonstrates three specific cases in Switzerland where HYDROSYS was deployed another Nordic scenario could be in the area of land-use and site-construction as well as in promoting water environment sensitive urban development. Finally, he informs about the system specifications, including more than 25 multi-variate sensors, a shared information system, simulation support, a 3D interactive graphics platform, on-site monitoring interfaces and a communication and co-operation system. An augmented reality view enhances real world video with digital information. Data is laid over the environment like a “digital tapestry”, e.g. in the form of a geo-referenced temperature map laid over a mountain. Users were brought into the design process. The advantages are clear: The system enables accurate and near real time updated environmental data simultaneously to office and field and mobile computing in non-structured environments.

HYDROSYS is an EC funded Seventh Framework programme STREP project (grant 224416, DG INFSO) on spatial analysis tools for on-site environmental monitoring and management. (http://www.hydrosysonline.eu/).

Jaroslav Urbánek from Masaryk University Brno (Department of Environmental Chemistry) presents a “Sensitivity and Data Uncertainty Analysis of an Environmental Distribution Model”. An environmental distribution model for persistent organic pollutants (POPs) is described. The model consists of the three compartments air, vegetation, soil. The soil phase is divided into 7 layers. Transport processes (diffusion, degradation, deposition, advection etc.) are occurring among the parts of the model. The analysis uses Maple computation. Mr. Urbánek gives a mathematical description of the model and describes the sensitivity analysis and the main parameters of the model. Finally, he presents the sensitivity analysis results for the three compartments and reports on data uncertainty and output variances.

Tomáš Ludík from Masaryk University Brno (Department of Environmental Chemistry) presents “Environmental Geoinformatics for Emergency Management” (http://geokrima.geogr.muni.cz/) reporting on a scenario of an accident of a vehicle transporting dangerous substances. The project "Dynamic geovisualization in emergency management" is financed by the Czech Ministry of Education, Youth and Sports (2005 – 2011). The Multidisciplinary approach includes the areas of cartography, informatics, and emergency management. A use case diagram and a process map help to ‘organise the intervention’ in case of the presumed accident scenario. Users are mainly fire brigade rescue units. In conclusion Mr. Ludík stresses that geographic visualization can significantly support decision making on all levels of emergency system management. The complex, interdisciplinary approach of this project allows users
to obtain the right information at the right time. The process map determines which task needs support of spatial information and which operations are allowed on it.

Jan Pavlovič from Masaryk University Brno (Department of Environmental Chemistry) presents a ‘Process-Oriented Modelling and Infrastructure for Remedial Decision Support System’, a joint project of the U.S. Environmental Protection Agency (EPA) and Masaryk University. A user-friendly decision-making tool is to be conceived that fits into complex EPA processes. The project consists of three phases: firstly, a Design of Process-Oriented Infrastructure, secondly, the Design of a Business Process Management System, and finally the application as a decision support for decontamination strategy. As a case study, an energy calculator is presented.

Werner Pillmann from ISEP wraps up the workshop with a short presentation on “Structuring Sustainability Research – The Contribution of ICT-ENSURE” and makes a tour d’horizon of present and future application fields of environmental informatics, including especially the areas of energy efficiency and guiding and coordinating regional/local activities, but also the whole domain of health and environment. The ensuing discussion talks about how to improve coordination and standardization to enable and accelerate collaboration between organizations at European, national and local level, overcoming the fact that national models of co-operation are often diverging.

The discussion again focuses on health and environment. It becomes clear, that at a European level, we are far from reaching a linkage between health and environment data. Privacy issues but also the often mentioned lack of willingness to share data are a major obstacle to implement a European-wide “Public Health action cycle” as claimed by Charlotte Wirl in her presentation.

3.3 Final discussion and conclusion

In the concluding part, Elisabeth Mrakotsky as rapporteur shortly summarizes the single workshop presentations and outlines some major points to be considered when implementing the SEIS in Europe:

First, she refers to the recently published results of a public on-line consultation of the European Commission on the ICT research and innovation agenda of the next decade, finished in November 2008 (http://ec.europa.eu/information_society/tl/activities/consultations/index_en.htm). One question of this consultation was for the most important challenges of Society. Respondents qualified energy efficiency, environmental sustainability, health and social care systems as being the future key factors. So, it becomes clear that ICT will also take a lead role in sustainability and in the
greening of the economy.

Moreover, innovation, e.g. in the areas of energy efficiency, renewable energy or sustainable buildings technologies can only be pushed by informed customers and consumers, by educated citizens who have all relevant information on the state of the environment, on their personal risk, and health situation, at their disposal. So, if we succeed in creating this common information base, the informed citizen can become the main driver of innovation. Thus, demand-side factors and societal challenges will push ICT innovation and there is a realistic chance that the present economic crisis forces industry and commerce to rethink their strategies and will lead to a greening of activities and an accelerated shifting towards more sustainability.

Several European initiatives, like e.g. the PEER group, are working in the field of avoidance of duplicity and of standardisation. At this level, efforts have to be improved.

Another important factor for awareness building, especially with young citizens who will be also the European citizens of tomorrow, is education.

At present, there is another major hindrance to the implementation of SEIS. During the workshop it was expressed by many speakers of the workshop and is perfectly known by all scientists and administrators dealing with environmental information: the issue of privacy and restricted access to data. In fact, data protection and the lacking willingness to share information are currently the most difficult problems to be overcome. At the same time, the language barrier is still an issue. Although a lot of information exists on national level, it is often only available in the language of this country which is an obstacle to sharing information on a European level.

In conclusion, our efforts must lead to a common standardised architecture and format of environmental information. This can help to push innovation and new ICT technologies for more sustainability. On the other hand, we must keep in mind that we have to put the citizen’s interest in the centre of our activities. Starting from the existing available information we must form one intellectual picture. This can bring us forward on the way to building the SEIS.
# 4 Speakers/ Participants List

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### 5 Workshop Agenda

Next two pages
# Workshop Programme

**Chair:** W. Pillmann  
**Chair:** Jiří Hřebíček

## Thursday, March 26th

### Workshop Overview
- **9:00** | Workshop Overview  
  Jiří Hřebíček, WernerPillmann

### Access to Environmental Information in a Shared Environmental Information System
- **9:25** | Access to Environmental Information in a Shared Environmental Information System  
  Thomas Pick

### Review of Slovak ICT Research Activities on SISE and SEIS
- **9:40** | Review of Slovak ICT Research Activities on SISE and SEIS  
  Vladimir Benko

### Information Systems in the International Commission for the Protection of the Danube River (ICPDR)
- **9:55** | Information Systems in the International Commission for the Protection of the Danube River (ICPDR)  
  Alex Höbart

### The Finnish Environmental Information Portal
- **10:10** | The Finnish Environmental Information Portal  
  Mikko Hyninnen

### National SEIS Developments and Networks
- **11:00** | National SEIS Developments and Networks  
  Jiří Hřebíček

### SISE impact research in The Netherlands, the Flevoland case of Legal mapping
- **11:00** | SISE impact research in The Netherlands, the Flevoland case of Legal mapping  
  Rob Peters, Barry Woudenberg

### Opportunities and Challenges for Shared Environmental Information in Europe - a PEER perspective
- **11:20** | Opportunities and Challenges for Shared Environmental Information in Europe - a PEER perspective  
  Mike Brown

### Information Science and Environmental Information Systems in Sweden
- **11:40** | Information Science and Environmental Information Systems in Sweden  
  Ake Silvertun

### Review of Croatian ICT Research Activities on Sharing of Environmental Information
- **12:00** | Review of Croatian ICT Research Activities on Sharing of Environmental Information  
  Ivica Ružičić

### Water Information System for Europe, Issues and challenges for Member states
- **12:20** | Water Information System for Europe, Issues and challenges for Member states  
  Dimitrios Bilouris

### Networking Environmental Informatics in Europe with Respect to Sustainability
- **12:40** | Networking Environmental Informatics in Europe with Respect to Sustainability  
  Kristina Voigt

### Coffee break
- **10:30 - 11:00**

### Lunch
- **12:00 - 14:00**

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**Chair:** Werner Geiger

### Scientists Contributions and Discussion
- **16:30** | Scientists Contributions and Discussion  
  Jaroslav Urbánek, Klára Kubošová, Jiří Komprda

### Sensitivity and Data Uncertainty Analysis of an Environmental Distribution Model
- **16:45** | Sensitivity and Data Uncertainty Analysis of an Environmental Distribution Model  
  Jaroslav Ráček, Tomáš Ludík, Petr Kubíček, Eva Mulišková, Gustav Šafr

### Environmental Geoinformatics for Emergency Management
- **17:00** | Environmental Geoinformatics for Emergency Management  
  Jan Pavlovic

### Process-Oriented Modelling and Infrastructure for Remedial Decision Support System
- **17:15** | Process-Oriented Modelling and Infrastructure for Remedial Decision Support System  
  Werner Pillmann, Elisabeth Mrakotsky

### A Model Framework for Environmental Sustainability Research: Discussion and Workshop Conclusions
- **17:45** | A Model Framework for Environmental Sustainability Research: Discussion and Workshop Conclusions  

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**Workshop ICT-ENSURE**

**Chair:** Thomas Pick

### Information Systems for Building an ERA in the Field of ICT for Environmental Sustainability
- **14:25** | Information Systems for Building an ERA in the Field of ICT for Environmental Sustainability  
  W. Geiger, R. Lutz, L. Maurer, W. Pillmann, Ch. Schmitt, M. Schreiber, K. Tochtermann

### Framework Conception for the Environmental Information System of Baden-Württemberg (Germany)
- **14:45** | Framework Conception for the Environmental Information System of Baden-Württemberg (Germany)  
  Andree Keitel, Roland Mayer-Föll, Albrecht Schultze

### The Role of ICT in Energy Consumption and Energy Efficiency
- **15:00** | The Role of ICT in Energy Consumption and Energy Efficiency  
  Vlad Coroama, Lorenz Hilfy

### ICT for Health and Environment European Research
- **15:15** | ICT for Health and Environment European Research  
  Charlotte Wirl, Johann Kerschebaum

### HYDROSYS - First Approaches Towards On-site Monitoring and Management with Handhelds
- **15:30** | HYDROSYS - First Approaches Towards On-site Monitoring and Management with Handhelds  
  Eduardo Vea, Ernst Krijff, Erick Mendez,
Information and Communication Technologies for Environmental Sustainability Research

3rd ICT - ENSURE Regional Workshop March 26, 2009

Workshop within the conference Towards eEnvironment
March 25-27, 2009
Corinthia Prague Hotel
References

(Access May 28, 2009)


Abbreviations

EI  Environmental Information
ERA  European Research Area
FP7  European 7th Research Framework Programme
ICT-ENSURE European ICT for Environmental Sustainability Research
ICPDR  International Commission for the Protection of the Danube River (ICPDR)
MS  EU Member States
PEER Partnership for European Environmental Research
SEIS Shared Environmental Information Space
SISE  Single Information Space in Europe for the Environment

Next page:
Impressions from the conference “Towards eEnvironment”