

Beta Prototype of MODELKEY Decision Support System now available

The MODELKEY Decision Support System (DSS) is an innovative software system that combines tools that will help you address major challenges in river basin assessment. Water body type-specific assessment of ecological and chemical status and the identification of relevant stressors are important features of the new software. The DSS is designed to prioritize hot-spots by integrating environmental and socio-economic information and supports the set up of additional monitoring activities. The DSS beta prototype is available for your evaluation now. Please take the opportunity to evaluate the system and provide us your specific wishes to help us to design the optimal tool for you.

The EU Water Framework Directive (WFD) sets strict objectives for the assessment and management of river basins: classification of chemical and ecological status, analysis of the economic usage of water resource, definition of a River Basin Management Plan, public and stakeholders participation, monitoring programs. The workload appears considerable and impressive, but within the MODELKEY project a new tool is being developed to support scientists and decision makers in all these difficult tasks: the MODELKEY Decision Support System (DSS).

This Newsletter focuses on the MODELKEY DSS whose beta prototype has been released now and uploaded into the end user intranet where it can be downloaded as a trial version working for 10 days for registered users (see „NEWS“ box at <http://www.modelkey.org/>). Here, you can read about its main characteristics in terms of functionality and structure. You can also read about how end users requirements and recommendations have been and will be taken into account for the design and the development of the DSS final prototype.

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The risk-based MODELKEY DSS: a novel tool to assess and manage river basins

The MODELKEY DSS is an innovative software system that combines several risk-based assessment tools addressing all major aspects of river basin management. The MODELKEY DSS allows to classify the ecological and chemical status for individual waterbodies or (monitoring) locations. It prioritizes hot spot locations by integrating environmental and socio-economic information. By identifying relevant causes of impairment (key stressors and key toxicants) and the most impaired biological communities (key ecological endpoints) the DSS supports the set up of additional (investigative)

monitoring and consecutive measures. All these features are available in a simple-to-use, geographically resolved, web-based software system and graphical user interface, where:

- the river basin is in the focus of a comprehensive analysis,
- data and information produced by surveillance, operational and investigative monitoring are uploaded and processed at different scales of detail (river basin or hot spot),
- resulting maps and figures are pre-formatted for reporting,

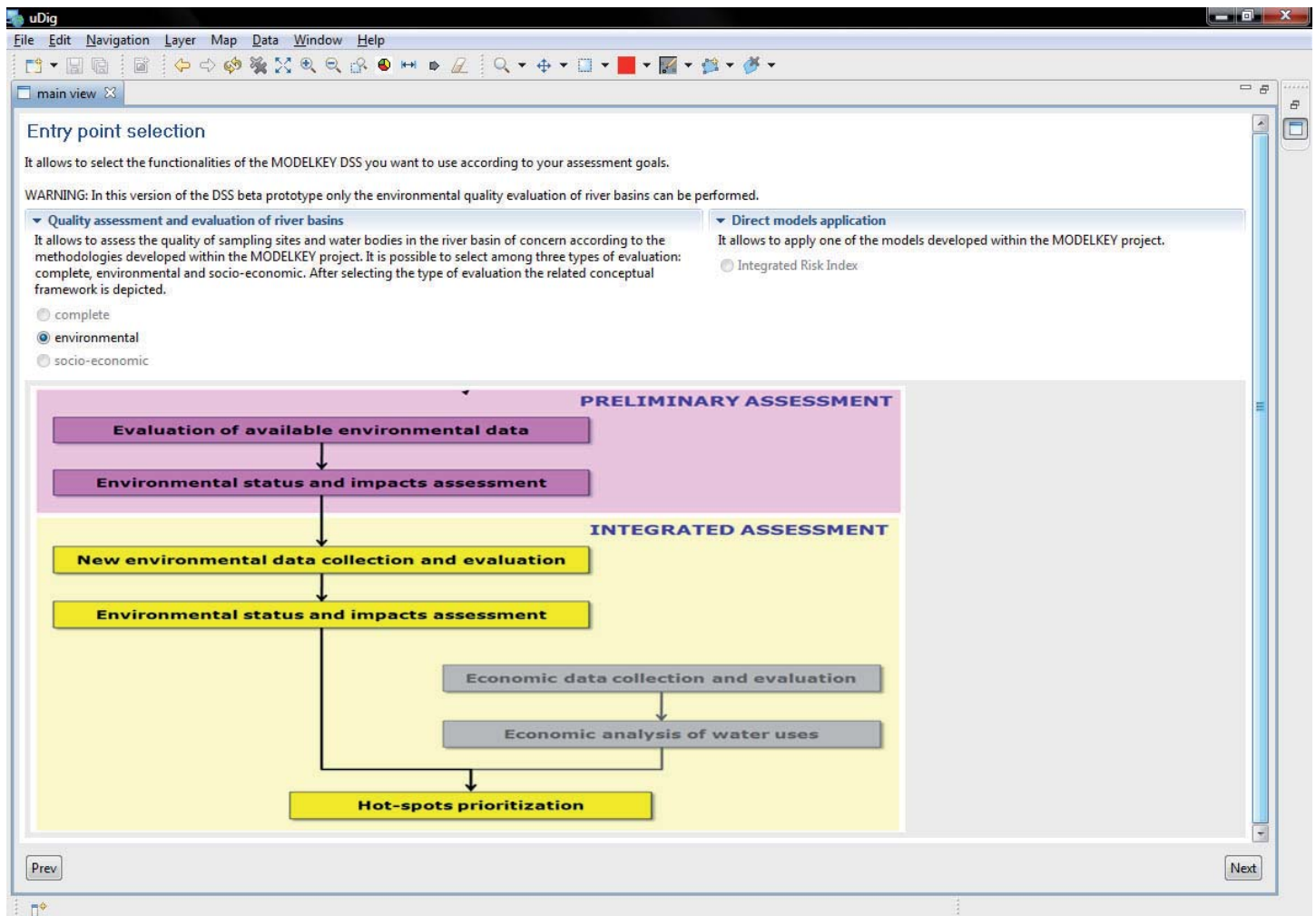
- the user is informed on details and probability level of the risk assessment of individual quality elements,
- the user is supported in spatially visualising and evaluating results.

In addition, the DSS provides best practices and links to other relevant sources of information. A strong feature of the DSS is its “open configuration”, enabling integration of external assessment tools (i.e. indicators, models and databases).

The software system is developed on the User-friendly Desktop Internet GIS (uDig) platform, an open source desktop GIS development platform and also a working open source desktop GIS appli-

cation. It is free of charge, user friendly and offers multilanguage facilities, thus allowing the translation of the DSS interfaces into Member States national languages.

The MODELKEY DSS is a novel tool that is easy to understand and to apply: It offers adaptability to various river and local conditions, perfect coherence with the language and the reporting requirements of the WFD, technical simplicity and preferential flexibility, transparency and traceability of results, enhanced by a strong graphical interface visualization. Thus, the MODELKEY DSS is the new tool to make the river basin assessment process more manageable and efficient.



Main interface of the MODELKEY DSS. The user can select the functionalities to perform according to his assessment goals. In the figure, the “Environmental evaluation entry point” is selected.

The core of the MODELKEY DSS: the Integrated Risk Indices module

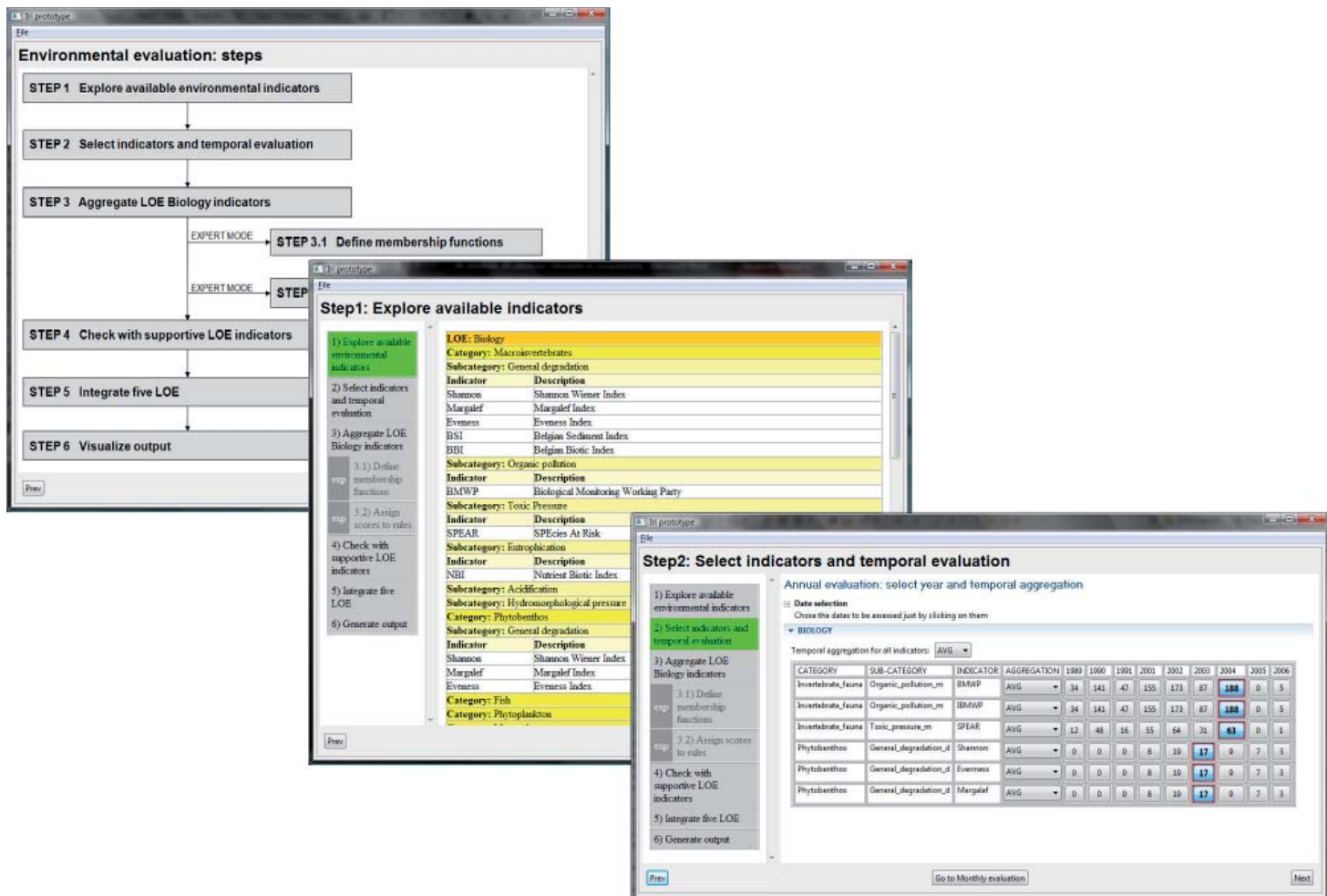
The core of the MODELKEY DSS software system is represented by the Integrated Risk Index module developed within MODELKEY. It implements a risk assessment methodology for calculating Integrated Risk Indices at site-specific and water body scale and a procedure for prioritization of hot spots.

Integrated Risk Index calculation. The overall risk assessment procedure is based on the Weight Of Evidence approach and applies a dedicated Fuzzy Inference System including Multi Criteria Decision Analysis methods. Specifically, a set of environmental indicators belonging to five

Lines of Evidence (i.e. biology, chemistry, ecotoxicology, physico-chemistry and hydromorphology) are considered and aggregated in order to evaluate the ecological and chemical status of single sampling sites and water bodies as well as to identify key stressors and key ecological endpoints. The final output is expressed as probability distribution on the five WFD ecological quality classes (i.e. high, good, moderate, poor, bad).

Hot spot prioritization. The hot spots prioritization procedure is aimed to support water managers in targeting their economic efforts to those sites

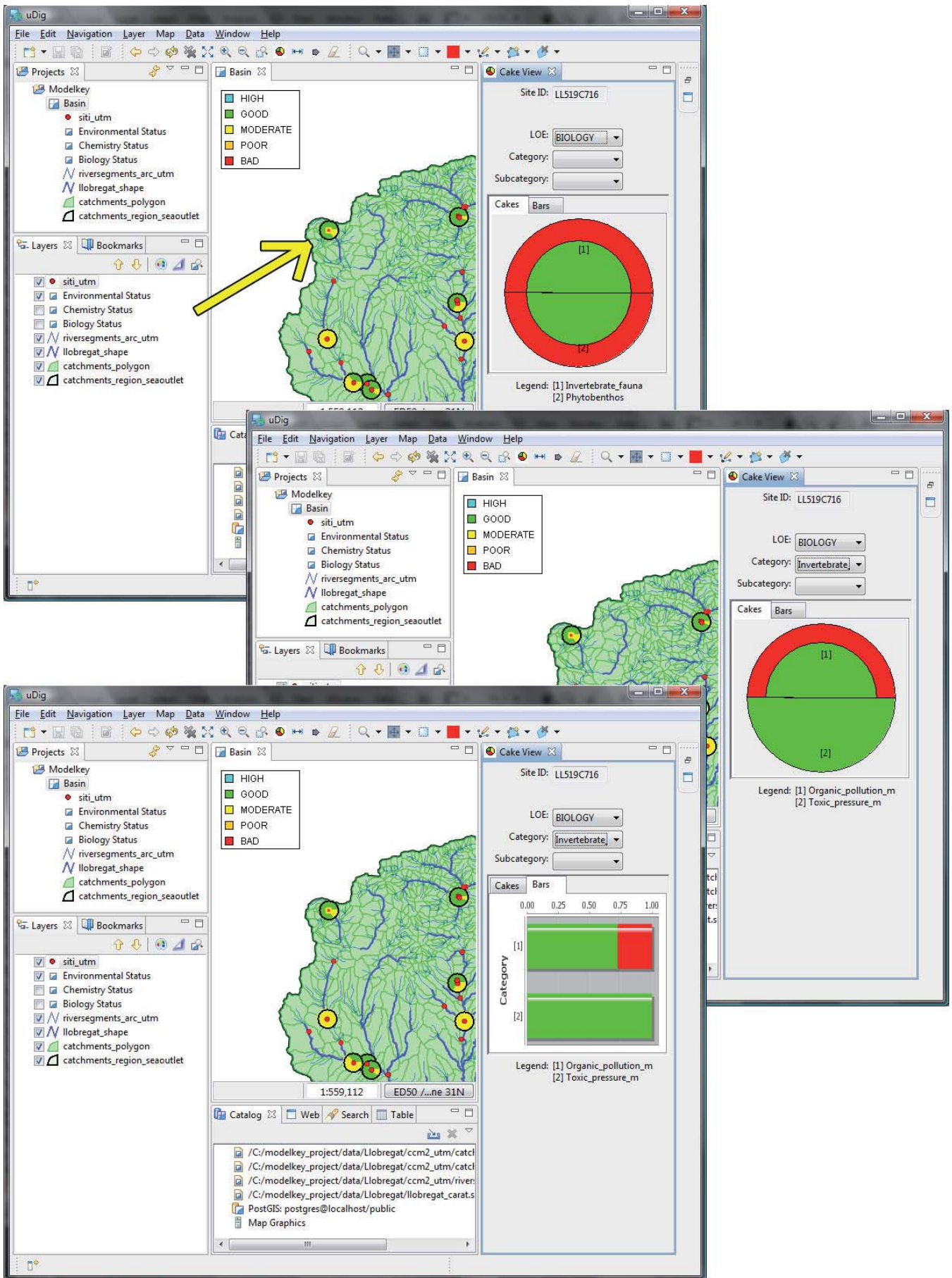
along river basins that strongly need management interventions. To this end it takes into account both environmental (i.e. risk assessment) and socio-economic (e.g. water uses valuation) perspectives. Specifically, a set of socio-economic indices distributed across different economic agents (i.e. consumers and firms) and water uses (i.e. agricultural, industrial, energy production, fish-farming, residential and recreational) are proposed and calculated. By integrating socio-economic and environmental information, sampling sites as well as water bodies are ranked and hot spots are visualized and selected by means of GIS tools.



Input interfaces of the MODELKEY DSS for the "Environmental evaluation entry point: in the first one the six required steps are listed; in the second one the user can explore available environmental indicators for each Line of Evidence; in the third on the user selects a specific year/month/day to investigate and he chooses the appropriate aggregation method for each indicator.

The Integrated Risk Index module is intended to be a generic model, characterized by an "open configuration" allowing the user to apply any type of available indicators. Moreover, the models and tools developed and available in the project are placed within the MODELKEY DSS according to their relationship to the Integrated Risk Index module: some of them support the calculation of

Integrated Risk Index by providing specific indicators or data (e.g. Diagnostic Effect Model), others support the interpretation of Integrated Risk Index results by providing more details (e.g. Predictive Effect Model), and the remaining are not related to Integrated Risk Index but address the assessment of scenarios (Generic Exposure Model). For more information on the models, please refer to Newsletter No. 4.



Output interfaces of the MODELKEY DSS. The coloured pie charts show the respective probability on WFD quality classes of each sampling site's overall quality. For example, the pie chart pointed by the yellow arrow shows a percentage of 80% to Good and 20% to Moderate. After selecting a pie chart by clicking on it, the prototype allows to go back to explore intermediate results through their visualization on AMOEBA yardsticks (cakes) and bar-charts. In the first interface the status of biological communities (i.e. key ecological endpoints) is reported: after selecting the community of interest (e.g. invertebrate fauna) the most responsible causes of impairment (i.e. key stressors) are shown in the second (through AMOEBA yardsticks) and third (through bar-charts) interfaces.

End users involvement in the DSS design and development

The scientific community working on water management has recognised the importance of a close interaction between Decision Support Systems (DSS) developers and potential end users (e.g. Final Conference Harmoni-CA, 24-27 September 2007; „Decision Support Systems for Risk Based Management of Contaminated Sites”, Marcomini A., Suter G.W. II, Critto A. eds., Springer Verlag, New York. 2009). In fact, to reach a continued application and updating of a DSS, it has to address the concerns of end users precisely and disseminated to end users carefully. To this end, end users should be involved already at the early stages of DSS development.

The DECIS subproject organised and will continue to organise specific sessions of discussion and dialogue with potential end users of the MODELKEY DSS (i.e. both decision makers/stakeholders who need support in river basins management and researchers/experts who could apply the tool in practice).

The end users related to the three MODELKEY case studies (i.e. Elbe, Scheldt, Llobregat) are included, while attempts are made to involve further international end users. Though the MODELKEY DSS mainly aims at implementing the WFD, it will also prove its value supporting water managers in general.

At three interactive sessions with end users so far, the DSS was propagated:

- RISKBASE WP5 workshop on “Risk Management The interaction of the societal system and the European policy Framework for Land and Water Resource Management” held on 11th-12th of October 2007 in Vienna (Austria);
- NATO workshop on “Sustainable use and development of watersheds for human Security and Peace” held on 22nd-26th of October 2007 in Istanbul (Turkey);
- MODELKEY and KEYBIOEFFECT workshop “WFD in relation to priority and emergent pollutants” held on 22-24 of October 2008 in Koblenz (Germany).

In the forthcoming months a selected group of end users related to the three case studies will be directly involved in the evaluation of the DSS beta prototype. The software system is available at the end user intranet and the end users will be guided on-line by a tutorial and a specific questionnaire in performing a preliminary application and evaluation. End user feedbacks and recommendations will be used for the development of the MODELKEY DSS final prototype.

MODELKEY events and announcements

MODELKEY Agenda	Topic	Contact
General MODELKEY Events		
12-14 May 2009, Antwerp, Belgium	General MODELKEY Meeting 2009 Target group: MODELKEY partners	Michaela Hein (michaela.hein@ufz.de)
30 Nov - 04 Dec 2009, Leipzig, Germany	Final MODELKEY conference Target group: all interested scientists and stakeholders	Michaela Hein (michaela.hein@ufz.de)

For more events see next page please

MODELKEY events and announcements

MODELKEY Agenda	Topic	Contact
End user meetings		
11 May 2009, Aalst, Belgium	End user meeting on MODELKEY results Impact of key pollutants on ecological status and biodiversity Target group: end users interested in MODELKEY tools and findings	Eric de Deckere milieu@ua.ac.be The flyer will be available at "Meetings" at www.modelkey.org from mid April 2009
Training courses		
22-26 June 2009, CNRS, Toulouse, France	Patterning and clustering of the effects of toxic substances in freshwater systems Target group: MODELKEY and KEYBIOEFFECTS partners and young researchers	Sovan Lek lek@cict.fr
18 - 22 May 2009, IGEM, Sarigerme, Turkey	The course „Decision support tools for river basins management“ will be organized by CVR in the frame of the IGEM Akademia International Training Centre (Istanbul) and will focus on the MODELKEY DSS including its application. Please visit the website: www.igemportal.org Target group: all stakeholders working in WFD implementation	Stefania Gottardo stefania.gottardo@unive.it

Related events

Publications	
January 2009	Publication of book „Decision Support Systems for Risk Based Management of Contaminated Sites“. Editors: Marcomini A., Suter G.W. II, Critto A. It includes a chapter on the MODELKEY DSS entitled „MODELKEY: decision support system for the assessment and evaluation of impacts on aquatic ecosystems“.
January 2009	Special series on „European River Basins at Risk“ (conference „Risk Assessment in European River Basins – State of the Art and Future Challenges“ at UFZ, Leipzig in Nov 2007) in <i>Integrated Environmental Assessment and Management Vol. 5, Issue 1</i>