

SCIENTIFIC WATCH

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Scientific Watch

Habitat Simulation and Environmental Flows Assessment

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Habitat models are now being incorporated into the planning of morphological improvements, impact studies of river engineering measures and the optimized operation of dams. CASiMiR-Fish and CASiMiR-Benthos are tools that have been used frequently in this context.

Altered flow regimes and morphological characteristics and their impact on aquatic habitats but not less important on riparian and floodplain vegetation are aspects that can be studied with ecohydraulic models. For this reason a succession model that complements the CASiMiR habitat modelling suite, has been developed - CASiMiR-Vegetation.

The advertisement for CASiMiR software and modules is divided into three main sections: 'module', 'software', and a central contact area. The 'module' section lists CASiMiR-Bah (for habitat simulation), CASiMiR-vegetation (for riparian vegetation development), CASiMiR-hydro (for ecohydraulic simulation), CASiMiR-fish (for fish habitat simulation), and CASiMiR-benthos (for benthic habitat simulation). The 'software' section describes the CASiMiR software as a modular, object-oriented system for simulating river morphology and habitat quality, available for Windows and Linux. The central contact area provides information for 'sje' (sjo - Schneider & Jorde) and 'LWW' (Institut für Wasserbau, Universität Stuttgart), including their addresses, phone numbers, and websites. The CASiMiR logo and the full name 'Computer Aided Simulation Model for Instream Flow and Riparia' are also displayed.

The workshops on CASiMiR present the fundamentals of habitat modelling and the approaches used to describe relations between morphologic, hydraulic and biological parameters. Particular attention is paid to the modelling of habitats for fish, benthic invertebrates, and floodplain vegetation. The underlying fuzzy logic method, as well as the advantages over more conventional approaches to develop habitat suitability criteria, are addressed. A hands-on introduction to the CASiMiR software using case studies and exercises is usually given. CASiMiR software can be downloaded free of charge.

A workshop was organized by Francisco Martínez-Capel (Universitat Politècnica de València, www.upv.es) with the support of the SCARCE consortium and was attended by 13 students. During the workshop, several CASiMiR programmes for the study of habitat in rivers and its relation to invertebrates, fish, hydropower and GIS in rivers were presented.

In addition, the package devoted to dynamic modelling of the riparian forests was introduced for the first time. Among the teachers they had the professor and owner of the company developing the software CASiMiR, Matthias Schneider, Ans Mouton (INBO, Belgium), expert in ecological modelling, and Tom Payne, American expert with decades of experience in this field. The professor Félix Francés also participated, as one of the persons who developed the original form of the CASiMiR-Riparia tool. Surveys have indicated that the degree of student satisfaction was generally very high.

More information available at the CASiMiR website: www.casimir-software.com

SCARCE- River Basin Authorities meeting

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In the frame of the activities related to the WP9 FRAME and in collaboration with the WP10 MANAGE, a meeting between the SCARCE team and technical responsables from several River Basin Authorities was held in the headquarter of the Ministry of Agriculture, Food and Environment (MAGRAMA) in Madrid in January 2013. The technical responsible represented the River Basin Authorities of the Ebro, Guadalquivir, Júcar and Segura. The meeting was also attended by technical staff of the MAGRAMA and the public company TRAGSA. The objectives of this meeting were to inform of the current status of the SCARCE project and to get the feedback of the River Basin Authorities to identify research needs.

The meeting was opened by the Deputy Director of the Integrated Management and Public Water (D. Javier Ruza) who gave the welcome to the attendants and pointed out the interest of the SCARCE project. Further, Prof. Damià Barceló, coordinator of the project, made an introduction to the project, its objectives and challenges. After his intervention, Prof. Isabel Muñoz introduced the database generated in the frame of the project and presented the development of new tools for prioritization of contaminants and to establish the relation between chemical and ecological status. Profs. Ramón Batalla and Xavier Sánchez-Vila showed the advances in the knowledge about hydromorphological aspects and their relation with the ecology in the studied River Basins and the process of dispersion and transport of contaminants. The results about the occurrence and levels of regulated and emergent pollutants and their implications for the structure and function of the ecosystems were showed by Profs. Mira Petrovic and Arturo Elosegi. The role of models as tools for prediction and management of global scenarios and as decision support systems were presented by Profs. Felix Frances and Joaquín Andreu. The round of presentations finished with Prof. Vicençs Acuña and Gabriela Ferrer who showed how to assess ecosystem services, to integrate them in river basin management and how to include them in the strategy for mitigating climate change effects. With the objective to intensify the feedback



with management end-users and representatives from different water-boards, a round table was held, chaired by Prof. Sergi Sabater. Prof. Sabater made a short intervention about the interest of SCARCE to transfer the knowledge and tools to managers for their implementation and to identify knowledge gaps that could be addressed within SCARCE. A debate was opened and Victor Cifuentes (CHG) indicated the need to produce easy and user-friendly tools which can be applied to the daily routine River Basin Management. Concha Duran (CHE) pointed out the different aims of scientists and managers, as well as the need of these kind of meetings to receive information on current activities and highlight needs for collaboration in specific related aspects. Several interventions were made about the possibility to implement some of the tools generated during SCARCE. Arancha Fidalgo (CHJ) pointed out the difficulty of the management to predict the efficiency of the Programmes of Measures because some of the models are focused on chemical indicators but lacking the information about biological indicators. The exchange of opinions between scientists and managers was very active and showed the interest to share information and to transfer the scientific results to the management.

Finally, Prof. Damià Barceló closed the round table mentioning that SCARCE is a pioneer project at EU level by trying to integrate chemical and biological information. Besides, he mentioned a European initiative called JPIWater headed by the MINECO for funding research in water related issues. This is a possibility for future collaborations in the line of SCARCE. To conclude, Prof. Barceló thanked for the participation and showed the availability of SCARCE team to carry out other meetings in the headquarters of the River Basin Authorities. The next meeting will be held in the facilities of the Ebro River Basin Authority in June 2013.



Irrigation agriculture affects functioning of semi-arid terrestrial and aquatic ecosystems

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Human activities are transforming the world's landscape dramatically. Croplands and pastures constitute already one of the largest biomes in the planet and, even so, the area equipped for intensive irrigation agriculture keeps expanding in order to increase productivity, at high environmental cost. Among all these costs, the group of Stream Ecology from the University of the Basque Country wanted to assess the ones related to the processes occurring in terrestrial and aquatic agroecosystems. Therefore, we performed an experiment in collaboration with the Instituto Pirenaico de Ecología and Instituto Geológico y Minero de España, comparing breakdown of leaf litter and wooden sticks in terrestrial and aquatic sites following a gradient of increasing irrigation agriculture. We observed that irrigation agriculture affects functioning of terrestrial and aquatic ecosystems, accelerating decomposition of organic matter, especially in soil. Given the current trend to increase irrigation agriculture, these changes can have important consequences for food webs, as well as for global carbon budgets.



Database compiling information about monitoring data from the Ebro, Guadalquivir, Júcar and Llobregat River Basins

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A first version of the Scarce database is now available from trial via the intranet of the Scarce homepage, utilizing a downloadable MS-Excel files with the data selected. Available data comprises information related to site characterization (physico-chemical, habitat description, impacts in the reach), biological community (invertebrate, biofilm, fish) and chemical analyses (inorganic and organic compounds including priority and emerging substances), of the four case study basins.

Data of at least 25 sites (5 sites for biological data) in each basin are included for two sampling campaigns (autumn 2010 and 2011). At the moment there are 21 different types of data and near 350 parameters measured. The information will be continuously updated during the project.

In order to allow for user friendly queries, the inquiries are programmed in form of multiple selections. A main box contains different fields which can be selected for a specific query. Selection can be done by *Basin*, *Station*, *Matrix* (reflecting the different matrixes that have been analysed), *Sampling campaign*, *Date*, *Type of data*, and *Determination* (where the different parameters analysed can be selected).



SCARCE Activities

Scientific activities

With the end of December 2012, SCARCE has completed the third project year. After a very positive evaluation through experts from the Spanish Ministry of Economy and Competitiveness, SCARCE continues with its scientific activities and public appearance. The scientific activities that have taken place during the last months of the project can be summarized as follows:

- SCARCE database containing all the data generated in the two general sampling campaigns in more than 75 sampling sites along the Llobregat, Ebro, Júcar and Guadalquivir rivers is complete and available on SCARCE intranet (see previous article). Consequently, the evaluation of the data coming from these campaigns to establish distribution patterns and correlations between chemical, biological and other parameters has started.
- The data series from the water authorities have been also checked to assess monitoring and ecotoxicological risk evaluation due to global change in the four basins included in the project.
- Many specific experiments, both in the laboratory and in the selected sampling sections are ongoing: Study of the time dependent interaction between hydrogeological and health components in health risk predictions with applications to the Ebro River, analysis of the sediment transport and morphosedimentary dynamics at selected monitoring river reaches, analysis of the effects of dams on nutrient dynamics and river metabolism, analysis of the effects of WWTP effluents on river ecosystem functioning, field experiment on effects of irrigation on litter breakdown, lab experiment on use of benthic organic matter, etc.

- As a further step for understanding the processes that take place in the river basins, several models are under construction: mechanistic model of river ecosystem functioning, hydraulic, sediment transport and habitat models, modelling of the emerging pollutant diclofenac in the Llobregat river basin, bed load transport models in a large regulated gravel bed river, application of InVEST model in Llobregat river basin and implementation of a sensitivity analysis (water provisioning), detailed water quality models, salts balances in the zones of influence of the salt mines in the Llobregat and Cardener rivers, etc.
- On the more social and economic side of the project, several actions have also taken place: analysis of the present contribution of water related ecosystem services to the human well-being, development of deliberative scenarios about ecosystem services and a questionnaire about social perception of ecosystem services in case studies, non-monetary valuation technique has been implemented in the Ebro basin for the service water provisioning.
- For the translation of all the scientific results to the stakeholders and end-users, direct interviews in the frame of the 3rd SCARCE Conference have been performed together with the organization of a meeting with river basin managers and officials from Ministry of Agriculture, Food and Environment, as it has been previously described.

Courses and conferences

Continuing with the exchange of knowledge in the form of training courses and seminars opened both for participants of the project and the general public, two courses have taken place:

- “Sediment Transport and Associated Fluvial Processes” organized by the University of Lleida and the IDAEA-CSIC and held in Barcelona the 15th and 16th of October of 2012. Almost 20 students coming from different fields and organizations (PhD students from different universities and research centres, Catalan Water Authorities, civil engineering and consultancy private companies) attended the course. Information of the course (e.g., outlines, lectures, exercises) was compiled and available on the SCARCE Intranet to all SCARCE members.
- “Modelling water, floods and sediments with Tetis v8.2” organized by the Technical University of Valencia and held in Valencia on the 29th November. 21 students both members of SCARCE project and coming from other organizations attended the course.

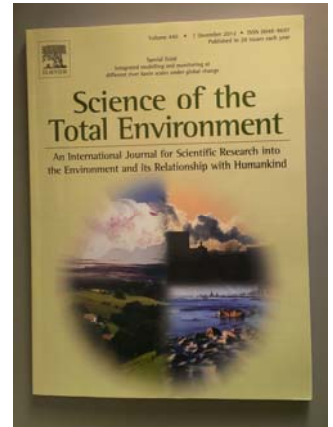
SCARCE has participated in several international conferences as an organizer or collaborator:

- Organization of the 3rd SCARCE International Conference: Bridging Toxicants, Stressors and Risk-based Management under Water Scarcity (26-27 November 2012, Valencia, Spain). It was focused on the need to bridge the gap between the broad spectrum of toxicants and stressors that specially affect quality of water under scarcity and its sustainable management, bringing them together with specialists in physical sciences, biology, health and others. There were 33 oral presentations and 45 poster presentations and more than 120 assistants. It had the participation of several stakeholders and members of the External Advisory Committee that improved the interaction between the project and the water authorities. Selected works from the conference have been included in a Special Issue in Journal of Hazardous Material that will be published during 2013.
- Organization of a Special Session in AquaConSoil Barcelona (16-19 April 2013, Barcelona, Spain). AquaConsoil is the largest European conference on management of soil, groundwater and sediments. This last edition had more than 700 participants and made special emphasis on water management in arid and semiarid areas, issues of great importance in Mediterranean countries. In this direction the special session “Water scarcity in Mediterranean basins under global change” was included in the program, chaired by Alicia Navarro-Ortega and Damià Barceló from the SCARCE project and with the active participation of other members of the project and the presentation of other projects like TERENO-MED.



Publications

The 2nd SCARCE special issue, which includes selected works from the 2nd SCARCE International Conference, was released in December 2012, in the volume 440 of the journal *Science of the Total Environment* (Elsevier) with the title: *Integrated modelling and monitoring at different river basin scales under global change*. The specific topics of the conference have been represented in this special issue with several contributions, both from SCARCE and external participants:



- Monitoring programme design that includes long-term, concurrent hydrometeorological, water quality, morphology and biological monitoring of reference sites to improve evidence of causative links between climate variability and local ecological status. (Guillen et al., López-Doval et al., López-Serna et al., Echeverría-Sáenz et al., Vazquez-Roig et al., Osorio et al., Jurado et al., Arroita et al., Lopez-Roldan et al., Ibañez et al., Aristi et al., González-Ortegón et al.)
- Analysis of interactions between surface and groundwater hydrology taking place at the mesoscale (dm to tens of m). (Mas-Pla et al.)
- Development of integrative simulation tools (process oriented models) to assess the effects of global changes in aquifers, streams and rivers. (Osorio et al., Camenzuli et al., Olaya et al., Candela et al., Baruffi et al., Bangash et al.)
- Development of system-oriented tools defined at the river network (water body scale), taking into account the integration of the water cycle into the water resources management at catchment scale. (Tigkas et al., Aguilera et al., Sanchez-Canales et al., Pasini et al, Ferrer et al, Susnik et al.)
- Assessment of the multiple effects of changes in the hydrological regime (duration, intensity, time, and frequency of floods and droughts) on both biodiversity and ecosystem processes. (Arroita et al., Lopez-Roldan et al., Ibañez et al., Aristi et al., González-Ortegón et al., Olaya et al., Muñoz-Mas et al.)
- Methodological framework development to quantify global change effects in terms of environmental and human risks. (Quevauviller et al., Guillen et al., Pasini et al., Huan et al., Ferrer et al., Susnik et al, Mc Ennis et al.)

Overall, this special issue exemplifies the need for multidisciplinary approaches which are essential to produce reliable assessments and predictions on the relevance of global change on water resources and quality, which can later be translated into policy issues and implemented by water resource managers at basin scale.

Forthcoming Events

4th SCARCE International Conference: Towards a better understanding of the links between stressors, hazard assessment and ecosystem services under water scarcity

25-26 November 2013, Cádiz, Spain

- More information at www.scarceconsolider.es

Advanced Course on Ecosystem Services

18-19 November 2013, Tarragona, Spain

- More information at www.scarceconsolider.es

>>>>>>>> **Contributing to the Newsletter**

If you wish to contribute to a future issue of the Newsletter or announce a forthcoming event, please contact: alicia.navarro@idaea.csic.es