

ground of the long common history of nature and society in the Danube River Basin.

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News and Notes

Innovative development

Thomas Hein: Institute of Hydrobiology and Water Management, University of Natural Resources and Life Sciences, Vienna, Austria. e-mail: thomas.hein@boku.ac.at
Georg A. Janauer: Department of Limnology and Oceanography, University of Vienna, Vienna, Austria, e-mail: georg.janauer@univie.ac.at

In the frame of the EU FP7 project DANCERS – DANube macroregion: Capacity building and Excellence in River Systems (basin, delta and sea) – a set of articles have been accepted for publication in the journal *Science of the Total Environment*.

River basin management – new strategies?

The Danube, one of the many regulated rivers in Europe, is affected by the impact of flood protection measures, hydropower installations and navigation, which exert pressure on sediment transport and river morphology (Habersack et al 2015, article in press). Sediment deposition, and re-mobilisation confined to fine grain-size fractions during floods are recorded in impoundments, whereas in other river reaches river bed incision is a continuing process since regulation had been implemented. Several other negative effects related to the natural structures in the channel and regarding the floodplain areas followed the taming of the river and affect the ecological status today. Causes and effects of this negative development are demonstrated and attention is drawn to the lack of comprehensive knowledge, including the whole basin, as to find solutions of sustainable character for an integrated approach of management.

Sustainable development, education, and the Danube river basin

Knowledge as well as certain skills are needed for organising river basin management in a sustainable way.

What needs to be added today is the propagation of focused education, which is the prime aim of the DANCERS FP7 project (see: <http://www.eip-water.eu/projects/dancers-project-romania>, Irvine et al 2015, article in press), leading to broader education and the development of economic aspects. What is needed is a new kind of networking for training in water management and the future development within the region. On one hand DANCERS project addresses environmental challenges and on the other hand tries to advance academic training and education as part of the Bologna Process, especially at the Masters and PhD level. New education networks need to be started, including public and private organisations. This needs, among other aspects, the establishment of research infrastructure on a standardised basis and programmes on water management and development reaching out to the whole Danube basin.

Floodplain restoration

As part of the process of river training throughout the whole world floodplains were reduced tremendously, e.g. by 68% at the Danube. In two case studies strategies for river restoration are presented, taking into consideration present drivers and pressures, but also realistic opportunities in the respective regions (Hein et al 2015, article in press). Despite Upper and Lower Danube showing differences in the context mentioned, common options apply regarding e.g. stakeholders and societal needs. While acting within these boundaries relevant at present, emerging constraints like climate change and invasive alien species, the latter already covered by a Regulation of the European Union, will be integrated in future strategies and recommendations for sustainable floodplain restoration.

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Restoration of the urban oxbow lake Alte Donau – a case study

Katrin Teubner: Dept. of Limnology & Bio-Oceanography, Faculty of Life Sciences, University of Vienna, Austria; Katrin.Teubner@univie.ac.at

Karin Pall: systema GmbH, Bensasteig 8, A – 1140 Wien, Austria; karin.pall@systema.at

Karl Donabaum: DWS-Hydro-Ökologie GmbH, Zentagasse 47, A-1050 Wien, Austria; karl.donabaum@dws-hydro-oekologie.at

With the settlement in the Danube river floodplain and the growth of Vienna to a big city, the Danube River ecosystem health has been degraded by anthropogenic impacts (e.g. Schiemer and Waidbacher 1992, Chovanec et al. 2002, Janauer and Kum 1996, Hein et al 2006, Janauer et al. 2008). In the long-term the river basin close to Vienna has been changed and became heavily modified (long-term socio-economical aspects of Danube basin history see DN31, Schmid and Haidvogel 2015).

Alte Donau was cut off from the Danube River for more than 160 years (Dokulil et al. 2010). Over decades, this urban

oxbow lake had attracted people living in the capital of Austria, Vienna, for many reasons. Besides the economic use of Alte Donau such as for boating, fishery, and poultry farming (goose husbandry), this groundwater-seepage lake has also a long tradition of serving as a popular recreational area (Figure 1). In the eighties, Löffler (1988) summarized ecological surveys ranging from phytoplankton and water plants to fish and water birds. He described this shallow lake as a mesotrophic ecosystem. About five years later the ecosystem changed as the nutrient loading increased coinciding with the strong reduction of the submerged vegetation cover (Donabaum et al. 1999, Dokulil et al. 2000, 2006, 2011). At that time Alte Donau was shifting from a macrophyte clear-water state to the state of a turbid water body with heavy phytoplankton blooms (Scheffer and van Nes 2007, Jeppesen et al. 2010). The lake's situation became particularly critical as the phytoplankton bloom was largely due to *Cylindrospermopsis raciborskii* (Mayer et al. 1997, Dokulil 2015). This



Figure 1: Alte Donau comprises two large main basins, the so called 'Obere Alte Donau' and 'Untere Alte Donau'. The elongated shape of these two basins with an area of 1.5 km² refers to the former river branch of the Danube River. The lake and its surrounding parks and restaurants serve as a popular recreational area in the city of Vienna. (Photo: Untere Alte Donau, 2015, www.lakeriver.at)