ISSN 2070-1292

danube news

Bulletin of the International Association for Danube Research (IAD)
Informationsblatt der Internationalen Arbeitsgemeinschaft Donauforschung (IAD)

donau aktuell

Editorial

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

Thomas Hein, President of IAD

Dear Readers,

Currently there is a decisive phase as first calls of Danube specific programmes have been launched, EUSDR flagship projects get into the phase of implementation and the update of the Danube River Basin management Plan has been widely discussed. IAD members have been in the centre of some of these activities and are active in various other fields and topics. In this issue we would like to inform you about selected current activities of IAD such as the IAD summer camp, the initiative to establish a network for more concerted research on invasive species in the Danube River basin (DIAS). First information about the coming IAD conference introduces the conference topic and the conference location in Sibiu, Romania. Furthermore, aspects of historical and social sciences for a sustainable development are presented, highlighting the importance for an intensified interdisciplinary cooperation to safeguard our ecosystems and provide a basis for their future use in a sustainable manner. In line with these topics the White paper on sustainable development, a result of the EUSDR flagship project DanubeFuture is discussed as a major outcome of the first project phase in this issue.

While these activities demonstrate a few examples of current involvement of IAD and introduce coming actions, we have to inform you that we lost two long term members who passed away in the last months, Miklós Puky and Rüdiger Schmid. Both have been outstanding scientists and valuable members of IAD. We will remember them as colleagues, friends and part of our IAD family.

Regarding activities of the Austrian Committee for Danube Research at present 79% of the national members are also members of IAD. They form the basis of 'multiplicators' transmitting information on IAD to a greater public, including representatives of the public service on international and national level, as well as students and private persons. In return the Austrian members receive information about the life within IAD, and Danube News (DN) is one of the ways IAD can reach out into the society. At this point we take the opportunity to thank all our authors and contributors of manuscripts, diagrams, graphs and pictures who assist us in making DN a source of interesting and new information on many aspects with regard to the Danube, mirroring the wide scope of Expert Groups and contacts with national and international organisations dealing with this Large River.

Current activities in the Danube Basin

The Transylvanian Water Tower through history, and an invitation to a much-needed conference

Angela Curtean-Bănăduc: "Lucian Blaga" University of Sibiu, Faculty of Science, Sibiu, Romania, angela.banaduc@ulbsibiu.ro
Doru Bănăduc: "Lucian Blaga" University of Sibiu, Faculty of Science, Ecology Research Centre, Sibiu, Romania, ad.banaduc@yahoo.com

Just a short glance on the Romanian geographical map is more than enough to reveal the fact that Transylvania is bordered like a proud fortress by the Carpathian Mountains, over seven million native people looking around to this huge amphitheatre to the numerous and dense ongoing flowing streams and rivers, Danube tributaries of different order.

Water is priceless now as it was throughout the history of this unique region. The ancestors of the Romanians, within the Sarmizegetusa Regia capital of Dacian Kingdom, located in Transylvania, were defeated finally by the Roman Empire

more than two millennia ago, not with the force of their arms but by cutting the local stream which supplied the defenders with water.

Christianity mixed with old pagan beliefs brought new values attached to water, but in all the cases related with its primary role in fertility. No wedding can be successful without the presence of holy water. It is said that in a harsh winter a long time ago, in a small and isolated Transylvanian village, a couple of lovers decided to make their wedding before the priest came with the holy water. The nearby lake instantly flooded for ever that church ... and sometimes at Easter you can still here the bells.

A too-long Middle Age with much of the population crowded into fortified settlements to survive hordes of savage migratory peoples entering Transylvania, such as the Huns, Gepids, Avars, Bulgarians, Hungarians, etc., revealed that the people still living with fear outside the walls were certainly healthier due to their direct and continuous access to good quality of water, a situation that later gave to the early Renaissance naturalists of the region a first thought of the need to understand better the interrelations between humans and water.

In the 18th Century all these nature lovers' individual efforts to deepen their knowledge inspired the formation of some dedicated societies. That was a period when Transylvanian naturalism experienced a spectacular growth; at that time the Transylvanian Society for Natural Sciences of Sibiu (Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt) was established (8th May, 1849) as the result of the initiative of local intellectuals. They aimed for an organization fit to accommodate the sharing of their passion for nature, and to serve the dissemination of their discoveries in order to educate the younger generation in the spirit of knowledge about nature and of the preservation of natural heritage. In this favourable context, exceptional naturalists appeared (Bielz, Neugeboren, Fuss, Schur, Kayser, Ackner, Reissenberger, etc.) and developed a significant pool of data.

One of the results of these enthusiastic nature lovers work was the construction of the present-day Natural History Museum of Sibiu (http://www.brukenthalmuseum.ro/naturale_en/) in the late 19th Century, an exquisite Italian Renaissance building on three levels which house, conserve and protect natural history collections comprising over one million items of priceless value. The aquatic and semi-aquatic species of plants, invertebrates, amphibians, fish and mammals are very well represented and constitute an important continuous attraction for researchers all over the world.

Figure 1: Transylvanian Watermill (Photo: Angela Bănăduc)

Figure 2: Olt River near the Transylvanian Alps (Photo: Doru Bănăduc)

Figure 3: Capra Lake in the Transylvanian Alps (Photo: Daniel Băţat).

Figure 4: Danube Delta (Photo: Daniel Bălţat).

Two very fine, large-scale and ancient libraries, the Baron Samuel von Brukenthal Library (http://www.brukenthalmuseum.ro/biblioteca_en/index.html) and the Library of the Transylvanian Association for Romanian Literature and Culture of the Romanian People (http://www.bjastrasibiu.ro/), induced and sustained a favourable environment for culture and science in the area. The importance of the naturalist tradition of the city appeared and grew continuously since 1849 through several series of scientific international periodicals such as: Verhandlungen und Mitteilungen – in German, Studii şi Comunicări - in Romanian, Acta Oecologica Carpatica – in English (http://reviste.ulbsibiu.ro/actaoc/index.html), Transylvanian Review of Systematic and Ecological Research – in English (http://stiinte.ulbsibiu.ro/trser/index.html), etc., all of them totally or partially dedicated to the study of the aquatic environment.

As early as 1380, a school was opened serving Sibiu's local and regional intellectual environment, and constitued a landmark for this region. The truth is that the city of Sibiu was permanently motivated by the desire to see its residents

Figure 5: Beuşniţa Waterfall (Photo: Daniel Bălţat).

improve their knowledge, as knowledge has always meant power. In 1780 Domenico Sestini, Professor at the University of Pisa, visited the city and said that owing to the local libraries, collections and museums, a university will be a natural step ahead, and that indeed happened, the year 1786 marking the beginning of higher education in Sibiu. The heir of this exceptional higher education inheritance is the Lucian Blaga University – LBUS (http://www.ulbsibiu.ro/en/despre_ulbs/), a significant European centre of academic excellence and social renewal. As a part of it, the Faculty of Science (http://www.ulbsibiu.ro/en/facul tati/stiinte/) with its Ecological and Biological departments and research centres, maintains the strong local and regional tradition in nature protection and conservation with a special accent on aquatic species, habitats and ecosystems.

Starting with the periodic international meetings from the 18th to the 21th Century of the members of the Transylvanian Society for Natural Sciences of Sibiu, to today's 21st Century International Conference on Aquatic Biodiversity (http://stiinte.ulbsibiu.ro/trser/events.html) held in the LBUS, the interest in nature including in the aquatic environment is obvious and traditional in this area.

In such a context, the collaboration of our experts in aquatic ecology with the International Association for Danube Research – IAD, the longest existing international scientific network in the Danube Basin region, founded in 1956, (http://www.iad.gs/), is a natural and a promising one. LBUS and IAD collaboration has been very fruitful in the last two decades, in many ways including our joint organization of the International Conference on Aquatic Biodiversity and the publication of the Transylvanian Review of Systematic and Ecological Research – The Wetlands Diversity series.

To crown an already stable collaboration in protecting the Danube Basin's natural heritage, the IAD and LBUS decided to celebrate the 60 years of existence of IAD by holding the 41st IAD international conference, **"The Role of Tributaries in Sustainable Management Approaches in the Danube River Basin" (http://stiinte.ulbsibiu.ro/ trser/events.html)** on 13–16 September 2016. Why this title of the conference? Because the magnificent Danube is ultimately formed, and as a consequence influenced even by the smallest and most 'insignificant' remote stream of this basin. If we intend to have a 'fairy tale' Danube, the proper management of its basin is the 'golden key'.

The 41st IAD international conference cannot fail to be a success, built as it is on an efficient collaboration between IAD and LBUS in the decades, on the legendary natural area that is Transylvania, on the traditional centre for nature research and protection of especially aquatic and semi-aquatic ecosystems that is Sibiu, and last but not least on the strong feeling of professionalism and friendship among the IAD members. All the members and friends of IAD are kindly invited to share this success and to maintain the high standards of this prestigious Danubian association.

Danube: Future "White Paper on Integrated Sustainable Development of the Danube River Basin"

Verena Winiwarter: Faculty for Interdisciplinary Studies, Institute of Social Ecology, Alpen-Adria-Universität Klagenfurt Wien Graz, Austria, e-mail: verena.winiwarterd@uni-klu.ac.at
Gertrud Haidvogl: Institute of Hydrobiology and Aquatic Ecosystem Management, University of Natural Resources and Life Sciences Vienna, Austria, e-mail: gertrud.haidvogl@boku.ac.at

In the Danube River Basin (DRB), environmental challenges such as pollution, alterations of the natural cycles or invasive species are connected to economic and social inequalities leading, among other things, to a veritable brain drain of much-needed expertise. Sustainable development is key to a prosperous future of the Danube region. It can build on a diverse natural and cultural heritage, natural resources or tertiary education excellence and exert a large scale and positive impact on migration, reduce brain drain and foster environmental, economic and social justice (see *Figure 1)*. Incorporating a long-term perspective is indispensable for this endeavour.

In July 2015, the Danube:Future White Paper on the future of research and education in the Danube River Basin was published. The White Paper was prepared in a bottom-up process that involved an interdisciplinary group of researchers from the majority of Danube countries.

The most promising specific avenue towards sustainability of the DRB macro region lies in the integration of cultural and natural heritage and legacy challenges by means of inter- and transdisciplinarity. To support the sustainability transition, interdisciplinary co-operation in research is required. In particular, the humanities have not been stimulated enough to bring their expertise into the needed portfolio of knowledge.

Civil society and independent media but also governments have key roles in the transformation process. University curricula and trainings based on regional strengths can support economic development and societal integration. The "White Paper on Integrated Sustainable Development of the Danube River Basin" describes key topics and principles of research and education and offers policy recommendations on national and European level. Inter- and transdisciplinary approaches combined with a long-term perspective will

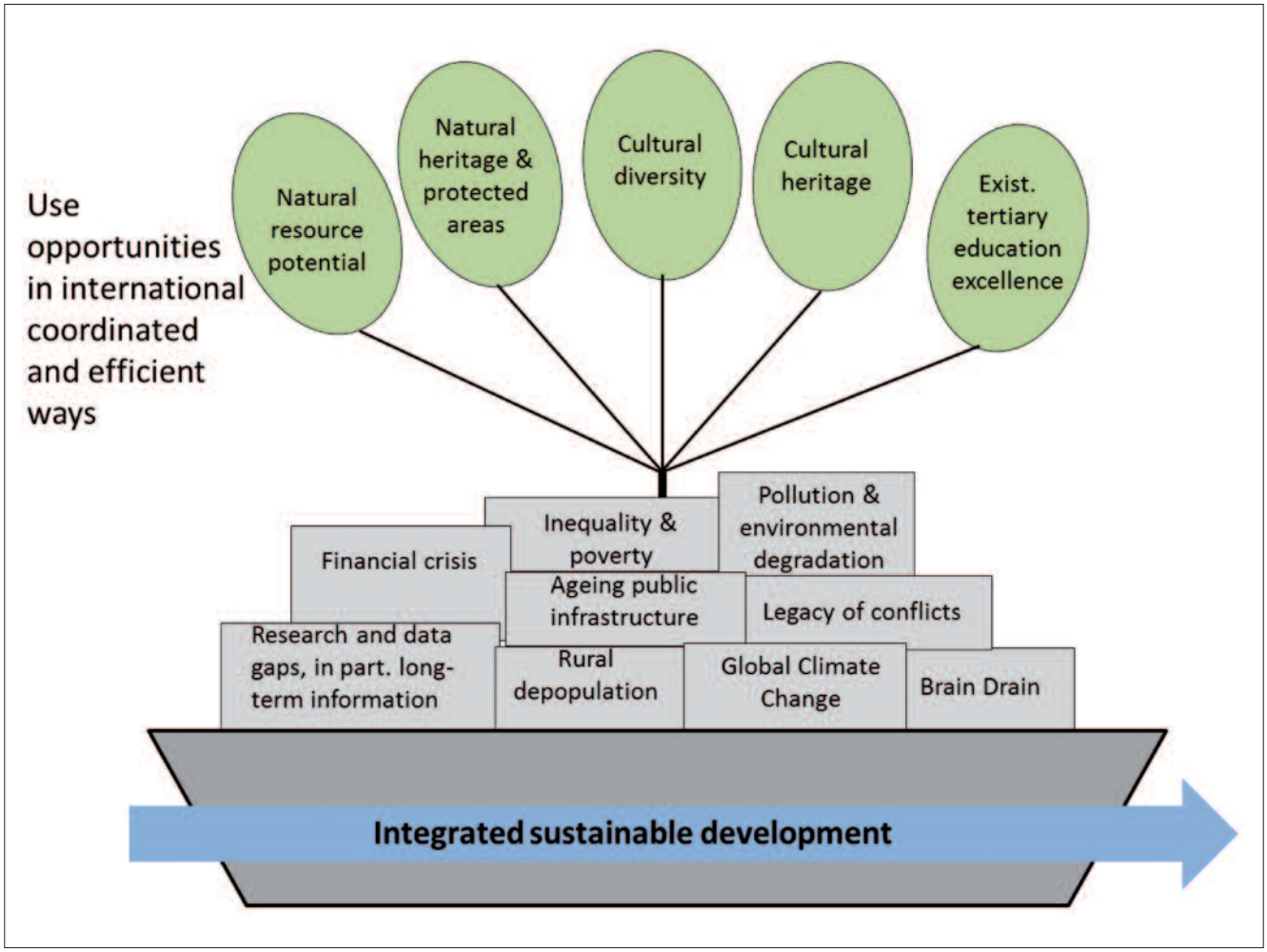

Figure 1: Challenges and potentials of the Danube River Basin (Copyright: Verena Winiwarter & Gertrud Haidvogl, after Fischer-Kowalski et al. 1995)

contribute to better understanding and tackling present and future challenges. Such knowledge will illustrate the impact of past events and decisions on ecology, economy and society. The EU-Strategy for the Danube Region and the objectives of the European research agenda have been accounted for the recommendations. They encompass sub-regionally defined sustainability training and education, the bridging of diverse and often conflicting cultures and inter- and transdisciplinary investigation of biodiversity, protected areas and ecosystem services.

Horizon 2020 challenges can and should be tackled in a form adapted to the specific challenges of the macro region. All H2020 challenges exhibit emergent properties, which results in a fundamental unpredictability. Risk management involving stakeholders becomes key. Decision making under conditions of uncertainty has always been and remains a major challenge for all societies. Research has to tackle the non-linearity of complex coupled-human-ecological systems. Long-term socio-ecological research is necessary to successfully deal with the legacies and valorise heritage for sustainable development. Due to the diversity of potentials and challenges characterizing the DRB, the macro-region can become a laboratory for forward-looking, international research and education.

The White Paper is an activity of Danube:Future. This initiative aims to support the member universities of the Danube Rectors' Conference (DRC) and the Alps-Adriatic-Rectors' Conference (AARC) in their efforts to promote a sustainable knowledge society. It also seeks to connect scientific networks such as IAD with these two university networks. Danube:Future is a flagship project of EUSDR-priority area 7, Knowledge Society.

The White Paper is available for download at:
http://www.danubefuture.eu/sites/default/files/Danube Future_WhitePaper.pdf

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Webpage Danube:Future project: www.danubefuture.eu

Reflect the history, create the future! Enquete „Donau-Leben – Impulse für Regionen" held in the Austrian Parliament

Harald Kutzenberger: Secretary General of IAD, Wilhering, Austria, h.kutzenberger@tb-kutzenberger.com

The President of the Austrian Federal Council, Gottfried Kneifel, invited diplomatic representatives, Members of the Parliament, experts, stake holders and decision makers of the Danube countries on November 10th to attend the Enquete „Danube Life – Impulses for Regions", convened in the Austrian House of Parliament. The Federal Council is one of the two chambers of the Austrian Parliament and represents the nine Federal countries. The event appreciated the anniversaries of 25 years of the Working Community of the Danube Countries (WCDC) and the upcoming sixty years anniversary of the International Association for Danube Research (IAD) and was organised by IAD secretariat. On behalf of IAD I would like to express our gratitude to President Kneifel for this opportunity and the recognition of the efforts for creating a common understanding within the Danube Region.

President Kneifel appreciated the long-term cooperation in the Danube Region targeted on political and scientific levels and he especially high-lighted the need for local implementation of the river basin management. WCDC representative Simon Ortner and IAD President Thomas Hein gave introducing words and provided insight to both organisations for the delegates.

The Executive Secretary of the International Commission for the Protection of the Danube River (ICPDR), Ivan Zavadsky,

Figure 1: President of the Austrian Federal Council, Gottfried Kneifel (Photo: H. Kutzenberger)

informed about mile-stones of transboundary cooperation in the Danube Region: the Danube River Basin Management Plan and the new Danube Flood Risk Management Plan. These two instruments were created by all Danube states with inputs from scientists, environmental organisations and stake holders, following EU regulations. To explain this development from the perspective of a member state, Franz Wagner from the Austrian Ministry of Agriculture, Forestry, Environment and Water Management, explained the Austrian National Water Management Plan as a tool for integrated development of catchments.

The second part of the event brought a vivid discussion in the „Danube Café“, which involved experts as well as the audience. DI Christian Steiner, Government of Lower Austria, Board Member of the European Land and Soil Alliance (ELSA), Elisabeth Wrbka, AVL Consultant for Landscape Planning and Urban Development, Kurt Weinberger, CEO of the Austrian Hail Insurance, Wilfried Hartl, Bioforschung Austria, Gottlieb Soriat, DV-Donau – Citizens´ Initiative for Sustainable Flood Protection, and IAD President Thomas Hein discussed about the practice of implementation of the goals for water management on local level. How can we reach water retention in the whole area of the catchment? Major topics had been: reduction of land sealing, optimising the retention in soils by supporting organic farming, and actively using the experience of green roofing for agricultural and commercial buildings.

Renowned and celebrated Bulgarian musicians, Alexander & Konstantin Wladigeroff and Magdalena & Dimitar Karamitev, and a Danubian buffet created by the agricultural school Ottenschlag, Lower Austria, and fine Hungarian specialities from Samos Bakery, Budapest brought the richness of the Danubian spirit into the event. IAD Secretary General Harald Kutzenberger lead through the program of the afternoon.

Figure 2: 'Green Roof': insulation against extreme temperature, retention of precipitation (Photo: H. Kutzenberger)

Finally a mobile exhibition and brochure on local measures for a sustainable development in the catchments of the Danube Basin were presented. This 'travelling' exhibition will be shown first in municipalities and schools all-around Austria, but there are concrete contacts already to extend the range of this 'travelling' exhibition to major cities in the Danube countries, in cooperation with the governmental and regional administration concerned.

JDS 3 from an environmental history and social science perspective – Part I: Danube research across disciplines and the selection of environmental problems

Martin Schmid: *Institute of Social Ecology (SEC) and Institute of Science Communication and Higher Education Research (WIHO), Alpen-Adria-Universität Klagenfurt-Wien-Graz, Austria, e-mail: martin.schmid@aau.at*
Gertrud Haidvogl: *Institute of Hydrobiology and Aquatic Ecosystem Management, University of Natural Resources and Life Sciences Vienna, Austria, e-mail: gertrud.haidvogl@boku.ac.at*

Introduction

After the first and second Joint Danube Surveys (JDS) in 2001 and 2007, respectively, in August and September 2013 the third Joint Danube Survey (JDS 3) was the next, major step to document and to assess the biological, chemical and hydromorphological state of the Danube in a standardized way (e.g. recently in this journal Stanković et al. 2015; Frank and Schmidt 2015; Schwarz and Holubova 2015). Not only for natural sciences, these river expeditions and their results must be regarded as milestones in recent Danube research. The importance of JDS goes far beyond the sphere of natural sciences, and even beyond that of academia.

Both authors of this contribution have an academic background in history, have worked now for years on different topics of the environmental history of the Danube, often in close cooperation with natural scientists. In our contribution we reflect on the objectives and approaches of JDS in general, and we discuss selected results of JDS 3 in particular from a social sciences' and humanities' perspective – a perspective probably unusual for most readers of 'Danube News'.

We use JDS 3 to demonstrate and to discuss the potentials and limitations of closer cooperation between natural sciences, social sciences and humanities in future Danube research. To initiate and to support such broad interdisciplinary research is the explicit aim of the recently established IAD expert group "Long-Term Socio-Ecological Research (LTSER) and Environmental History" (Schmid and Haidvogl 2015).

Our contribution comes in two parts. This first part aims at a general characterization of JDS from a social science perspective. We ask what is specific about the JDS approach, which environmental problems are addressed and which methods are applied and further developed in JDS? Additionally, we are concerned with the benefit of research à la JDS for scholars from social sciences and humanities and vice versa.

The second part to be published in the next issue of 'Danube News' goes more into details and reflects selected results of JDS 3 from an environmental history perspective, namely hydromorphological alterations, fish diversity, and pollution. We argue that pertinent results from JDS can and should be interpreted as a body of information not only on the

current but also on past socio-natural states of the Danube River Basin (DRB). Environmental history can help to address the dynamics of the social, cultural, and economic sphere that have caused the state of the river at any one time, which the current state natural sciences observe and assess in important standardized monitoring programs like JDS.

JDS as 'boundary work' between science(s), management, and the public

For more than a decade, JDS have facilitated and necessitated cooperation and coordination between scientists and research institutions across the whole Danube river basin. Cleverly marketed as 'the world's biggest river research expedition' (cp. http://www.danubesurvey.org/), JDS have contributed to a higher awareness in media and the general public for some of the most pressing environmental issues the Danube River Basin faces today.

From the very beginning, one of the outstanding features of JDS was that it is situated on the interface of river research and management. JDS have provided results that have the potential to identify main environmental issues and their causes; results shall assist decision-makers to take the right measures for managing water bodies all over the Danube Basin (Joint Danube Survey Public Report, p.3). In fact, results of JDS 3 feed directly into the next, updated version of the Danube River Basin Management Plan (DRBMP).

All three JDS were motivated by legal requirements, first and foremost by the EU-wide 'Water Framework Directive (WFD)'. With a special website, a news blog, public events, and a public report, JDS works also publicly and visibly across the boundaries of science and non-science. JDS help to raise public awareness for the work of its coordinating institution, the International Commission for the Protection of the Danube River (ICPDR).

In line with Science and Technology Studies (STS), JDS can be termed as 'boundary work' (Gieryn, 1983) between three societal spheres: (1) scientific field monitoring and research (including the development of new methods for scientific observation), (2) river basin management and environmental policy, and (3) science communications and public relations. In this respect, JDS can be compared to other - and admittedly much more prominent - activities like the Intergovernmental Panel on Climate Change (IPCC). However, there is one important difference between JDS and IPCC: JDS results are solely the product of scientific research while the regular IPCC reports are the outcome of a consensus process between researchers on one side and representatives of political governments on the other. The Danube of JDS 3 is not a 'boundary object' in the strict sense of the technical term, as it was recently argued for 'ecosystem services' (Abson et al. 2014). However, the Danube we encounter in the recent reports from JDS 3, can and shall be used by different communities (in and outside academia) in different ways.

With a clear focus on ecology, chemistry and hydromorphology, JDS approaches the Danube mainly as an ecosystem. Such a focus allows studying and assessing what ecologists call the changing 'human impact' or 'human imprint' on riverine ecosystems. But what drives this 'human impact'? One way to address the societal, cultural, and economic side of environmental change is to take a long-term perspective like interdisciplinary environmental history.

Why history matters

Environmental historians take a perspective that is informed not only by natural sciences but rather by humanities and social sciences. Environmental history is, to cite one of the most concise definitions, 'the history of the mutual relations between humankind and the rest of nature' (McNeill 2003). 'Mutual relations' means that an environmental history of the Danube not only shares the natural sciences' interest in the 'human imprint' on the river, but is also interested in 'impacts' the other way round, as it asks how the changed riverine ecosystem affected human societies. 'Long Term Socio-Ecological Research (LTSER)' is an alternative name for such an approach. With environmental history LTSER shares the interest in studying the interactions between society and nature on larger temporal scales (from decades, up to centuries and few millennia), but the latter takes a more system-oriented approach focusing on 'coupled socio-ecological systems (SES)' to facilitate cooperation particularly with ecologists.

From our own research experiences, we are convinced that interdisciplinary dialogues between historians and natural scientists are rewarding for both sides. From an environmental history perspective, natural scientific enterprises like JDS 3 offer highly relevant information not only on the current state of the river but also on its long history in which societal and natural processes have been entangled in many ways. Data collected by JDS represent information from biological and geological archives, which store residues from the long common history of nature and society that resulted in the river we encounter today.

On the other hand, environmental history can help to identify and better understand past societal processes that caused the situation natural sciences observe today. This includes the identification and chronology of past societal interventions into the riverine landscapes (like river regulation measures, land use and land cover change, technical arrangements in the riverine landscape) as well as their intended and unintended consequences and long-term legacies for both ecology and society.

With environmental history a high awareness for temporal processes on different scales comes into our conception of the Danube as an object of interdisciplinary investigations. The reasons for a specific state we observe in the river today can lie in the recent or in a – in historical terms – rather deep past. Earth scientists have shown that long before modern

industrialization, intensification of land use in the Danube River Basin over the last two millennia significantly increased sediment loads delivered by the Danube to the Black Sea (Giosan et al 2012). The same study also argued that increased deforestation in the lower Danube basin over the last five to six centuries resulted in a pulse of river-borne nutrients 'that radically transformed the food web structure in the Black Sea'. In other words: The shape, extent and species composition of today's Danube Delta is the unintended consequence of human activities that started two thousand years ago and far away from the site itself. Water pollution is another case in point. Its source can be a very recent spill somewhere close to a water body in the basin (like in the case of Baia Mare in 2000). But the Danube has a memory; it stores in its sediments the remnants of societal activities. Then one day during a flood, sediments from past spills or dumps are spread again, and only with historical methods we at least have a chance to clarify where the original point of that pollution was, or where and when these pollutants came into the river.

JDS – a selection of specific types of environmental problems

From the beginning, JDS were based on indicators to identify and assess environmental problems in the Danube River basin. The already mentioned legal background (particularly the EU-WFD) that motivates JDS and its explicit aim to have an impact on river basin management (via the DRBMP) effects not only the types of indicators which are surveyed, but also which types of environmental problems are considered in JDS in general (and which not).

Besides indicators, there are many other ways to distinguish what is harmless (or even 'good') for the environment and what is harmful and thus regarded as an environmental problem. These different conceptions of environmental problems vary according to scientific disciplines, but also according to different broader socio-cultural (e.g. political or ethical) understandings of how human societies relate to nature. Four basic paradigms help to order this wide variety of what is regarded as an environmental problem and by whom (Fischer-Kowalski et al 1994; Winiwarter 2003; both based on Korab 1992) *(Figure 1):*

1. the toxicological or pollution paradigm
2. the paradigm of 'ecological equilibrium' or 'natural balance'
3. the paradigm of resource economy or entropy, and
4. the paradigm of conviviality.

We shortly illustrate these paradigms and their effects with examples from the current environmental debate about the Danube, topics that are also addressed in JDS.

Two paradigms dominate: 'Pollution' and 'equilibrium'

An example for the first, the toxicological paradigm is water pollution e.g. from industrial activities. If the accepted environmental problem is the release of substances which are harmful to humans, animals or plants in the riverine landscape, the main political response will be to set thresholds and to define critical values that must not be exceeded. The latter requires first adequate scientific monitoring, sampling and analysis, but thereafter it needs a political process of negotiations. The societal value of the industrial activity that releases the harmful substance has to be brought into balance with an evaluation of the damage the very same substance causes. In almost all cases, dealing with toxic substances is not a question of yes or no, but of quantities, society finds acceptable (i.e. critical values). In the toxicological paradigm, scientific research (chemistry in particular together with other natural sciences), has the role to provide knowledge necessary to define these critical values and then to observe and assess the current state of water quality by comparing measured concentrations with the standards set by politics. This exactly is done by JDS, particularly with the chemical, but also in the biological assessment (e.g. when it comes to N- and P-concentrations and related water quality).

Conservationists and ecologists mainly use the second paradigm of 'ecological equilibrium', although it was recently more and more replaced in ecology by related concepts like 'resilience' or 'no-analogue communities'. Nevertheless, the idea of an endangered 'balance in nature' is still prominent in public environmental debates. At the Danube, a case in point would be the discussion about 'natural reference conditions' in general or invasive alien species (IAS) more specifically. The latter topic gets more and more attention in environmental sciences, not only along the Danube. In JDS, IAS became an important issue in JDS 3 for the first time.

Another example that fits well into this paradigm of 'ecological equilibrium' is the hydromorphological assessment of Danube sections in five classes from 'near-natural' to 'severely modified'. Human interventions like river regulation or dams are seen as causes for disturbances that endanger the integrity of the riverine system. The grade of disturbance is assessed based on habitat types and their spatial extension, by sediment balances and several other indicators. If 'disturbance' is the main environmental problem, the solution is protection or restoration of the natural system (conservation, restoration of the longitudinal continuum with fish facilities, prohibition of uses, so called 're-naturalisation'). Scientific research then is in charge of assessing the grade of disturbance, and of controlling the effectiveness of such measures.

JDS are disciplinary dominated by biology, chemistry, and meanwhile also hydromorphology. This might explain to a large extent why the overall majority of environmental problems in focus of JDS belong either to the paradigm of 'pollution' or to that of 'equilibrium'. The third and fourth paradigms play a minor role in JDS. The third paradigm of 'entropy' might even have an opposing role to the conceptualisation of environmental problems in JDS; this paradigm is favoured e.g. by physicists and environmental economics.

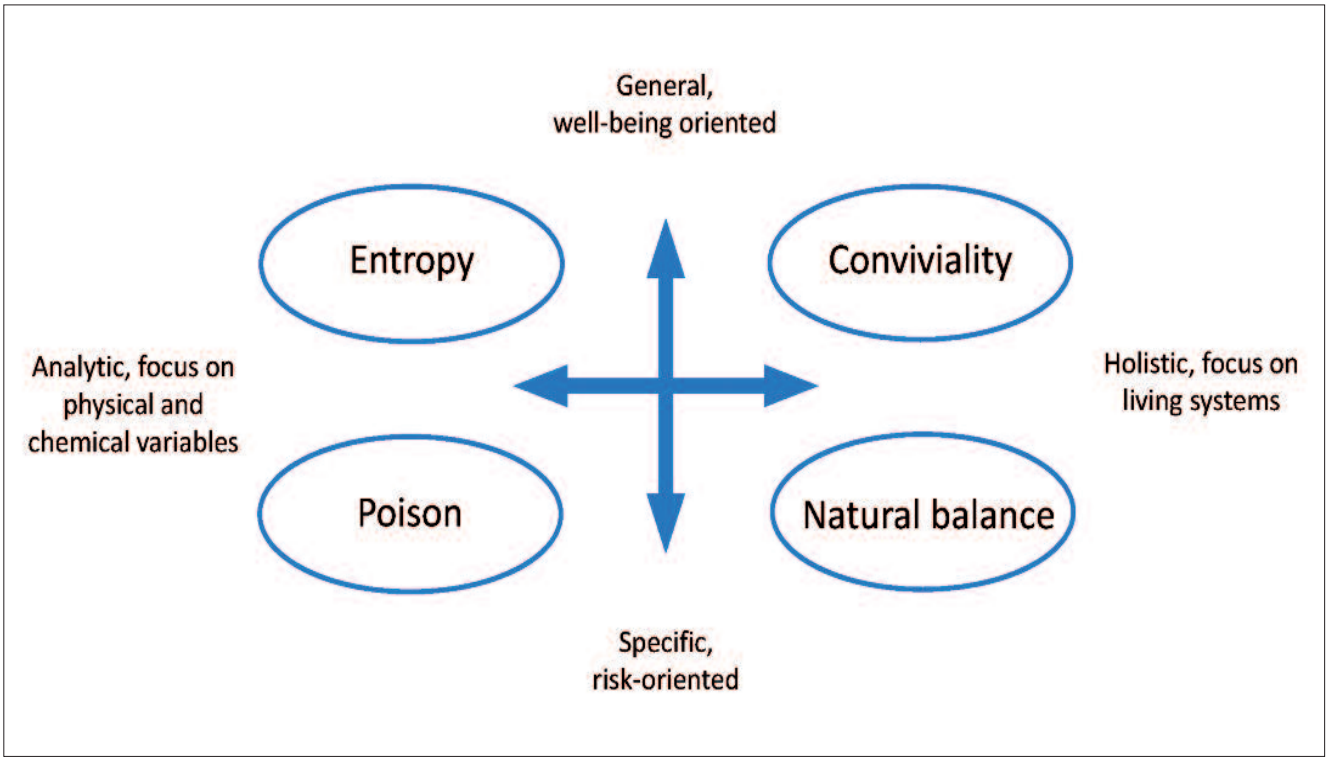

Figure 1: Four basic paradigms to identify 'environmental problems', and the epistemological qualities of these four paradigms (from Fischer-Kowalski et al. 1994)

It mainly asks where society (over)exploits energy and resources above rates of regeneration. Thus, within this paradigm a societal activity like hydropower exploitation can be seen as a solution, whereas another paradigm like equilibrium sees the same activity as a reason for an environmental problem. Implicitly and more in the public than in the scientific debate, the present notions of biodiversity, IAS along with habitat destruction might refer to the fourth paradigm of 'conviviality'. Mainly used by philosophers, moralists and preservationists, this paradigm asks where humans unnecessarily destroy, harm or dominate the living conditions of other species, consequently the aim of this paradigm's followers is to reduce the degree of human dominance over other species.

With 'poison' and 'natural balance', JDS is dominated by those two paradigms that focus mainly on specific risks and their reduction (instead of an orientation towards general well-being); this also has positive implications for the political acceptability of JDS and its recommendations *(Fig. 1)*. According to the authors of the original idea of the four paradigms (Fischer-Kowalski et al 1994), it is easier to argue for measures against specific risks than for ones aiming for long-term well-being; the latter are often seen as unrealistic, utopian, and at least in the case of 'conviviality' more preachy than rational. This might partly explain why JDS is so successful in influencing river basin management in practice. On the horizontal dimension of epistemological qualities, JDS is well balanced with the poison paradigm closely related to established ways of analytical thinking on one side, and the natural balance paradigm presenting more holistic views referring to living systems on the other.

Conclusions and Outlook

From a general social science perspective, we have characterized JDS as successful 'boundary work' on the interface of three spheres: scientific research, river basin management and science communication and public relations. The importance of JDS goes far beyond the natural sciences. From an environmental history perspective, i.e. a perspective informed by social sciences and humanities and interested in the mutual relations between humans and nature over time, scientific results of JDS represent valuable data from geological and living biological archives that shall be re-read and interpreted as traces of past states of the environment in the Danube River Basin (DRB). We have emphasized that with environmental history and 'Long Term Socio-Ecological Research (LTSER)' a higher awareness for temporal processes comes into interdisciplinary Danube research. Such advertence for chronology and timing is decisive also to identify the social, economic and cultural dynamics that have caused the present situation observed and assessed with natural scientific me-thods in schemes like JDS. We have argued that JDS so far have shown a strong tendency to concentrate on those types of environmental problems that are based on either a 'toxicological' paradigm or a paradigm that focuses on 'ecological equilibrium' in the riverine systems; other types of environmental problems (related to 'entropy' or 'conviviality') are not in the focus of JDS.

The second and final part of this contribution will be published in the next issue of 'Danube News' and will discuss selected main results of JDS – namely hydromorphological alterations, fish diversity and pollution – against the back-

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)*

cyanobacterium, which is mainly occurring in sub-tropical shallow lakes after nutrient enrichment (Dokulil and Teubner 2000), is well known for potentially producing cyanobacterial toxins.

The awareness of the degraded state of the ecosystem Alte Donau in the nineties took action in urban planning by shifting the focus from water exploitation to ecosystem health (Figures 2-4) satisfying both nature conservation and the use for recreation and cultural values. Various management measures and concepts for reducing the nutrient load, biomanipulation and sustainable landscape planning were used as lake restoration tools to improve the ecosystem health of Alte Donau (e.g. Donabaum et al 1999, Teubner et al. 2003, Dokulil et al. 2000, 2006, 2011).

The book about the restoration of Alte Donau (in preparation) provides a synthesis of the many facets of urban lake restoration and ecosystem observations. It mainly comprises the period 1993-2014. More than 20 authors describe the hygienic situation, the hydrological and biotic conditions and landscape planning measures during the long-term development when Alte Donau was shifting back from an ecosystem state of an algal-turbid water body to a clear water state. This long-term urban lake description covers thus the eutrophication period before the first chemical treatment in April 1995, the 'restoration' period of chemical treatment and related measures (1995-1999), the period of the re-introduction of macrophytes (2000-2005), and the period of 'stable conditions' of the clear-water state (2006-2014).

These four main lake management periods are described from the perspective of environmental constrains (hydrological to chemical conditions), i.e. the ecosystem response mirrored by biota (from primary producers such as macrophytes and phytoplankton to aquatic bacterial assemblages, primary and secondary production, assemblages of ciliates and larger zooplankton and macrozoobenthos, assemblages of fish and water birds) to the management sustainability (restoration management and re-planting of the littoral zone, concepts of urban landscape planning) and future perspectives. Finally, the summary chapter extracts the following information: What were the keystone management actions improving the ecosystem health? Which biotic shifts were most responsible for the success of the sustained lake restoration that is superimposed by global warming?

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Figure 2: Size comparison between the freshwater jellyfish (Craspedacusta sowerbii, Fritz et al. 2007) and the submerged water plant Spiked Water-milfoil (Myriophyllum spicatum). The frequency of warm summer days with water temperature exceeding 22°C has increased by 10.5 days per decade from 1994 to 2014. Extreme hot summers favour the development of neobiota (Moog et al. 2007, Pall et al 2013) in Alte Donau as e.g. this jellyfish. (Photo: Untere Alte Donau, 2015, www.lakeriver.at)

Figure 3: Recreational areas such as public baths and beaches are in the close neighbourhood of habitat zones for animals and plants in the open water and banks. The small space patchiness of alternate zones satisfying both the recreational use and nature protection of urban wild life is most probably one of the greatest challenges of urban landscape planning (e.g. Hozang, in prep; Pall in prep). (Photo: Obere Alte Donau, 2015, www.lakeriver.at)

Figure 4: The Canada Goose (Branta canadensis) is one of 44 species of water birds found in Alte Donau. Field surveys of water birds were carried out in 1997/98 and 2000/01 (Raab, in prep). Other biota, as e.g. the assemblages of the many microorganisms in the water, for example the algae and water fleas (phytoplankton, zooplankton), were studied in biweekly or monthly sampling intervals for more than 20 years (1993 to 2015) and used for assessing the water quality. (Photo: Kaiserwasser, 2015, www.lakeriver.at)

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Acknowledgement

This long-term study was supported by several grants from the Municipal Department 45, Water Management (Vienna). We would like to thank for permission of publication. Further we thank Martin Dokulil for critical reading of the ms.

Obituary for Miklós Puky, PhD (1961–2015)

Árpád Berczik: Hungarian Academy of Sciences, Budapest, Hungary.
e-mail: berczik.arpad@okologia.mta.hu

Figure 1: Miklós Puky (Photo: zVg: IENE)

Miklós Puky was born in Budapest, on 10 March 1961. Even as a child he showed a particular interest in, and was attracted to the beauty and wonders of nature. He soon learnt to love the world of amphibians and reptiles, and he wanted to become a veterinary assistant or surgeon, or an animal tamer. In secondary school, he specialized in Biology, and took his final exams with excellent results. In 1986, he graduated as a biologist and professional translator in English from the Eötvös Loránd University in Budapest. As of September that year, he started work as a researcher at the Hungarian Danube Research Station of the Hungarian Academy of Sciences (today, Danube Research Institute of the HAS Centre for Ecological Research). He remained in this post till the day of his death. As a young researcher, for six years he had the opportunity to attend postgraduate courses mostly in conservation biology in the United States of America, England, Belgium, Cyprus and Scotland. In 1992, he defended his doctoral thesis, titled "Heavy metal accumulation in Anura populations". He got his PhD in 2005, with his work "Conservation of amphibians in Hungary".

His work as a scholar involved mostly conservational topics. He was concerned with the fragmentation, colonization and invasion issues of endangered amphibians, reptiles and also Decapods. Recently, he had broadened his aspects of study so as to include the possible effects of climate change. The conservation of the above mentioned species groups and their habitats formed a great part of his activity.

Apart from his work in Hungary, he took part in the conservation programmes of several countries from England to Nepal and the United States. He held lectures, titled "Conservation Ecology", at the Eötvös Loránd University for fourteen years, awakening the interest of many students. He also regularly gave lectures at international conferences and universities of other countries, such as – apart from the ones mentioned above – Mexico, China, South Africa and New Zealand.

His special vocation led him to environmental education, the recognition and protection of the treasures of nature, mainly those of the Hungarian wetlands, lakes and running

waters. Within his special area of expertise, he made valuable contributions to the regional research programmes of the Danube Research Institute, which were conducted regularly on the 417 km long Hungarian section of the Danube. The Toad Action Group Association, of which he was founder and leader, served as the framework for most of his indefatigable practical activity in nature and environment conservation and in raising environmental awareness. This organization, beside the distribution of valuable, high standard postcards, calendars and conservational publications, also pursued dedicated educational work, available to a wide spectrum of children, from the age of primary school students upwards.

He authored and co-authored over 110 scientific and educational publications (including books and book chapters), published in Hungary and also in other countries, followed by considerable professional interest and appreciation.

He was a member of the Hungarian Hydrological Society and the Hungarian Biological Society, of which he also served as a functionary. He also held memberships in the Infra Eco Network Europe, the ASG, and he was chairman of the Hungarian team of the IUCN Species Survival Commission, Declining Amphibian Populations Task Force.

He had been a member of the IAD for 29 years, during which time he attended nearly all of its conferences. His intelligence, his love for his profession and his colourful personality made him a well-known, esteemed member of the great family of Danube researchers.

His activities were honoured in Hungary with the much-valued "Pro Natura" and "For Our Environment" medals and the "sen. Entz Géza" award, and he also won the Ford European Conservation Award.

In the early spring of 2015, he was returning from a tour of South-East Asia, where he acted as advisor, and as ever, he was full of experiences and plans for the future, but he shortly suffered a heart attack. Despite the devoted attempts at treatment, on 20 March he left his beloved mother, his dear colleagues and co-workers, and the entire earthly field of his comprehensive scientific activity.

He was buried in Budapest, on 9 April 2015. We hold him in loving memory.

Obituary for Rüdiger Schmid (1942–2015)

Gunther Seitz: *EGL Saprobiology, District Government of Lower Bavaria, Landshut, Germany. e-mail: gunther.seitz@reg-nb.bayern.de*

Figure 1: *Rüdiger Schmid, 2003 (Photo: Government of Upper Palatinate, Regensburg)*

On August 2, 2015 our highly respected and popular colleague Rüdiger Schmid died at the age of 73. Rüdiger has rendered outstanding services to IAD over many years with a great foresight to improve the water quality of the Danube across borders long before the EU Water Framework Directive came into force. He has played a significant role in the international Danube expedition of IAD in 1988, a forerunner of the actual Joint Danube Surveys performed every 6 years by ICPDR, to assess the quality of the Danube from Vienna to the Black Sea and to present the results in an extensive publication. In 1998 he was designated as leader of the IAD expert group Saprobiology, a task which he fulfilled until his retirement in 2004. Due to his expert knowledge and his restless commitment the water quality map of the whole Danube could be published at the turn of the millennium. This map was completed three years later by adding the major tributaries. The required relevant information was collected during a memorable workshop in Regensburg attended by competent experts of the eastern Danube countries due to a generous sponsorship. The highlight of his professional activities was the organization of the first German "Danube Day" in Regensburg, where people participated in a great summer.

Rüdiger Schmid was born in Bayreuth on 27 March 1942. After a teacher-training in chemistry, biology and geography in Munich he began his service in the Bavarian Water Authority in 1971. As a technical officer of Upper Franconia´s government he established the chemical-biological monitoring of Bavarian´s first drinking water reservoir in Mauthaus and edited a regional water quality map of running waters which was a pioneer work at that time.

In 1976 he was entrusted with the leadership of the Middle Franconia´s water quality supervision, before joining the government of Upper Palatinate in 1980, where he published the first water quality map of this administrative district. In 1993 Rüdiger Schmid was elected as administrator of the water management office in Regensburg that he headed until his retirement. He was the first natural scientist in Bavaria holding this position. Because of his scientific background he was able to focus not only on water quality issues, but also on hydromorphology and restoration of streams.

Until his death he indulged his passion for the recreational angling which was reflected in memberships of some fishery associations. Moreover, his retirement was characterized by numerous travel activities together with his wife not only in Europe but also in the most remote parts of the world.

All those who have known Rüdiger will treasure his memory.

ISSN 2070-1292

danube news

Bulletin of the International Association for Danube Research (IAD)
Informationsblatt der Internationalen Arbeitsgemeinschaft Donauforschung (IAD)

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Hydrological catchment of the River Danube

Address / General Secretary:

International Association for Danube Research (IAD)
(Internationale Arbeitsgemeinschaft Donauforschung)
Am Zunderfeld 12, A-4073 Wilhering
Tel.: 0043 727478881 Fax: 0043 727478884
E-mail: kutzenberger@iad.gs
IAD-Homepage: http://www.iad.gs

Editor:

Dr. Georg Janauer
Universität Wien
Department für Limnologie
Althanstraße 14
A – 1090 Wien
E-mail: georg.janauer@univie.ac.at

Layout:

Diener-Grafics GmbH
Winterthurerstr. 58, 8006 Zürich
Tel. 0041 (0)44 440 11 50

Printing:

VDV Friedrich, A-4020 Linz, Austria