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Editorial

Danube River Basin management: What can we learn from case studies in other parts of the world?

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Abstract: This paper analyses the general topic of the 35th IAD Conference with particular reference to scientific concepts, transdisciplinarity and cooperation, sustainable development, transboundary issues, public awareness and implementation of water laws and the EU Water Framework Directive. Experience from selected case studies of other large transboundary river catchments in the USA, Asia and Europe shows that basics can be extrapolated to the Danube River Basin. Chances and problems of future Danube Basin management are discussed, considering the role of IAD.

Zusammenfassung: Das Hauptthema der 35. IAD Konferenz wird in diesem Beitrag analysiert hinsichtlich wissenschaftlicher Konzepte, Transdisziplinarität und Kooperation, nachhaltiger Entwicklung, multinationaler Belange, öffentlicher Meinung und Umsetzung der Gewässerschutzgesetze und der EU Wasserrahmenrichtlinie. Erfahrungen aus ausgewählten Fallstudien von anderen grossen internationalen Flusseinzugsgebieten in den USA, Asien und Europa zeigen, dass Grundsätzliches auf das Donaubecken angewendet werden kann. Chancen und Probleme des zukünftigen Donau-Managements werden unter Berücksichtigung der Rolle der IAD diskutiert.

Key words: Scientific concepts, implementation, sustainability, transboundary river basin management, case studies

Introduction

The general topic of the 35th IAD Conference: *„Scientific concepts and implementation of sustainable transboundary river basin management"* has been chosen for various reasons: First, the combination of science and management shows once again that IAD is dedicated to applied and basic science, according to BLOESCH (1999, 2001). This Conference and Proceedings are aimed at providing evidence that only sound basic scientific research can support decision makers and managers in an efficient and successful way. Secondly, sustainability has lost the magic of a sexy word in politics, since it turned out that the western societies are far

from being truly sustainable (JUCKER 2002), and the economic growth remained the prevailing strategy despite of the early warnings of the Club of Rome (MEADOWS et al., 1972). The paradigm change of CAPRA (1982) also remained a vision. Last but not least, the transboundary issue has gained top priority as in Europe the Water Framework Directive (EU-WFD) has been enforced and Danube countries in transition willing to join the European Union need to fulfil the ecological water standards, i.e., „good ecological status". However, method harmonization and establishing quality standards, laws and regulations is one issue, rising public awareness and realising political implementation another, yet more difficult task (BIRK 2004; BOGDANOVIC 2004).

It is widely accepted that, both from a scientific and management point of view, the catchment as a hydrological unit is the basis for successful river basin management (BOON 2004). However, the world-wide problem is that there is hardly any river basin where the political borders match the hydrological or geographical borders. Physical boundaries compete with human boundaries. Hence, the scaling matters not only for ecosystems (FRISSEL et al., 1986), since transboundary waters exist on the local, regional and national level, i.e., between different communities, provinces and nations. The Danube River Basin is a special case as it encompasses 14 riparian (and a total of 18) countries, the largest number in transboundary catchments world-wide.

Case studies reflect the applied aspect of a problem since solutions are searched by scientific approaches that may be extrapolated to other situations. This paper summarises experience from selected case studies of large transboundary river catchments and examines how such experience can be applied to the Danube River Basin. Specifically, the role of IAD is considered.

Case studies

The Illinois River in Oklahoma/Arkansas (USA) – point vs. non-point sources of pollution. SOERENS et al., (2003) review the „classical" transboundary case of upstream pollution that threatens scenic downstream rivers. Northwestern Arkansas (upstream state) is subject to over-proportional fast economic development (poultry production, metropolitans) while Oklahoma (downstream state) lives on tourism favoured by exceptional ecological and recreational characteristics. Thus, phosphorus (P) pollution threatened the downstream reservoir by excessive load and eutrophication. Over decades the dialog, facilitated partly by the U.S. EPA, between the states and among stakeholders was both cooperative and contrary at times. The big problem started when Fayetteville (Arkansas) diverted portions of their wastewater into the Illinois watershed, and Oklahoma sued in concern about excess P load. In 1992, the U.S. Supreme Court ruled that downstream state's water quality laws must be met but this did not exclude additional discharge from upstream sites. Finally, the states agreed upon 0.037 mg/L total P (with 0.010 mg/L recommended by the EPA, however) and a 40% reduction of P load. This caused concern in Arkansas, but also has driven new arguments and allowed for

measures such as best management practice in poultry waste and fertilizer use. The authors conclude that „ongoing efforts are seeking to find technical, regulatory, and political solutions to improving water quality in the Illinois River. The intense scrutiny of the impacts of nutrients in the river has spawned much excellent research in agricultural practices and in water quality monitoring."

The Mekong River, south-east Asia – large dams and reservoirs disrupting the river continuum. A „classical" case of hydropower and irrigations dams is compiled by DUDGEON et al., (2000) for the Mekong River encompassing 6 nations (China, Burma, Laos, Thailand, Cambodia, Vietnam), with a catchment of 795,000 km^2 and a mean annual discharge of about 15,000 m^3/s, yielding a potential energy capacity of 58,000 MW and the possibility of irrigating some 6,000,000 ha. In the framework of various international commissions (since 1995 the Mekong Commission, formed by the four lower riparian states, but at the beginning without China that now is in a sub-committee, together with Burma) has been stressed the commitment to at least 26 dams along the mainstream and at least 78 dams in tributaries. By 1997, one dam was built in the mainstream and 20 in tributaries although war and political instability have stopped development for about 20 years. Most interestingly, the Commission stated that „member states were allowed to use the river waters without seeking the approval of other members – except during the dry season". Numerous feasibility studies have been elaborated, but the authors deplore that adequate data for sound management decisions are lacking, insufficient or unreliable. However, there are expected to be serious implications for the environment (in particular fish spawning, migration and hence production, and loss of indigenous biodiversity) and for the people whose livelihoods are dependent on riverine ecosystems. For example, endangered anadromous Pangasidae catfish may go extinct, endemic flocks of at least 119 gastropod species may be considerably diminished, and diseases such as schistosomiasis may be induced and spread. People displaced upstream increased deforestation and hence run-off and sedimentation. Further, concern is with the role of the World Bank and western private consulting firms making big profits while cost for mitigating in-site impacts are avoided. However, some 30 local NGOs oppose the dam-building industry. But despite „appraisal optimism" and recent economic depression in south-east Asia, „the development of hydropower and irrigation seems inevitable given the potential (economic) benefits". The recommendation of the World Bank to go for small-scale development, likely to be less damaging and more „sustainable", is not dispersing peoples and scientists fear.

The Elbe River, Eastern Europe – physical destruction for flood control and navigation and ecomorphological restoration. After the recent major floods throughout Europe, and in the context of global warming, flood control and flood protection have gained great political and public awareness as damage was extraordinary. The problem does not only relate to forecasting, modelling and early warning, but also to morphological river destruction such as river course canalisation, bed pavements, riprap bank constructions, dams and polders. NESTMANN & BÜCHELE (2002) present a scientific study on the morphodynamics of the River

Elbe whose basin encompasses the Czech Republic and mainly Germany, and, to a small extent in the headwaters, Austria and Poland. The technical report serves as a prerequisite to understand the function of a large river and to make adequate management decisions for flood protection. Integrating methods used comprise numerical models for, e.g., flood routing along the river course and functioning of retention areas, lab small-scale experiments to calculate hydraulic parameters and sediment transport (zones of erosion and deposition), and groundwater dynamics. Results are presented and analysed with GIS. Although the study focuses on abiotic topics, ecological links are included, e.g., flood plain inventories by remote sensing (radar). A practical result is that back-movement of dikes to create retention areas and capacity is only effective if technical steering is provided.

Discussion, Conclusions and Outlook

The Arkansas/Oklahoma case shows clearly the long-term struggle towards a win-win situation. Rough political statements such as Arkansas governor's „our people are treated like lab rats in experiments" do not help to solve a serious water pollution problem. It was the wise insight that the river systems is a unit belonging to all people (also to Arkansas people spending their holidays in Oklahoma) and hence pollution must be combated in a watershed approach that could solve the problem to a satisfying degree. The same debate has a long history in the Danube River Basin. According to the economic and political (before 1990) gradient, the upstream „western" countries have mitigated pollution, while this is still a problem further downstream (SCHMID 2000) and in respect to the Black Sea (BEHRENDT 2004). While during the „cold war period" IAD successfully unified scientists across the „iron curtain", this had little or no effect on politically motivated environmental actions of the individual states. But the upstream-downstream problem is between individual countries, and still must be resolved and implemented, now within the International Commission for the Protection of the Danube River (ICPDR). The EU-WFD provides quality standards which are to be achieved in some future, if the political willingness and public awareness are further promoted. Sub-basin projects are presently in work, such as the Tisza and Sava Basins, and IAD scientists support the coordination of ICPDR.

This is quite different in Asia (and South America and Africa as well), where the commission rules out cooperative behaviour, foreign companies make big profit and promote, together with local powerful governments, non-sustainable economy either to rise standards of living or to increase their own money. Thus, riverine and forest ecosystems are exploited despite great ecological concern, and international agreements such as the Kyoto Protocol are undermined. Local NGOs seem to emerge significantly, however, their power is little in comparison to the power of economic globalisation and corrupt top-down regimes. In the Danube River Basin, we have experienced such exploitation since the 1950s in the upstream parts of the mainstream (waterway Rhine-Main-Danube) and all tributaries (hydropower), while the lower Danube and tributaries (such as Tisza and Drava-

-Mura Rivers) remained „more natural" despite human impact (BLOESCH & SIEBER 2003; SCHWARZ & BLOESCH 2003). However, with the extension of the European Union, the economic pressure is increasing, and the situation is similar like in Asia and other continents. Endangered sturgeons (also *Acipenser sinensis* in the Yangtze River) may go extinct as the anadromous catfish in the Mekong. Flood plains may be destroyed in a slow but significant process of changed hydrology, morphology and biota by strong development of dams and navigation despite efforts to protect them (WWF 2002; SCHNEIDER-JACOBY 2004). Two main research topics of IAD are dealing with these two issues, and hence our association can significantly contribute scientific arguments to sound management strategies (BLOESCH 2001).

In Europe, river restoration and conservation is not only of scientific interest (TOCKNER et al., 2003), but also a political topic, unfortunately no more with top priority. International and transboundary commissions (such as ICPDR, Rhine-, Elbe- and Odra-Commissions, etc) make progress in implementing integrated water protection, including aspects of quality, quantity and morphology. But where ecology meets economy, the latter is mostly the winner, and flood plains are threatened in particular (TOCKNER & STANFORD 2002). This will most probably not be different in the Danube River Basin, and further deterioration of riverine ecosystems seems inevitable, as stated for the Mekong, substituting numerous river basins world-wide. For example, while SCHNEIDER-JACOBY (2004) is optimistic to conserve large flood plains in the Sava-Drava Basin, the Sava initiative is massively hindered by the political desintegration of the former Yugoslavia (Ivana Teodorovic, pers. comm.). The Tisza River is under investigation for flood regulation including flood plains, but mining development upstream may threaten the whole riverine ecosystem (SCHULZ et al., 2004). Only with extensive basic studies, as exemplified by the Elbe-study, investigating the processes of river function, can such impacts be mitigated but unfortunately not stopped (see also, PETTS & AMOROS 1996). A realistic pragmatic procedure (with the analysis of the present status, allowing to define the gaps in knowledge and deteriorations from a future status, and with recommendations for implementation) includes the balance of stakeholders interests of use and protection. Integrated scenarios could be successful tools for transboundary river basin management (GOOCH & STÅLNACKE 2003). With regard to technical development and living-standard increase the local people might consider to take also their negative aspects into account, to value riverine landscapes, and not to repeat the mistakes of others.

The role of IAD is certainly different nowadays from what it has been in history. The ample pool of taxonomic knowledge and experience in saprobic quality evaluation can greatly support the implementation of „ecological good status" in the surface waters of the Danube River Basin as aimed by the EU-WFD. However, since 1998 this is the main focus of ICPDR. IAD, therefore, has abandoned its traditional role and found a scientific niche, such as macrophyte and sturgeon research, has enhanced its activity within the International Association of Theoreti-

cal and Applied Limnology (SIL) to move from descriptive to functional research, and is stretching between science and practice to act as an important NGO in the Danube River Basin (BLOESCH 1999).

Finally, transboundary problems develop in a particularly interesting situation, where rivers functioning as state borders meander over decades so that land reclamation from either side becomes a political issue, as featured in the Sava-Drava flood plains (SCHNEIDER-JACOBY 2004). There is no solution in sight, if riparian countries claim their national territory while neglecting the complex function of the whole wetland ecosystem. Scientifically based cooperation can yield a win-win situation between flood plain conservation, local business sustenance and soft tourism. On the long-term, only participatory methods lead to successful solutions that solve transboundary problems. Political compromises are inevitable, but they must be good to be truly „sustainable". In conclusion, scientific concepts for river basin management need to be integrated into an open transboundary political process.

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