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EDITORIAL

IWAS II: integrated water resources management under different hydrological, climatic and socio-economic conditions

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The International Water Research Alliance Saxony (IWAS) project (2009–2014) was dedicated to investigate global challenges concerning integrated water resources management (IWRM) in different model regions in Eastern Europe (region R1), Central and Southeast Asia (R2 and R3), the Middle East (R4) and Latin America (R5). This thematic issue compiles the most important scientific results of the second phase of the IWAS project which was introduced by Kalbus et al. (2012). The main results and lessons learned from the transdisciplinary IWRM project are presented in Seegert et al. (2014). The IWAS project was structured into the above-mentioned model regions (R1–5) and into cross-cutting topics: Q1—Model based scenario analysis, Q2—Technology development, Q3—Governance, and Q4—Capacity development (Fig. 1).

The first cross-cutting topic Q1 was dedicated to model-based scenario analysis of hydrological and climate related processes. Within the first project phase of IWAS a Tool-Box for hydrological process simulation was developed and exemplary applied to the IWAS investigation regions (Kalbacher et al. 2012). The toolbox concept has been completed by invoking data integration as well as model visualization methods (Rink et al. 2014; Bilke et al. 2014). Within the second IWAS project phase, the toolbox has been extensively applied to several IWAS model regions: R1 (e.g. Fischer et al. 2014; Koerner et al. 2014; Pavlik et al. 2014), R2 (e.g. Karthe et al. 2014), R4 (e.g. Kloss et al. 2014; Graebe et al. 2013; Subagadis et al. 2014; Walther et al. 2014), R5 (e.g. Borges et al. 2014; Da Anunciação et al. 2014; Gonçalves et al. 2013) to address a variety of questions for surface water and groundwater management. More general works were Barfus and Bernhofer (2014) who applied global climate models (GCM) to different model regions and Pluntke et al. (2014) dealing with uncertainty in hydrological modeling due to data scarcity.

The second cross-cutting topic Q2 was focused on technology development, implementation and transfer. Three work packages in Q2 were dealing with the Sewchar concept for sustainable sanitation systems (Fuehner et al. 2012), hydrothermal carbonization for treatment of domestic waste and sewage sludge (Poerschmann et al. 2014), and the development of multisensory systems for the detection of pathogens.

The remaining transdisciplinary topics were dealing with aspects of governance (Q3) and capacity development (Q4). Dombrowsky et al. (2014) were discussing socio-economic questions of water governance in transition countries as well as institutional and legal constraints for transboundary river basin management. Capacity development is an important method for the implementation of IWRM concepts (Leidel et al. 2014). As a result of the IWAS capacity development activities an E-learning platform has been established (Leidel et al. 2013, see http://www.iwrm-education.de).

IWAS Ukraine (R1) was dealing with a variety of IWRM aspects elaborating on socio-economic as well as natural science questions (Dombrowsky et al. 2014; Hagemann et al. 2014) discussing the role of water governance in transition countries as well as institutional and legal constraints on transboundary river basin management. A decision support concept was developed by Leidel et al.

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Fig. 1 The IWAS model regions (source: http://www.ufz.de/iwas-sachsen)

(2014) and exemplary illustrated for the Western Bug river basin. The second part of works is dealing with surface and subsurface hydrology as well as climate effects on it. Koerner et al. (2014) are assessing the groundwater recharge as an important hydrological parameter in the Bug river basin using different approaches such as inverse and forward modeling. The uncertainty in hydrological modeling under data scarcity is studied by Pluntke et al. (2014). Fischer et al. (2014) and Pavlik et al. (2014) investigate climate effects on hydrology at different scales—a subbasin and the complete river basin of the Western Bug.

IWAS Middle East (R4) was working in the field of water scarcity in semi-arid to arid regions with focus in Saudi Arabia and Oman. Precise measurement of groundwater recharge (Siebert et al. 2014) and soil properties (Werisch et al. 2014) are important input information for groundwater models in order to assess groundwater resources and related water resources management. Overexploitation of groundwater resources in coastal areas triggers saltwater intrusion and deterioration of groundwater systems by salinization (Walther et al. 2014). Optimization of irrigation schemes for agricultural purposes is particularly essential in water scarce areas (Kloss et al. 2014).

In the second phase of the IWAS Brazil (R5) project, a German–Brazilian consortium IWAS-AQUA DF was recruited particularly for the development of IWRM concepts for the federal district of the capital, Brazil. Major research topics of the consortium were dealing with quality and quantity of surface water resources for future water supply of fast growing mega-cities. Da Anunciação et al. (2014) and Borges et al. (2014) studied the influences of climate change effects on water resources. Oliveira et al. (2014) and Franz et al. (2014) investigated the impact of soil degradation and accumulation of pollutants in sediments on the urban watershed in the federal district. The trend of micro-pollutants in surface water was studied by Majewsky et al. (2014).

A more detailed description of the most important findings of the IWAS project can be found in Seegert et al. (2014) and in the research papers of the thematic issue therein. Concerning water resources management and hydrology in Central Asia (model region R2), a thematic issue is forthcoming (Karthe et al. 2014). An important result of the IWAS initiative was the foundation of the Centre for Advanced Water Research (CAWR) which will continue the IWRM research in the context of global change in future. In addition to the existing model regions, the activities of CAWR will be extended to other regions with global water problems such as China (Chen et al. 2014).

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