Environ Sci Pollut Res (2013) 20:6904–6906
DOI 10.1007/s11356-013-1943-z

EDITORIAL

Processes and environmental quality in the Yangtze River system

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Received: 22 February 2013 / Accepted: 14 June 2013 / Published online: 11 July 2013

The Yangtze River is a source of life and prosperity for China and the river basin is home to 400 million people, one third of the population of China. The river basin accounts for approximately 50 % of the national total runoff and 40 % of China's freshwater resources, which makes the river basin the most important source for drinking water, supplying water to 186 cities. In addition, it is one of the major arteries of China's inland water transportation. The fish fauna of the Yangtze catchment is one of the richest in the world, providing more than 70 % of the fishery production of China. Due to its rich natural resources, the river contributes a lot to China's economic development. It serves as a key factor in inter-provincial commercial trade and the regional economy. The potential benefits even grew after the Three Gorges Dam began operating at full capacity after 2009, including flood control, energy production, and improved navigation. The river is also among the key locations for China's agriculture and industry. In 2006, the river hosted 10,000 chemical enterprises—about half of the total number in China (cf., Floehr et al. 2013, this issue).

However, the Yangtze River—as an ecosystem as well as a lifeline—is reported to have been drastically degraded during recent decades (Muller et al. 2008; Xie 2003). A recently published focus story in *Science* entitled "Trouble on the Yangtze" highlights the potentially serious consequences of proposed and completed hydropower dams on the Yangtze River for fish and cetaceans (Qiu 2012). As pointed out by Yang et al. (2012) in a reply to the above-mentioned article, water pollution is another important but largely ignored concern; rising contamination and hydrological changes in the Yangtze River accelerate the loss of local species.

Discharge of industrial and urban wastewaters, along with the application of fertilizers, pesticides, and herbicides in farming, have negative impacts on the water quality (Muller et al. 2008; Yang et al. 2012; Jin et al. 2012). These impacts include release of heavy metals and persistent organic pollutants as PAHs, together with re-mobilization of polluted sediments. Due to its pollution, the Yangtze River was rated by the World Wildlife Fund as being amongst the top 10 rivers at risk in the world (Wong et al. 2007; Wang et al. 2012a).

This special issue of Environmental Science and Pollution Research highlights selected papers presented at two International Workshops on "Processes in the Yangtze River System—Experiences and Perspectives", one held at RWTH Aachen University, Germany in 2011, and the other at Tongji University in Shanghai, China in 2012. Both workshops were held for the purpose of scientific exchange on recent cutting-edge environmental research in the Yangtze River with a focus on the Three Gorges Reservoir (TGR). The second of these conferences, which is summarized in a conference report by Holbach et al. (2012a), marked two important milestones in Sino–German cooperation: (a) the 10-year anniversary of successful scientific Sino–German cooperation on questions related to the newly built Three Gorges Dam and (b) the mid-point of the Yangtze-Hydro Project (Bergmann et al. 2012) funded by the German Federal Ministry of Education and Research from 2010 to 2014.

In detail, more than a dozen papers on processes and environmental quality in the Yangtze River basin are presented in this special issue elucidating the following topics:

- Modeling the biomagnification of organic pollutants in aquatic food webs (Scholz-Starke et al. 2013)
- Review on the toxicological status (Floehr et al. 2013)
- Contamination status of dioxins in sediment cores from the Three Gorges Dam area (Chen et al. 2013)

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- Application of 15N–18O double stable isotope tracer technique (Liang et al. 2012)
- Mitigation of nutrient losses via surface runoff from rice cropping systems with alternate wetting and drying irrigation
- Case study on rehabilitation of a polluted urban water body
- Water mass interaction in the confluence zone of the Daning River and the Yangtze River in respect to algal growth (Holbach et al. 2012b)
- Approximation and spatial regionalization of rainfall erosivity based on sparse data (Schönbrodt-Stitt et al. 2013)
- Temporal variation and spatial distribution of PAH (Wang et al. 2012b)
- The littoral zone in the Three Gorges Reservoir: challenges and opportunities (Yuan et al. 2013)
- The response of mulberry trees after seedling hardening to summer drought in the hydro-fluctuation belt (Huang et al. 2012)
- Chemical and effect oriented exposomics: Three Gorges Reservoir (Schramm et al. 2012)
- Dechlorination and organohalide-respiring bacteria dynamics in sediment samples (Kranzioch et al. 2013)
- Plant communities in relation to flooding and soil characteristics in the water level fluctuation zone (Ye et al. 2012)

In order to provide a comprehensive picture of processes in the water fluctuation zone of the TGR, where the water level fluctuates annually by about 30 m generating a drawdown zone of up to 350 km^2 in summer (Yuan et al. 2013), and the concept of optimizing ecosystem services in this area according to the strategy presented by Mitsch et al. (2008), Willison et al. (2013) present the major outcomes of an international conference held in Chongqing Municipality (China) in October 2011 on the subject of conservation and eco-friendly utilization of wetlands in the Three Gorges Reservoir. The bilingual (English and Chinese) conference proceedings were subsequently published (open access) in the Journal of Chongqing Normal University. The proceedings reports are critically reviewed by Willison et al. (2013) in this special issue of ESPR in the context of other internationally relevant literature.

The increasing worldwide contamination of freshwater systems with thousands of industrial and natural chemical compounds is one of the key environmental problems of the twenty-first century (Schwarzenbach et al. 2006; Yang et al. 2012) and global challenges. Considering this alarming situation, which were addressed in the mentioned Yangtze cooperation projects and workshops, the following lessons can be learned:

(a) to understand the complex environment of the Three Gorges Reservoir and to develop research strategies a long standing and sustainable cooperation is needed;
(b) basic research is needed for the development of conceptual strategies and technical solutions considering the multidimensional environmental problems in this region;
(c) joint forces supported by bi- and multilateral, international research programs are needed;
(d) research programs to support fundamental research are often too short-lived to derive reliable results and sustainable solutions.
(e) For this reason, it is necessary that basic and applied research sponsors combine their forces and to create specific calls in the funding bodies that address basic and applied research in environmental sciences (Schaeffer et al. 2009).

Acknowledgments The author would like to thank the Federal Ministry of Education and Research, Germany (BMBF) for supporting the research cluster "Pollutants/Water/Sediment—Impacts of Transformation and Transportation Processes on the Yangtze Water Quality" and the BMBF DLR for supporting a cooperation project with Chinese colleagues. The author would also like to thank Prof. Dr. Martin Willison (Dalhousie University, Canada) for improving the language of this editorial.

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