applied sciences

MDPI

Editorial

Special Issue "Floodplains and Reservoirs as Sinks and Sources for Pollutants"

Christian Opp

Faculty of Geography, Philipps-Universität Marburg, D-35032 Marburg, Germany; opp@geo.uni-marburg.de

Citation: Opp, C. Special Issue "Floodplains and Reservoirs as Sinks and Sources for Pollutants". *Appl. Sci.* **2023**, *13*, 33. https://doi.org/10.3390/app13010033

Received: 5 December 2022
Accepted: 15 December 2022
Published: 20 December 2022

Floodplain soils and reservoir sediments are known for their fine-grained structure and rich organic-matter substances; therefore, they are able to sorb metals and other potential pollutants, which is is characteristic of their sink function. Under changing environmental conditions, including climate change effects, such as changing water levels and redox conditions, and during reservoir rehabilitation measures, floodplain soils and reservoir sediments can also be sources of pollutants.

This Special Issue aims to collect and present different research approaches and regional case studies from Kazakhstan, the USA, Germany, China, Iraq and Iran to show both the regularities and special peculiarities of such sink and source functions of floodplains and reservoirs, including one case of organic pollutants in the snow cover.

A total of nine papers are presented in this Special Issue. Weber et al. [1] identified both heavy metals and microplastics as pollutants in floodplain reservoirs and provided evidence for their special accumulation in the upper 50 cm of the floodplain soils, as well as their migration down to a 200 cm soil depth. Amirgaliev et al. [2] reported that the transboundary (Kazakhstan–Russia) Ural River is heavily contaminated with polychlorinated biphenyls, heavy metals, oil contaminants, and pesticides, which also lead to an enrichment in these pollutants in the muscular tissues of fish. Petrolium hydrocarbon enrichments were proven by these authors both in the water of the northeastern Caspian Sea and in muscles of Caspian fish. Hahn et al. [3] determined element-specific enrichment factors for arsenic, chromium, vanadium, cadmium, manganese, nickel and zinc in the sediments of six reservoirs. The authors could prove the origin of these elements by leaching processes from catchment soils. Lotz and Opp [4] show the catchment origin of pollutants in river sediments by other methods, analyzing different factors such as geology, dams, and land cover, vegetation, rock characteristics (contents of K_2O, CaO, and SiO_2) and reservoir drainage area on a basin scale using R.F. models. Beier et al. [5] compared metal (loid) enrichments in two reservoirs with different mining histories and land use characteristics, including analyses of their tributaries and catchment soils. Based on the German Federal Soil Protection Ordinance, the status quo of the metal (loid) contamination of the two reservoirs was evaluated, and recommendations for further management and investigations were made. Allafta and Opp [6] combined the revised universal soil loss equation (RUSLE) with remote sensing (RS) and a geographic information system (GIS) to construct a soil erosion hazard map of the Shatt Al-Arab basin. Annual soil erosion rates in tons per hectare were determined. The highest soil loss rates are associated with heavy rainfall, loamy soil predominance, elevated terrains/plateau borders with a steep side slope, and intensive farming. Lotz et al. [7] aimed to identify multi-metal distribution patterns in the Sacramento River floodplain, and found 484 significant correlations between metal distribution patterns. The most important factors were the distance to specific streams due to emissions, transport processes in their watersheds, and local soil properties. Amirgaliyev et al. [8] analyzed and evaluated the polychlorinated biphenyls (PCBs) contamination in snow cover in southeastern Kazakhstan during different winter periods. The snow cover pollution of the study area from up to 25 individual PCB congeners was identified. Ismukhanova et al. [9]

reported on the water-bottom sediment system of the Kapshagay Reservoir and visualized the processes of metal migration and accumulation within this system.

Funding: This research received no external funding.

Acknowledgments: Thanks to all the authors and peer reviewers for their valuable contributions to this Special Issue 'Floodplains and Reservoirs as Sinks and Sources for Pollutants'. Special thanks to open access funding provided by the Open Access Publication Fund of Philipps-Universität Marburg with support of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation). I would also like to express my gratitude to all the staff and people involved in this Special Issue. Finally, special thanks to MDPI for support during the whole publication process.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Weber, C.J.; Hahn, J.; Opp, C. Spatial Connections between Microplastics and Heavy Metal Pollution within Floodplain Soils. *Appl. Sci.* **2022**, *12*, 595. [CrossRef]
2. Amirgaliev, N.A.; Askarova, M.; Opp, C.; Medeu, A.; Kulbekova, R.; Medeu, A.R. Water Quality Problems Analysis and Assessment of the Ecological Security Level of the Transboundary Ural-Caspian Basin of the Republic of Kazakhstan. *Appl. Sci.* **2022**, *12*, 2059. [CrossRef]
3. Hahn, J.; Bui, T.; Kessler, M.; Weber, C.J.; Beier, T.; Mildenberger, A.; Traub, M.; Opp, C. Catchment Soil Properties Affect Metal(loid) Enrichment in Reservoir Sediments of German Low Mountain Regions. *Appl. Sci.* **2022**, *12*, 2277. [CrossRef]
4. Lotz, T.; Opp, C. Ranking of Basin-Scale Factors Affecting Metal Concentrations in River Sediment. *Appl. Sci.* **2022**, *12*, 2805. [CrossRef]
5. Beier, T.; Opp, C.; Hahn, J.; Zitzer, N. Sink and Source Functions for Metal(loid)s in Sediments and Soils of Two Water Reservoirs of the Ore Mountains, Saxony, Germany. *Appl. Sci.* **2022**, *12*, 6354. [CrossRef]
6. Allafta, H.; Opp, C. Soil Erosion Assessment Using the RUSLE Model, Remote Sensing, and GIS in the Shatt Al-Arab Basin (Iraq-Iran). *Appl. Sci.* **2022**, *12*, 7776. [CrossRef]
7. Lotz, T.; Su, S.; Opp, C. Multi-Metal Distribution Patterns in Soils of the Sacramento River Floodplain and Their Controlling Factors. *Appl. Sci.* **2022**, *12*, 8462. [CrossRef]
8. Amirgaliyev, N.A.; Medeu, A.R.; Opp, C.; Madibekov, A.; Kulbekova, R.; Ismukhanova, L.; Zhadi, A. Polychlorinated Biphenyls in the Snow Cover of South-Eastern Kazakhstan. *Appl. Sci.* **2022**, *12*, 8660. [CrossRef]
9. Ismukhanova, L.; Choduraev, T.; Opp, C.; Madibekov, A. Accumulation of Heavy Metals in Bottom Sediment and Their Migration in the Water Ecosystem of Kapshagay Reservoir in Kazakhstan. *Appl. Sci.* **2022**, *12*, 11474. [CrossRef]