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Editorial

Editorial for Special Issue "Elemental Concentration and Pollution in Soil, Water, and Sediment"

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Certain elements are essential to the growth and health of living organisms with specific biochemical functions in their metabolic processes. However, these elements can become toxic when their amounts exceed certain thresholds. Therefore, the environmental levels of various trace elements in soil, water, or sediment are of major concern due to their dose-dependent effects on living organisms. The aim of this Special Collection is to bring researchers from different fields together, involving biogeochemistry and ecotoxicology in various environmental media, in order to provide a more comprehensive understanding of the environmental fate of trace elements in their biogeochemical cycles for different ecosystems.

In this context, several contributions have been made to study the presence and effect of trace elements in different environmental sinks. In the soil system, Horváth and co-authors [1] monitored the contamination levels and executed a comparative assessment of soil properties and dwelling mesofauna in a mid-sized Hungarian city in two different years, and they found a correlation between specific chemical parameters and soil microarthropods. Pan and co-authors [2] studied the concentrations of potentially toxic elements in 27 surface soil samples from areas where coal-mining activities ceased nine years ago (Guizhou Province, China). Cadmium was the only element that showed a mean concentration higher than the national soil quality standard, with levels that could be harmful to live organisms. Korzeniowska and Krąż [3] studied heavy metal pollution caused by anthropogenic activities in the natural Tatra National Park (Poland). They observed the presence of Cd and Pb from human activities and noted that with the increase in the altitude of the terrain, the concentration of metals in soils decreased. Sutkowska and co-authors [4] defined pollution indices as an efficient tool for distinguishing anthropogenic soil pollution and geogenic contamination in two polish areas differing in geological setting and type of land use. In the attempts to establish remediation techniques for polluted soils, Baek and co-authors [5] evaluated the feasibility of using a practical chemical washing method for the removal of fluorine from an enriched soil, and they stated that chemical washing might not be effective for remediating soils containing chemically stable forms of fluorine. Aguilar-Garrido and co-authors [6] evaluated the potential remediation of peat in different As-polluted soils by assessing the decrease of As solubility and its toxicity through bioassays. Peat addition decreased As mobility, but less effective in buffering As pollution was observed in calcareous soils. Moreover, Zaragüeta and co-authors [7] observed that the use of sewage sludge, which can be used as an organic amendment in agricultural soils, increased the concentration of some trace metals in the soil, in bioavailable forms, and in the crop. Interesting results also presented in the work done by Yang and co-authors [8], who studied the adsorption behavior of *p*-arsanilic acid (ASA), a kind of organic arsenic feed additive that contains the arsenic group in a chemical structure, on three kinds of pure iron oxides and nine soils to elucidate its implication for contaminated soils. Their findings help to understand the environmental transportation behavior of organoarsenicals by evaluating the potential hazards associated with the usage of organic arsenic feed additives. Last but not least, in studies done with soil fractions, Suazo-Hernández and co-authors [9] analyzed the effect of metal (Cu, Ag) engineered nanoparticles on phosphorous availability in an agricultural Andisol and observed that the incorporation of the studied nanoparticles into the selected soil generated an increase in P retention, which may affect agricultural crop production.

Several studies were focused on the anthropopressure on sediments; Warta River studied by Jaskuła and co-authors [10] and Wigry Lake surveyed by Kostka and Leśniak [11], both located in Poland, showed signs of heavy metal pollution. In Warta River, the third-longest river in Poland, heavy metal contaminated sediments can act as point sources in urbanized areas and fluvial processes. The results obtained from Wigry Lake showed signs of metal pollution, mainly by Pb, although it is located in a pristine region. In the same line, the work performed by Ramírez-Pérez and co-authors [12] investigated the geochemistry, enrichment, and pollution of trace metals in anoxic sediments, pointing to a possible ecotoxicological risk to organisms for Pb, Cu and Zn in superficial sediment layers in the San Simon Bay (Spain), contaminated in the surface mainly due to anthropogenic inputs, especially in the case of Pb, reflecting the enormous human pressure on these ecosystems. Huang and co-authors [13] studied the causes of copper and other common heavy metals input in sediments of irrigation canals in Taiwan province (China). They observed that sediments were polluted mainly due to the highest masses of pollutants released into drainage wastewater of the county and the return flow from irrigation, and the illegal discharge of wastewater. Dinis and co-authors [14] assessed the ecological risk of cadmium in karst lake sediment at Yelang reservoir in Guizhou province (China), also incorporating an ecotoxicology approach, and found strong to extremely strong ecological risks of Cd in sediments, but low ecotoxicology for the organism investigated, due, mainly, to water properties (pH, and Ca and Mg content). Matabane and co-authors [15] did a sequential extraction and risk assessment of potentially toxic elements in river sediments of Blood River (South Africa), to assess a possible trend of mobilization of these elements from sediment to water, they found a high toxicity-risk level, which could cause a threat to organisms dwelling in sediments and local residents via consumption of crops irrigated with the polluted river water. Finally, the sediment research is completed by a review article of Nawrot and co-authors [16], which provides different methods in assessing the status of the trace metal contamination in sediments affected by anthropogenic interference by applying geochemical and ecotoxicological assessment and classification indices.

In water systems, two contributions determined pollutants in Russia: Menshikova and co-authors [17] analyzed the water balance at the Kachkanar Mining and Processing Plant tailings dump (Russia, Ural Region), and they highlighted that increasing the volume of seepage discharge will lead to an increase in natural water pollution within the area. Novikov and co-authors [18] identified the chemical composition of water from natural springs near large cities in the Arctic region of Russia, which is used instead of tap water. They found hazardous pollutants exceeding Russian hygienic limits in half of the tested waters. Interesting findings were also shown by Moskovchenko and co-authors [19], who studied the chemical composition of snow from Tyumen (Russia), which allowed for a quantitative determination of pollutants deposited from the atmosphere. With this determination, they identified the most polluted parts of the city, which were in the center and along the roads with the most intensive traffic. Kozina and co-authors [20] studied the conditions of sedimentation in the Caspian Sea, taking into account lithological, mineralogical and geochemical data and observed that hydrogen sulfide contamination, recorded in the bottom layer of the water column of the deep-water basins, affects the formation of authigenic sulfides, sulfates and carbonates associated with the activity of sulfate-reducing bacteria.

The research in water systems was completed by Fedoročková and co-authors [21], who designed and verified a laboratory method for the testing of alkaline, magnesite-based reactive materials for permeable reactive barriers to remove heavy metals from contaminated groundwaters.

Above mentioned studies especially focused on the effect and distribution of heavy metals investigated in soil, sediment and water systems and demonstrated that several regions in the World present potential risks from trace element pollution. Furthermore, different ecological approaches (indices, ecotoxicological studies, geochemistry), different forms of pollutants (nanoparticles, bulk metals, organic metals) and potential remediation or techniques for trace element pollution controls are also illustrated in this volume and provide a thorough comprehension of the status, control, and remediation of elemental pollution in the ecosystems under anthropogenic disturbances.

Conflicts of Interest: The authors declare no conflict of interest.

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