Efficient Water Resources Management in Cr(VI) Impacted Water Bodies and Mobility of Potentially Toxic Metals in the Environment

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The management of water resources is a critical environmental issue with financial, social and health implications. In the EU, water management is guided by the Water Framework Directive 2000/60/EC (EU 2000) which prescribes a series of key actions addressing a range of important emerging topics. However, a question that remains to be answered is how to increase the effectiveness of existing resources based on a strong priority setting which will guide the work of the coming years. Another significant question is how to enable and achieve increased involvement of those implementing water policies in the river basins to ensure that the prescribed actions are translated into outcomes on the ground.

CrITERIA is an EU- ERANETMED project on water management of Cr(VI) impacted water bodies in the Mediterranean having the ultimate aim to assist water resource management organizations and water users on decision making when coping with water scarcity, climate change and polluted water. Pollution by Cr(VI), a potential human carcinogen, is used as an example of additional water pressure problem that has to be tackled through integrated water resource management. This special issue of the Bulletin of Environmental Contamination and Toxicology hosts a selection of nine (9) papers initially presented in a special conference session organized by the CrITERIA research team during the 16th International Conference on Environmental Science and Technology (<http://cest2019.gnest.org/>) that took place in Rhodes, Greece in 4–7 September 2019. The

second part of the special issue includes twelve (12) contributions by international researchers that explore the environmental mobility of potentially toxic metals within the soil-water-plant system.

Contributions in the first part of the special issue link water pollution data related to Cr(VI) water contamination with integrated water resource management. Papers also include the presentation of real data from several case study areas. Until recently, human activities were considered as the only Cr(VI) source in water, however, latest research (e.g. Fantoni et al. 2002; Oze et al. 2007) has shown that relatively high levels of Cr(VI) can also be attributed to natural processes related to the weathering of minerals of specific rock types found in ophiolite sequences, i.e. remnants of ancient oceanic crust that characterize the aquifers of several case studies presented here. Proposed management approaches, including participatory interaction between water managers and water users, are also explored and alternative remediation techniques are presented in several papers of the special issue. The success of many treatment technologies in remediating Cr(VI) contamination has been demonstrated in the literature and practice (Hawley et al. 2005). Most of these technologies require knowledge of site-specific conditions, flexibility in remediation design and creativity in optimization strategies. Since the biogeochemical properties of Cr and the soil matrix can affect the removal efficiency of many treatment strategies, an understanding of these properties down to nanoscale is essential for choosing an effective treatment method. Once the properties and the behavior of Cr in the subsurface and treatment environments can be predicted, remedial alternatives for Cr(VI), such as the examples presented here, can be addressed as the ultimate water management step in affected areas.

Contributions in the second part of the special issue examine the geochemical behavior of potentially toxic elements in the surface environment. The mobility and speciation of trace metal(loid)s is central to many of the feedbacks that connect geochemical, biological, and geological

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processes at Earth's surface. Often, redistribution of chemical elements in the surface environment results in lower concentrations and therefore demands sophisticated measurement methodologies for quantification. Included papers report on the assessment of reactivity, bioaccessibility and biological availability of contaminants as well as the remediation of contaminated land with particular focus on phytoremediation methods.

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