Volume Preface

Water is basic for all life and also for several physicochemical processes that directly and indirectly support life and shape our planet. With an increasing population as well as with climate change, there will be an increasing shortage of water in different qualities and for different purposes such as for drinking water and for irrigation. Access to clean and safe drinking water is a human right. However, it is not yet accessible to all people. Growing humankind needs more and more resources. This holds for water that is indispensable as drinking water as well as for food production – with or without irrigation. Water shortage by volume is the case particularly in arid regions; however, such a shortage is also more and more observable in the so-called water-rich regions. Additionally, there is a shortage of clean water, i.e., water of sufficiently high quality – not just for drinking water purposes but also for high-tech industrial production – and sufficient quality is also indispensable for safe food.

Therefore, increasing reuse of reclaimed water in different qualities is necessary. There are, however, several challenges to implement this on a large scale. Depending on its further use, water needs to comply with different quality levels needed to be met for its usage, respectively. Reclaimed water for irrigation and agriculture needs to meet certain standards as water contaminants can be taken up by plants/crops and/or accumulate in non-target organisms. Current challenges include the removal of microbial contaminants such as bacteria (including antibiotic resistant bacteria), viruses, protozoa, and other microorganisms, mobile-resistant elements, and also organic contaminants of emerging concern and other organic and inorganic constituents. As for the chemical compounds, it is anticipated that their usage and introduction into the aquatic environment via various routes will increase in the future, as will do their production and application in various products and processes. This holds true for the amount but also for the number of compounds. As for (micro)organisms, the effect of climate change and increase of human population on them is expected to be significant.

One of the most important challenges for water reuse is therefore enabling wastewater reuse in sufficient quality and quantity in the most sustainable manner.

This book address the most important related current challenges including analytical chemical methodologies for the identification and quantification of contaminants of emerging concern and also of their transformation products, the various bioassays applied for the assessment of the biological potency of treated wastewater, and the bioavailability and uptake of organic contaminants during crop irrigation. It also addresses emerging issues like antibiotic resistance, both in wastewater and in soil in downstream environments. It presents the current situation in various countries that suffer from water scarcity and various other important issues like water recovery systems. The potential for other reuse practices like in the paper industry and in landfill management is also presented.

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