Special Issue Reprint

Constructed Wetlands as a Sustainable Technology for Wastewater Treatment

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The world faces growing water scarcity and pollution, intensified by socioeconomic development and rising demand for clean water. Annually, about 359.4 billion m³ of wastewater is generated globally, with nearly half discharged untreated. Conventional treatment plants, while widely used, are energy-intensive, rely heavily on chemicals, incompletely remove emerging contaminants and pathogens, emit significant greenhouse gases, and operate separately from natural ecosystems. Sustainable, cost-effective alternatives are urgently needed. Constructed wetlands mimic natural wetland processes—using plants, substrates, and microorganisms—to effectively remove pollutants. Recognized as eco-friendly and efficient nature-based solutions, they offer multiple benefits, including water purification, resource recovery, carbon sequestration, stormwater management, biodiversity support, and opportunities for education and recreation. This Reprint tackles current challenges in constructed wetlands, such as carbon emission reduction and removal of emerging contaminants. The studies provide insights to advance innovative applications and enhance the mechanistic understanding of wetlands for sustainable pollution control.