


Editorial

Water, Wastewater and Waste Management for Sustainable Development

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1. Introduction

The subjects of environmental protection, climate change, and sustainability are gaining in importance every year [1]. This includes the management of water, which is an extremely valuable resource, and wastewater generation. Increasingly more attention is also being focused on waste. By managing waste rationally, some of it can be used as a valuable resource [2]. Innovative and effective solutions can contribute to an improved quality of life. The move towards sustainability in the context of water and waste management is essential for ecosystem balance and caring for the future of our planet.

Wastewater and waste can have a negative impact on both human and animal life. For this reason, sustainable measures must be taken which include environmental, social, and economic aspects. The actions taken should concern both the municipal and industrial sectors [3]. The Special Issue titled “Water, Wastewater and Waste Management for Sustainable Development” covered topics related to water, sewage, and waste management in a sustainable way, including resource reduction, treatment, and environmental impact. This Special Issue is the continuation of the activities initiated in the previous Special Issue of the *Water* journal “Water, Wastewater, Waste Management in Agriculture and Agri-Food Industry” [4].

2. Overview of the Special Issue

The papers collected in the Special Issue “Water, Wastewater and Waste Management for Sustainable Development” were diverse. The editor grouped ten papers in three categories:

(1) Agriculture and agri-food industry:

- Reuse of Treated Slaughterhouse Wastewater from Immediate One-Step Lime Precipitation and Atmospheric Carbonation to Produce Aromatic Plants in Hydroponics (Contribution #1).
- Possibilities for Anaerobic Digestion of Slaughter Waste and Flotates for Biomethane Production (Contribution #2).
- Evaluation of the Characteristics of Pollutant Discharge in Tomato Hydroponic Wastewater (HWW) for Sustainable Water Management in Korea (Contribution #3).
- The Impact of Various Types of Cultivation on Stream Water Quality in Central Poland (Contribution #4).

(2) Waste and wastewater management:

- A Newly Isolated *Rhodococcus* sp. S2 from Landfill Leachate Capable of Heterotrophic Nitrification and Aerobic Denitrification (Contribution #5).
- An Extensive Analysis of Combined Processes for Landfill Leachate Treatment (Contribution #6).
- Application of the Monte-Carlo Method to Assess the Operational Reliability of a Household-Constructed Wetland with Vertical Flow: A Case Study in Poland (Contribution #7).



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- Pharmaceuticals Removal by Ozone and Electro-Oxidation in Combination with Biological Treatment (Contribution #8).

(3) Industry sector:

- Study on Properties of Micro-Nano Magnetic Composite Prepared by Mechanochemical Method of NdFeB Secondary Waste and Removal of As (V) from Mine Water (Contribution #9).
- Integrated Process of Immediate One-Step Lime Precipitation, Atmospheric Carbonation, Constructed Wetlands, or Adsorption for Industrial Wastewater Treatment: A Review (Contribution #10).

The paper “Reuse of Treated Slaughterhouse Wastewater from Immediate One-Step Lime Precipitation and Atmospheric Carbonation to Produce Aromatic Plants in Hydroponics” (Contribution #1) presents the results from evaluating the suitability of the treated slaughterhouse wastewater obtained by the integrated process composed of immediate one-step lime precipitation and atmospheric carbonation for the production of aromatic plants by hydroponics. The results showed a significant increase in plant height of 177 and 147% and root length of 64 and 37% for Pennyroyal and Chocolate Peppermint plants, respectively (after 26 days). Importantly, no signs of toxicity or symptoms of micronutrient deficiency were detected in aromatic plants.

Philipp et al. (Contribution #2) in paper “Possibilities for Anaerobic Digestion of Slaughter Waste and Flotates for Biomethane Production” investigate the effects of substrate composition and operating parameters on biomethane production during anaerobic digestion, focusing on the use of flotates and slaughterhouse waste as substrates with a high organic content. According to the authors, the novelty was the use of a moving-bed biofilm reactor with a circulation pump for the anaerobic treatment of flotates, slaughter waste, and their mixture. In the research, the highest average methane yield of $0.65 \text{ NLCH}_4 \cdot \text{gTS}^{-1} \cdot \text{eli}^{-1}$ was achieved in mesophilic operation at an organic loading rate of $4.2 \text{ gTS} \cdot \text{L}^{-1} \cdot \text{d}^{-1}$.

In the paper “Evaluation of the Characteristics of Pollutant Discharge in Tomato Hydroponic Wastewater (HWW) for Sustainable Water Management in Korea” written by Son (Contribution #3), the aim was to analyze the extent to which nutrients discharged from tomato horticulture are loaded into rivers, as well as their impact on rivers according to environmental standards. This study included 103 tomato hydroponic wastewater samples.

The paper “The Impact of Various Types of Cultivation on Stream Water Quality in Central Poland” presents data on the spatial dynamics of selected ion concentrations and their land cover dependence in lowland agricultural catchments. Water samples were collected from 30 sites located across small tributaries of the rivers Bzura, Pilica, and Radomka for chemical analysis of their NO_3 , NO_2 , NH_4 , Ca, Mg, K, Na, As, Ba, Sr, and V concentrations (Contribution #4).

Chen et al. (Contribution #5) in paper “A Newly Isolated *Rhodococcus* sp. S2 from Landfill Leachate Capable of Heterotrophic Nitrification and Aerobic Denitrification” investigate a high-performance HN-AD bacterium that can remove nitrogen without nitrite accumulation under aerobic conditions. In this experiment, *Rhodococcus* sp. S2 was isolated from landfill leachate collected from a wastewater treatment plant in Shenzhen (China). According to the authors, the results suggest that *Rhodococcus* sp. S2 might be a promising candidate for wastewater nitrogen removal.

Sanitary landfilling is the predominant process for solid urban waste disposal, but it generates leachate that poses environmental, economic, and social concerns. In the review paper “An Extensive Analysis of Combined Processes for Landfill Leachate Treatment” prepared by Jamrah et al. (Contribution #6), combined processes for landfill leachate treatment are analyzed. As indicated by the authors, the concept of combining treatments has proven to be a more efficient and successful approach.

The paper “Application of the Monte-Carlo Method to Assess the Operational Reliability of a Household-Constructed Wetland with Vertical Flow: A Case Study in Poland” written by Migdał et al. (Contribution #7) models the operation of a vertical-flow constructed wetland (VF-CW) for domestic wastewater, using Monte Carlo simulations and

selected probability distributions of various random variables. The novelty of this research is the implementation of the indicated mathematical simulation methods for analyzing the reliability of the operation of the domestic wastewater treatment facility.

Audino et al. in their paper “Pharmaceuticals Removal by Ozone and Electro-Oxidation in Combination with Biological Treatment” (Contribution #8) investigated the efficiency of two advanced oxidation processes, ozonation and electrochemical oxidation, applied individually or in combination, in the removal of contaminants of emerging concern contained in hospital wastewaters, focusing on pharmaceuticals. As indicated by the authors, to efficiently treat hospital wastewaters (or other kinds of wastewaters containing pharmaceuticals), it is necessary to combine novel biological treatments with AOPs to efficiently remove CECs, micropollutants, and bacteria.

Arsenic-containing mine wastewater causes serious harm, has a wide distribution, and has a long duration of pollution. Feng et al. in their paper “Study on Properties of Micro-Nano Magnetic Composite Prepared by Mechanochemical Method of NdFeB Secondary Waste and Removal of As (V) from Mine Water” (Contribution #9) used the mechanical ball milling method to activate NdFeB secondary waste to prepare micro/nano-magnetic composite materials, the main components of which are Fe_2O_3 , Fe_3O_4 , and C.

The review paper “Integrated Process of Immediate One-Step Lime Precipitation, Atmospheric Carbonation, Constructed Wetlands, or Adsorption for Industrial Wastewater Treatment: A Review” (Contribution #10) discusses industrial wastewater treatment strategies, with a special focus on the immediate one-step lime precipitation process, atmospheric carbonation, constructed wetlands, and adsorption.

3. Conclusions

The Special Issue “Water, Wastewater and Waste Management for Sustainable Development” contributes selected aspects of research and reviews on water, wastewater, and waste management also in the context of sustainable development. The topics covered in this Special Issue were diverse due to its broad scope. The area of water, wastewater, and waste management is extremely important in the global context of the biosphere, industrial, and municipal sectors. The editors of this Special Issue would like to thank all the authors involved in the project and invite further scientific activity in this area.

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List of Contributions:

1. Madeira, L.; Ribau Teixeira, M.; Nunes, S.; Almeida, A.; Carvalho, F. Reuse of Treated Slaughterhouse Wastewater from Immediate One-Step Lime Precipitation and Atmospheric Carbonation to Produce Aromatic Plants in Hydroponics. *Water* **2024**, *16*, 1566. <https://doi.org/10.3390/w16111566>
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