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22853 | Advanced Treatment in Constructed Wetlands: The Role of Photocatalytic Modules and Nanostructured Filters

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Background & Aim: Constructed wetlands (CWs) have emerged as a leading nature-based solution (NBS) for wastewater treatment, offering multiple benefits such as low maintenance costs, high pollutant removal efficiency, carbon sequestration, biodiversity enhancement, and aesthetic value (Justino et al., 2023; Kadlec, 2008). However, in tourism facilities, two major challenges affect wastewater management: seasonal variability in wastewater composition and volume, and the lack of connection to centralized treatment systems (Calheiros et al., 2015). To address these issues, a decentralized CW system was developed, operating alongside a septic tank for wastewater collection. This horizontal subsurface flow CW has been operational since 2010. The study aims to integrate photocatalytic modules and nanostructured filter technologies with CW to enhance water quality for irrigation. **Methods:** wastewater quality characterization will be performed according to national legislation and the efficiency of the photocatalytic modules and nano filters will be assessed. **Results:** CW efficiency is being assessed, and ongoing studies are being carried out related to the best approach for the implementation of the photocatalytic modules and nanostructured filters technologies. **Conclusions:** By integrating advanced filtration and photocatalytic technologies, this research intends to develop a highly efficient, self-sustaining, and ecofriendly wastewater treatment system suitable for the tourism industry. The findings will contribute to the broader application of CW in decentralized wastewater management and sustainable water reuse strategies, most especially in a tourism facility.

Keywords: Constructed wetlands, decentralized wastewater treatment, tourism facilities, photocatalysis, nanostructured filters, nature-based solutions.

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