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ENGINEERED ECOSYSTEM: BIOTECHNOLOGIE IN DECENTRALIZED WASTEWATER TREATMENT FOR ISOLATED AREAS

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Abstract
In isolated, rural, or peri-urban regions of developing countries, the lack of access to sewage treatment services is due, among other reasons, to the low investment in decentralized solutions. The aim of the study was to present the monitoring results of a decentralized wastewater treatment system, Engineered Ecosystem (EE), which has been operated for over a decade at the Center for Environmental Studies and Sustainable Development (CEADS) of the Rio de Janeiro State University (UERJ) in Ilha Grande, south coast of the Rio de Janeiro State, as a viable option for decentralized wastewater treatment for rural areas or isolated communities. The EE is formed by the combination of conventional treatment technology, such as septic tank, submerged aerated filter and mixed biofilter, with the biotechnology (as a tertiary treatment) of four constructed wetlands with different flow types (flow directions), three of which were vegetated with macrophytes and one with microalgae. The system was designed to treat the equivalent sewage of 14 inhabitants a day (100 L/hab/day), occupying a total area of 25 m². This system also has characteristics such as being compact and with low operating and maintenance costs. Furthermore, the results obtained indicate high efficiency in the removal/biodegradation of pollutants by biological oxidation of organic matter (assessed as COD = 85%), removal of nutrients (total nitrogen = 89%) by biomass absorption and nitrification/denitrification reactions. In addition, the final effluent presented the following characteristics: DO = 2.76 mg/L; pH = 6.73; ORP = 106.5 mV; and turbidity = 16.7 NTU. The daily production of dry biomass by the macrophytes in the wetland tanks was estimated at 43.8 g/day. The performance of EE has been satisfactory, and it can be considered a viable alternative to universalize access to domestic wastewater treatment in isolated communities, being a sustainable and low-cost biotechnology.

Keywords: Constructed Wetlands, Microalgae tanks, Sewage treatment.

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