A GREENER FUTURE:

ECO-FRIENDLY SOLUTIONS FOR A HEALTHIER PLANET

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Abstract: The need for the development of eco-friendly technology is a result of the rising concern over how industrial operations affect the environment. Water contamination is one of the most important environmental problems. In order to remediate dirty water, a number of technologies have been developed, but their effectiveness is constrained and they have limitations like high operating costs and secondary contamination. In this study, we explore the possibility of employing algae-based water treatment systems as a long-term, environmentally responsible alternative. Two tanks, one with a photobioreactor for algae culture and the other with a reactor for wastewater treatment, made up the study's laboratory-scale experimental setup. The effluent came from a local industry and had previously undergone standard treatment. We employed Scenedesmus obliquus and Chlorella vulgaris, which were injected into the wastewater treatment reactor after being cultivated in the photobioreactor. The outcomes demonstrated that the system based on algae was capable of removing up to 85% of the contaminants from the wastewater. Scenedesmus obliquus was more successful at removing organic debris, whereas Chlorella vulgaris was better at removing heavy metals. There was no secondary contamination, and the method was economical. The cultures of algae were discovered to be a good source of biomass for generating electricity. The study shows that using algae-based water treatment devices is a viable and environmentally benign approach. A cost-effective and efficient alternative to traditional wastewater treatment techniques, the system also has the potential to generate electricity. The discoveries have important ramifications for the companies that pollute water, giving them a practical and environmentally favourable wastewater treatment option. To maximise the system's performance and look into its economic viability, more research is required. The study emphasises the significance of environmentally friendly and sustainable technology for a greener future.

Keywords: *Algae-based systems; Water treatment; Eco-friendly; Sustainable; Industrial wastewater*

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