Masters Dissertation Showcase
Year 2023

	Department: Environmental Engineering Programme: Masters in Engineering Specialization: Environmental Engineering
1	**Title of the Thesis** Urban photobioreactor for climate change mitigation and biofuels production
2	**Abstract** The extensive use of fossil fuels resulting in increased amount of GHG's is causing climate change and smog formation. There is global interest in developing sustainable biofuel production to reduce carbon dependency. Microalgae helps in CO_2 sequestration from atmosphere and gives us oil (lipids) for as a potential source of raw material for third generation biofuels production as carbon neutral fuels. Flat panel photobioreactor of microalgae has been explored in detail as a climate change mitigation option in urban areas, that have high levels of pollutants in the atmosphere. The basic idea behind this research project includes microalgae cultivation in a flat panel photobioreactor under controlled environment, which will provide information regarding its potential usage in the urban areas for air quality improvement. **Process** In this project the microalgae cultivation in a flat panel photobioreactor, will be monitored in terms of microalgae culture / water ratios, temperature variation and flue gas concentration. The effect of growth parameters on the microalgal biomass productivity (g/L/day) and lipid yield (%, w/w) will be investigated. Moreover, the characterization of the extracted lipids (fatty acid profiling) will be conducted to investigate its compatibility requirement to produce biofuels. **Outcome** The main outcomes of this research study are as follows: 1. Eco-friendly path of low energy and low-cost solution for reducing greenhouse gas emissions and improving air quality in urban areas 2. Biological removal of nitrogen oxides by microalgae to reduce smog formation 3. Microalgae as a high source of proteins (converting NOx into proteins) 4. Indigenous need for sustainable technology development in the country To comply with UN Sustainable Development Goals (No. 7 -Affordable and Clean Energy, No. 11 – Sustainable cities and communities and No. 13 – Climate action).
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Figure 1: Fabricated Urban photobioreactor