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Comprehensive Greenhouse Gas Emissions Assessment at the University of Sri Jayewardenepura: Establishing an Evidence Based Framework for Carbon Neutral Campus Operations**Weerakkodi, T.N.^{1*}, Ranasinghe, D.M.S.H.K.¹, Pasan Dunuwila¹, Miller, E.²**¹*Department of Forestry and Environmental Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*²*Faculty of Environment and Urban Change, York University, Canada***weerakkodinethmi@gmail.com***Abstract**

Universities worldwide face mounting pressure to quantify and reduce environmental impacts, yet comprehensive ecological footprint assessments remain scarce in South Asian institutions. The University of Sri Jayewardenepura, recognised as Sri Lanka's first carbon neutral university following the Centre for Sustainability Initiative (2019-2022), undertook an expanded greenhouse gas assessment to establish a framework for ongoing sustainability management aligned with Sri Lanka's Nationally Determined Contributions and institutional commitments. This study applied Greenhouse Gas Protocol standards to quantify Scope 1 (direct), Scope 2 (purchased energy), and Scope 3 (indirect) emissions for the main Nugegoda campus, serving approximately 15,000 students and 1,500 personnel during 2022-2025. The assessment adopted biocapacity accounting methodologies adapted from York University's Ecological Footprint Initiative, incorporating primary data on stationary combustion, electricity, fleet operations, waste, water, business travel, and commuting. Data sources included electricity billing records from multiple meters (2022-2024), generator diesel records showing 7,456 L consumed in 2025, solid waste data revealing annual generation of 520-614 collection cubes (approximately 780-920 t), water monitoring, fleet maintenance records, and travel expenditure. Preliminary quantification identified purchased grid electricity as the dominant Scope 2 source, contributing approximately 189 tCO₂e annually based on 2023 consumption of 269,547 kWh and Sri Lanka's grid intensity of 0.7 kgCO₂e/kWh. Solid waste generation was a significant Scope 3 contributor at approximately 391-461 tCO₂e annually, whilst backup generators contributed 20 tCO₂e in 2025. Partial quantification yielded 1,907 tCO₂e from measured sources; however, excluding substantial Scope 3 categories like commuting, procurement, and food services suggests total emissions significantly exceed this figure. Recommendations include implementing renewable energy to reduce grid dependence, enhancing waste segregation and composting to divert organic waste, optimising backup generators through improved maintenance, establishing systematic commuting surveys, and developing procurement emission tracking. The assessment positions USJ to establish evidence-based reduction targets, maintain sustainability leadership in South Asia, and contribute methodological advances for tropical university carbon accounting.

Keywords: *Greenhouse gas emissions, Carbon accounting, Ecological footprint, Sustainable universities, Campus sustainability*