Environmental sustainability gaps in research laboratories: Findings from an audit at the Faculty of Medicine, University of Colombo

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Research laboratories contribute significantly to environmental degradation through energy consumption, water use, waste generation, and hazardous chemical handling. Globally, the pharmaceutical sector, closely linked to laboratory operations, has a carbon emission intensity 55% higher than the automotive industry. Despite this, Sri Lanka lacks structured frameworks to promote sustainable laboratory practices. This project evaluated sustainability practices in selected postgraduate laboratories at the Faculty of Medicine, University of Colombo, to identify critical gaps and develop a locally adaptable intervention. A structured audit was conducted in three postgraduate laboratories using a checklist adapted from internationally recognized frameworks, including LEAF, WHO guidelines, and MyGreen Lab certification criteria. Data were collected through observation, staff interviews, and document review. Compliance in four domains—electricity use, water conservation, waste management, and hazardous chemical handling—was assessed using a four-point scale ("Always", "Sometimes," "Rarely," "No"), adapted from template checklists used in certified accreditation systems. These served as the benchmark for comparing observed practices. To minimize bias, all assessments were conducted by a single trained investigator. Estimated energy use of key equipment was used to approximate carbon emissions. Water conservation had the lowest compliance (22.2%) due to a lack of leak detection and inefficient washing. Waste management scored 53.3%, with moderate reuse and segregation. Electricity conservation scored 36.4%, hindered by unoptimized freezer use and poor organization. Hazardous chemical handling scored 44.8%, with gaps in inventory, spill preparedness, and non-compliance with WHO-recommended storage practices. Equipment emissions exceeded 3 metric tons CO_2, surpassing certified green lab targets (<1.5 t CO_2/lab/year). The audit revealed critical sustainability gaps. The evidence-based SOP developed offers low-cost, standards-aligned interventions. As per the audit cycle, these procedures must be implemented and followed by a re-audit. Institutional adoption and regular audits are essential to reduce the environmental impact of research in Sri Lanka.

Keywords: *Sustainability*, *Laboratory audit*, *Research environment*, *Waste management, Water conservation*