

## Sustainability and green laboratory practices

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Healthcare systems contribute an estimated 4-5% of greenhouse emissions globally, in New Zealand this figure has been reported at between 3-8% and is the largest emitter (excluding transport) in our public sector (1). Healthcare facilities operate 24/7 with

a large footprint that impacts the environment, generating large quantities toxic and non-biodegradable waste, consuming high amounts of energy, emitting greenhouse gases and consuming vast quantities of water (Table 1).

**Table 1.** Laboratory-attributed emissions

<p style="text-align: center;"><b>Energy &amp; greenhouse gas emission</b></p> <ul style="list-style-type: none"> <li>- Cold storage, refrigerants</li> <li>- Transport</li> <li>- Equipment</li> <li>- Climate control, air conditioning, insulation</li> <li>- Lighting</li> <li>- Computers, systems hardware and storage</li> <li>- Medical gases</li> </ul> <p style="text-align: center;"><i>Labs consume 5-10x more energy than Equiv. sized office*</i></p>	<p style="text-align: center;"><b>Water consumption</b></p> <ul style="list-style-type: none"> <li>- Heating and cooling equipment</li> <li>- Washing, cleaning</li> <li>- Reagents</li> </ul> <p style="text-align: center;"><i>Up to 60% of water usage in buildings by laboratories* autoclaves can use up to 227L water per cycle*</i></p>
<p style="text-align: center;"><b>Chemicals &amp; materials</b></p> <ul style="list-style-type: none"> <li>- Reagents</li> <li>- Catalysts</li> <li>- Washing, cleaning and flushing</li> <li>- Gases, metals</li> <li>- Paper and printing supplies</li> </ul> <p style="text-align: center;"><i>Implications for wider pollution of air, water and soil</i></p>	<p style="text-align: center;"><b>Waste</b></p> <ul style="list-style-type: none"> <li>- Single-use plastics (e.g. gloves, syringes, pipette-tips, culture plates)</li> <li>- Biological, medical waste</li> <li>- Packaging</li> </ul> <p style="text-align: center;"><i>Biological, medical or agricultural research waste est. ~5.5Mt of lab plastic waste/year or 2% total global plastic waste*</i></p>

\*Royal Society of Chemistry (6), \*My Green Lab (5), Mt = metric tonne

Unequivocal scientific evidence on the detrimental impact of human activity on the planet and the critical environmental tipping points (2), shows that the planet may never recover. On a global scale, conversations, policy and government-initiated projects for reducing emissions have gained significant momentum since the 196 countries, including New Zealand, signed the Paris Agreement (2015) at the UN Climate Change Conference (COP21). As part of this agreement, the New Zealand government committed to reducing our greenhouse gas emissions to 30% below 2005 levels, by 2030 and amending legislation and establishing a Climate Change Commission. Climate-related Disclosures and Other Matters Amendment Act (2021), requires mandatory climate-related reporting and disclosure by publicly listed companies, such as insurers and banks. The Ministry of Health requires the healthcare sector to report its sustainability actions and goals in annual planning and budgeting to meet the Climate Change Response (Zero Carbon) Amendment Act (2019) legislation.

Te Whatu Ora released its baseline Greenhouse Gas Emissions Inventory Report in September 2023 (1), quantifying emissions including; gas (medical and industrial), electricity, transport and waste directly attributed to their operations and reporting a 10.3% decrease in CO<sub>2</sub> emissions between 2019 and 2020. However, they did not provide a breakdown of emissions attributed to clinical laboratories in its charge nor address laboratories specifically in their guidance material (3), released in September 2023 as a; “guide to support and encourage the New Zealand health sector to take an active role in implementing sustainability as integral part of its practice.”

How many of these types of reports and guidelines are paying lip-service to the Acts without taking practical steps towards sustainability for the planet? Or provide the teeth to make decisions, offer effective solutions, resources and assistance to clinical laboratories to meet these initiatives?

Is it too little too late? Afterall we are a mere six years away from this committed target. Statistics NZ reported in 2020

that New Zealand’s gross greenhouse emissions showed no sustained reduction when compared with 2005 figures (4). Has sustainability been given the sense of urgency and priority that it deserves?

The guidelines only serve to put the onus back on hospitals, laboratories and primary healthcare providers to do all the heavy lifting. As we dive into 2024, the medical laboratory profession and healthcare services in New Zealand remain in crisis. Any management plans to minimise emissions, reduce waste and implement green practices, will ultimately fail, if they compound upon already untenable workloads and pressure for the current healthcare workforce, without providing sufficient and additional resourcing and opportunities.

The creation of sustainable and green practices in laboratories requires a multidisciplinary approach that cannot be undertaken solely by the laboratories and quality managers but involves sweeping changes to company culture from the top down. Healthcare management must provide the influence, financial support and provision of dedicated resources. Organisations need to establish networks across different business sectors (e.g. construction (energy efficient building /laboratory design), transport, supply chains, suppliers and manufacturers), coordinate rollout of new technologies, advocate for change across healthcare professions and researchers, promote and recognise achievement by rewarding laboratories for their sustainability initiatives, negotiating shared spaces and pooling resources, securing public funding for green initiatives and offering sustainability education in academic degree courses.

There are established certification routes, for example; Liggins Institute Laboratory, at the University of Auckland, is the first university research laboratory in New Zealand to achieve ‘My Green Lab’ certification (5) in 2022. In March 2022, the Awanui pathology group obtained Carbon Reduce Certification (*emissions to ISO14064-1 requirements*) from Toitū Envirocare ([www.toitu.co.nz](http://www.toitu.co.nz)). But for most laboratories, it is more practical to develop steps, targets and measures to reduce energy

emissions, chemical and material use, waste and water usage as they apply to their own workflows. Multiple online resources provide tips, tools, networking and interactive guides to get the green ball rolling, including, My Green Lab (5), the Royal Society of Chemistry (6) and labconscious (www.labconscious.com). Literature also provides an increasing number of studies and commentaries for clinical laboratories, for example, Lopez (7) presented methods to review current lab operation and introduce sustainable practices using the quality improvement model PDCA tools to develop key targets and actions.

There is wide agreement and good-will amongst laboratory and healthcare workers to reduce the impact of their work on the environment. Healthcare professionals are astutely aware of the barriers and challenges for a working clinical laboratory and the compromises between implementing sustainability actions and ensuring the health and safety of workers, patients and the public, and maintaining testing efficacy, quality and throughput. Consultation across and up and down the sector during planning and implementation is crucial, as will buy-in and participation in any decision-making and implementation.

In the same way that confusing and inconvenient recycling instructions imposed by local government are causing green or recycling fatigue that threaten our eco-friendly behaviour in the community, overly complex measures, under resourcing, impossible targets and poor management will only serve to further erode the goodwill of the profession and fail to implement sustainable and green practices that the healthcare sector and the planet cannot afford to lose.

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