REPORT ON PROCEEDINGS BEFORE

PORTFOLIO COMMITTEE NO. 2 - HEALTH

INQUIRY INTO CLEAN INDOOR AIR

CORRECTED

At Jubilee Room, Parliament House, Sydney, on Wednesday 1 April 2026

The Committee met at 9:30.

PRESENT

Dr Amanda Cohn (Chair)

The Hon. Susan Carter (Deputy Chair)
The Hon. Greg Donnelly
The Hon. Sarah Mitchell
The Hon. Emily Suvaal

* Please note:
[inaudible] is used when audio words cannot be deciphered
[audio malfunction] is used when words are lost due to a technical malfunction
[disorder] is used when members or witnesses speak over one another.

CORRECTED

The CHAIR: Welcome to the third hearing of the Portfolio Committee No. 2 - Health inquiry into clean indoor air. I acknowledge the Gadigal people of the Eora nation, the traditional custodians of the lands on which we are meeting today. I pay my respects to Elders past and present, and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of New South Wales. I also acknowledge and pay my respects to any Aboriginal and Torres Strait Islander people joining us today. My name is Amanda Cohn and I am the Chair of the Committee.

I ask everyone in the room to please turn their mobile phones to silent. Parliamentary privilege applies to witnesses appearing from New South Wales in relation to the evidence they give today. However, it does not apply to what witnesses say outside of the hearing. I urge witnesses to be careful about making comments to the media or to others after completing their evidence. For witnesses appearing from interstate, the protections with respect to the evidence they give is more limited. I urge witnesses to be careful about the comments they make during their evidence and to avoid making adverse reflections about others. In addition, the Legislative Council has adopted rules to provide procedural fairness for inquiry participants. I encourage Committee members and witnesses to be mindful of these procedures.

Ms AMANDA WATSON, Individual with lived experience, affirmed and examined

The CHAIR: Welcome, and thank you for making the time to give evidence this morning. Would you like to start by making a short opening statement?

AMANDA WATSON: I'd like to thank the Committee for the opportunity to present my personal testimony to you today. I'm here as a biotoxin patient and because of my lived experience of being a tenant in New South Wales. Proudly, I'm a mother. I'm also a director for a not for profit, which has been a path that led me here. I think I was incredibly frustrated and disappointed in the system being so broken and that we weren't afforded any protections at all as a family, particularly as a mother trying to protect my child throughout this ordeal. It's been 12 years, which is almost half of her life. Sometimes I despair about how we're ever going to get back some of what we had—some of our old life.

I looked at things like Maslow's hierarchy about survival needs. I looked at the human rights, at adequate housing. I remember a few years ago I mentioned that to somebody and they said, "You'll literally have everybody rolling their eyes at you if you start to mention things like human rights." Habitability—housing is not adequate if it does not guarantee physical safety or provide adequate space, as well as protection against the cold, damp, heat, rain, wind and other threats to health and structural hazards. As you can see from my submission, we've been to hell and back, but I'm very heartened to read that last month the New South Wales Government announced an inquiry into the human rights Acts for New South Wales. But will it be enough? And where will it be applied?

The Tenants' Union is advocating for a humans rights Act for New South Wales to include the right for adequate housing when the New South Wales Government develops these laws and policies. You know that I've been to several of the hearings because I wanted to better understand what it was you were trying to achieve and understand the questions that you were asking. One of the things you keep asking is: Where can you look to for guidance as to best practice? Firstly, I would suggest reviewing the tenancy legislation in Victoria, which is not yet perfect but far more progressive than New South Wales. For clarity, I conferred with Leo Patterson Ross, who is the CEO of the New South Wales Tenants' Union. Victoria has better tenant protections and minimum habitability standards that are enforceable, whereas in New South Wales tenants are placed in the position of having to be the main enforcer of contract terms.

In Victoria, the minimum standards have become a legal requirement in order for a landlord to place a property on the rental market. It is unlawful for the landlord to list a property that doesn't meet these standards. There is a Victorian Government portal to report substandard properties and significant landlord breaches for investigation. The penalties are significant. Victoria and Queensland both nominate a property being mould-free as a habitability standard. Currently in New South Wales the habitability standard doesn't address mould directly, and the general understanding of habitability is not clear enough. My NCAT experience that I documented in my submission is a case in point as to this failure.

Perhaps there needs to be a regulator with actual consequences for noncompliance, property standard checks and an introduction of landlord registration schemes. Please bring back David Chandler or somebody of his calibre, with his chutzpah, to tackle such an onerous task. There needs to be increased financial support for the Tenants' Union and the Tenants Advice and Advocacy Services, who really are the only hope that tenants have, especially given the way that NCAT are skewing the narrative of what cases they choose to publish. It is imperative that they receive significantly more funding to ensure any tenant attending NCAT has access to a tenant advocate, if they choose, to better navigate such an unfair and uncertain system.

I had actually put in an application—because we were so sick—to get legal support, which I was prepared to pay for, and that was knocked back. I don't consider myself a stupid person, and I try to do my due diligence in understanding the legislation, but I have just been flummoxed every time I go in there about what appears to me to be personal bias or an interpretation of the law. Some of it isn't even just in the Residential Tenancies Act. They're citing other Acts. I think there's an NCAT Act as well. As tenants, we wouldn't have any knowledge to actually go and look in those places. Then, when you get a determination, they're using Supreme Court and High Court case judgements as examples of why they've reached a particular determination. If we have to go to New South Wales case law, again, how would I even begin to know to look for those sorts of high-ranking legal cases for a better understanding of what my prospects of success might be?

The New South Wales Government noted in its election commitments to conduct a review of NCAT, which seemed to be closed to public consultation. The NCAT Service Charter—unfortunately, I referred to it as a constitution in my submission, but it's the NCAT Service Charter—is a testament to their failure on almost every single point that they're aiming for. None of what has happened to us over three consecutive tenancies can be described as a statistical anomaly. It is a systemic failure, and NCAT actually have a part to play in that. If we look at the mould remediation industry, I see a lot of "IICRC", "TGA approved", "accredited", "certified" and

"licensed" stated on websites and reports for a lot of mould testing or remediation experts. But let's use that term very loosely, as there really are no standards in this industry, and many don't follow any of the standards that they display, such as the IICRC. Then add in dubious lab test results pertaining to the treatment efficacy, all purposely designed to create a false illusion for unsuspecting customers.

Then there's a subjectiveness of it. My landlord had two reports that he engaged the same contractor whilst I was still in residence, and one after I left. Both of those reports actually contradict themselves. Suddenly, we went from high, abnormal results to everything's okay, including the carpet, which I'd had specifically sampled because I had purchased that and spent five and a half thousand dollars of my own money when I moved in to make sure that we were going to be safe, only to find that it very specifically was contaminated and should actually, —even according to his own expert's report—be removed. And it's still there, because I saw it on the listings on Domain and realestate.com.au. I could see the indentations in the carpet where my furniture was. They even took me to NCAT after I had had three separate conversations about the state of that carpet, and I said, "Do you still require me to do a professional clean?" I was simply told that it needed to be vacuumed and left tidy.

Then, after I vacated, they actually took me to NCAT to try to claim my bond as well. Thankfully, the conciliator was pretty switched on, and I had documented everything because I've learned the hard way: You always have to have a witness, and everything has to be in writing. The concern is around these guidelines. There are no real guidelines in this industry. Dr Heike Neumeister-Kemp, who has helped us with our environmental testing, has advised that she and other collaborators have updated the Australian mould guidelines, which will be relaunched later this year. The Northern Territory Government will be tabling it as a white paper for their own remediation guidelines. She has indicated that she would be happy to share that with the Committee when it's available.

Why is mould more problematic now? Somebody said, "It's been around since the biblical ages." Aside from the building standards—which we've been talking about in these Committee hearings—changing, the tightening of the building envelope to increase thermal capabilities has reduced air exchange. But, in my lifetime, laundries were outside. We didn't have dryers, we didn't have dishwashers and we didn't have water filters in sinks or in the fridges. We didn't have ducted air or split systems; we just had an evaporative cooler. These are all points of water ingress and potential for mould, not just if they have a leak, but also if they're not maintained and serviced.

That is why, when we had our property tested, the inverter air conditioners were just full of bio-contaminants. There's no mandate that they actually be cleaned regularly at all. I think that they have to be, because that's the air that we're breathing. That's the purpose of part of this inquiry. There were lots of questions around air exchange. Occupants tend not to open windows if there are no flyscreens. The awning windows that we have in our current apartment block—with the restrictors, obviously, for safety—just have no air flow. The air can't go up and under. If it had been a sliding window that had a lock mechanism then air could travel. It's just practical stuff.

I think I mentioned in my submission that we lived in a heavily tree-laden street. My landlord didn't want to spend the money cleaning out the gutters, and that was the sole cause of the water backing up, because it had nowhere to go. Another thing is that mould is found in unexpected places. Front-loaders are not just harbouring mould in the door seal; front-loaders don't fully drain. The moisture remains in the drum and sump, and residual water is in the outer tub, which is outside the visible drum, and this supports microbial persistence. Then we have low-temperature washing, all in the name of efficiency, but that doesn't sterilise, and then you have survival of bacteria and fungi.

Some studies suggest that front-loaders have up to a 500 times higher microbial load than an average top-loader, and now most new buildings facilitate stacking washer-dryers or under-bench washer-dryers, and don't always accommodate a top-loader. There's a gentleman in the United States who has a blog. He's a building expert and he's also a biotoxin patient. He was incredibly careful in building his new home to make sure that it didn't have any environmental contamination. He bought a front-loading washing machine and contaminated his entire property. The centrifugal force just thrust all of that contamination out into the environment.

Something else is that, as a biotoxin patient, now I know I will never live in a building that has a concrete slab or that is built on or around sandstone, is built at the bottom of a hill or abutting excavated earth, nor any that have flat or inverted butterfly roof lines that can inhibit run-off or be a water collection point. I would not live near dense foliage or anything that would inhibit airflow or sunlight, or that retains damp or proliferates fungal spores that could become airborne. I was horrified at the lack of knowledge of the dangers of mould, and particularly after flood events. It was clear we learnt nothing in COVID when, after the Lismore floods, I saw people, especially ADF personnel, trudging through blackwater and dragging out water-damaged and mouldering possessions without any PPE gear at all, oblivious to the dangers. My colleague Sean Di Lizio became unwell

aiding in a clean-up after the Brisbane floods. If you google, you can see his story on multiple sites. He almost died because he was so unwell.

I'm really heartened that the members of this Committee are also facilitating the inquiry into the mould at Calvary hospital. As I have stated in my submission, the same type of mould could be lurking in a residential property and can be just as debilitating or deadly. But NSW Health seems oblivious to that, because you've read the guidelines and the differences between that and SafeWork. I will state it again here today: Mould does not discriminate between a residential or commercial property. As you also would have read, I've been working really hard to try to change the landscape with a level of education and awareness and advocacy.

The main part of the biotoxin study, which was funded by the NHMRC, should be ready for peer review in about four to six months time. Then, based on feedback from the publisher, our biotoxin study team are finalising the final letter of our review article to *Environmental International* about moisture, mould and multi-system malfunction, inflammatory syndrome following inhaled microbial exposure to water-damaged environments. They reviewed well over a thousand documents, and we believe it will represent the most comprehensive review ever available of scientific literature pertaining to water-damaged buildings, mould and the aetiology of mould-related illness. Its publication is hopefully imminent, and I'd be happy to provide a copy to you as soon as it is available.

Another paper, which is "The assessment of visual contrast sensitivity in biotoxin-exposed individuals using four testing methods", was something that I actually thought of. I wanted to see it validated. It has been peer reviewed, it has been accepted for publication and should be available soon. I'm also happy to forward this to the Committee as soon as it is available. One thing that I want to say is that I'm not an expert. I've tried to learn as much as I can because of how much I've been maligned personally. I've been labelled as paranoid delusional, suffering from psychiatric illness, having Munchausen's disorder because I wanted to try to get the medical care that my daughter needed. I think sometimes people underestimate what I call mum logic. AI refers to it as constraint-driven innovation.

We have to think logically about this. This is a really challenging thing to try to get our head around and to get a lot of buy-in from various departments. But, when I go onto various tenant groups, it's really distressing to read the number of people that are in a very similar position and feel such an immense lack of control or any rights, particularly in New South Wales. You can see again in my submission the absolute run-around I got between all the government departments. Nobody wanted to take any accountability. I'll leave it at that because I'm never short of a word. I'm open to whatever questions you might have. Hopefully you have some.

The CHAIR: Thank you for your very extensive written submission. It was quite a detailed account of what you and your daughter have been through. What I was hoping to very specifically clarify were the responses from the various New South Wales government departments. If I can reflect, what it looks like is departments often pointing you to other departments. I know one of the reasons the Committee wanted to do this inquiry is the opportunity to bring together evidence and recommendations that cut across different departments or different portfolios. I think you've mentioned Health, Fair Trading, Strata and Property Services Commissioner, Service NSW. Could we go through each of the government departments you've contacted and what their responses were?

AMANDA WATSON: Sure. Their responses were "No remit," "We don't have anything to do with this," "We don't have any responsibility," which I understand. When I first started this mouldy journey, I had no idea either of the risks to us and my daughter. I didn't know that there were genes involved. I didn't know that I had what they refer to as the dreaded multi-susceptible gene. Not only did I have one; I had two of them, which meant that I guaranteed I passed it on to my daughter. There are a lot of people and government departments that seem to not want to know. The biotoxin inquiry was, I think, in 2018, so it's not like this is just new on the landscape. There were some pretty sound recommendations made by that particular inquiry about what State government needed to do.

I thought a good jumping-off point would be NSW Health. The link that I've referred to you, which has also fundamentally been referenced in the biotoxin inquiry, is pretty much like, "It's an asthmatic response," or, "Just clean it with a little bit of vinegar and dish soap and she'll be right, mate." I rang—like, I'm pretty persistent, as you probably can tell, because I thought there has to be somebody that actually knows something about this. Every part of NSW Health that I tried to engage with just said, "No remit. What we refer you to is the occupational hygienists who are on our website." When I probably called half a dozen of those, because they were referenced by NSW Health, they were all very clear that if it was a workplace, there were clear guidelines and avenues for them to address any uninhabitability or breaches. But in a residential context, there were none.

The CHAIR: I assume this question will need to be taken on notice. Would it be possible to provide the Committee with some of the specific correspondences you've received from—

AMANDA WATSON: No, there were none. It was just all phone calls. The only correspondence I received was from—I will double-check to make sure I didn't get anything from the occupational hygienist, but I took pretty extensive notes in my diary every time that I spoke to anybody. The one person that I thought might have some remit was the environmental officer at North Sydney Council, who was wonderful, and he was horrified. But he said, "We actually have no legislative power except for fire safety. There's nobody for us to report it to." I even went to the mayor and said, "Surely you know somebody who knows somebody that we can start to engage and get something happening." There was nobody. It was North Sydney Council that referred me to the strata commissioner. What was interesting is when you try and contact, most of them are now using Service NSW as a jumping point, which means you get nowhere. There's no contact point as an address and no phone numbers. Again, they just say that they have no remit. There wasn't really anything that I could do.

The Hon. EMILY SUVAAL: Can I just clarify that the strata commissioner also said they had no remit?

AMANDA WATSON: I didn't get to speak to them. I can only speak to the government departments that they use as their gatekeepers. I will say what's interesting over the years in terms of engaging with Fair Trading—which is now fundamentally, I think, managed by Service NSW—is that the quality of the information pertaining to tenancies has reduced dramatically. They often don't want to give you any particular sound advice. Even when dealing with NCAT, the first time that we went—and it was engaging with people like the Tenants' Union, who I was just very fortunate they would give me some advice. They're not there to represent it. They don't have the funding to do it. They can just give you little snippets of information.

With regard to the fact that I got served a retaliatory termination notice as soon as I put in an NCAT claim, they said, "You need to ask the member at the first hearing if you can have the two matters joined together," which I did, and they agreed. But I went back to NCAT and said, "How do I do that?" I think it was four times I was told I simply needed to write a letter, but by the time we got to a determination, it was noted that they couldn't actually rule on it because I didn't apply for another order and have them joined together. I remember even after that determination, I rang NCAT again and said, "If I've got this situation and I need to join this with my matter, what do I do?" I was still told that I needed to write a letter.

The Hon. EMILY SUVAAL: I was interested to explore that. Thank you very much for your evidence so far. It has been really helpful for us, particularly with perspectives of a tenant. I think it has been something that has been really useful to hear. You mentioned in your opening remarks the Victorian legislation and their habitability requirements. I'm just interested to know a bit more from your perspective what you've learned about that, the importance of that, and whether there would be any recommendations you could make to the Committee.

AMANDA WATSON: I think probably people like the Tenants' Union are the ones who are very much across it. It would be worth asking them for some advice, which is why I rang them, because I thought they're going to know better than I do. Again, if you review my submission, you'd see how carefully I looked at whether the property that I was in would be deemed to be uninhabitable based on the current legislation in New South Wales and is there a substantial amount of moisture or water in the ceilings, walls or floors. I made sure that the assessors who came—in fact, I organised to hire a thermal camera to make sure we had further evidence to show those ceilings were wet. Then I go to NCAT and it felt like, "What would you know?"

In fact, I would go so far as to recommend that any building inspection should include thermal imaging and moisture meter readings as a minimum, from a preventative maintenance standpoint, because often these leaks are hidden. So whether you're a homeowner—I would even suggest that we aim in New South Wales to have some sort of habitability inspection, like a building inspection, every two years. I think that three years is too long and five years is too long. Having it every two years would mean that if there is a fundamental problem with the building, it could be addressed quickly rather than getting to the point that I had to deal with. In one of the hearings that I had with a senior member, I was quite shocked to hear him say, "Landlords don't have to maintain properties. They can give you shanties if they want to." At the time I thought, "My gosh, is that his opinion? That's quite shocking." But I came to realise, as I continued through all of this, that he was probably making a commentary on the system.

The Hon. EMILY SUVAAL: Did you ever contact or have anything to do with the Rental Commissioner?

AMANDA WATSON: No—well, I tried. But, again, if you go through Fair Trading/Service NSW, there are no jump-off points. There's nothing to help you access these people. I'm not sure exactly what they're doing, to be perfectly frank. I don't mean to be disparaging, but I haven't seen much in terms of any engagement or protections around these sorts of tenancy issues.

The Hon. EMILY SUVAAL: You also mentioned in your position there was very little accountability or recourse against agents who do not uphold professional standards or protect the rights of both parties under the

contract terms. In terms of property agents, are there specific suggestions you could make, or at least, from your experience of navigating what sounds like a complete morass of different bureaucracies, suggestions to balance that out a bit more? It sounds like there are the issues with the landlords, but there are also the issues with the system that you had to navigate.

AMANDA WATSON: Property agents play a huge part in this in terms of facilitating these sorts of outcomes and being that conduit. I believe, like a HR manager in an organisation, they should be representing the interests of both parties. But it's clear that they don't. We're the commodity, not the property. In my case, I had an agent who had been, let's say, managed out of her position in the agency that I had signed my lease with. They had managed the properties for decades when the landlord's parents had owned them. They managed her out because they said that they'd never had more cases before NCAT or more unhappy landlords and agents. So she took her licence and started her own business working from home. The landlord then gave her the management. I went to my old agency crying and said, "We've got two loose cannons and no outside accountability. I'm really concerned."

They said, "We're actually concerned for you." They refused to continue to manage any of his properties. But she was pretty instrumental in facilitating this. I could spend all day giving you examples about how she doesn't seem to understand the law. From her perspective, it was perfectly okay for me to sign a back-dated lease because she hadn't done her job; it was perfectly okay for me to accept rent increases that I'd never received or weren't valid. When I pointed them out to her months after I realised—because I wanted to do the right thing—their response was to rescind the rent increase and double it.

At one point, when it was clear they weren't going to meet the deadline for NCAT in terms of rectification of the breaches, we had a meeting at the property. My friend was there, and the agent said, "Would it be okay if we asked for an extension?" I said, "Of course, I want it to be done properly." This was actually in relation to the so-called mould treatment—we use that very loosely as well. But I knew them well enough that I contacted NCAT and said, "Could I please just ask what the request was?" They said that they needed an extension because the tenant had been obstructionist. They're trying to blame me for my possessions in the property. They were taking photos as I was moving out and packing up and suggesting that we lived with stuff everywhere.

I suspect that the landlord was a minimalist; that's okay. I think the first three months he yelled at me because I had unpacked boxes in the dining room because we hadn't yet bought furniture from the previous place, and I'd been dealing with my mother unwell up in northern New South Wales. He screamed at me that he was going to terminate me because I had unpacked boxes on his carpet which was the replaced carpet that was old, threadbare and appeared that it had actually come from his other property in Neutral Bay because it had the address on the back of it and that I'd paid $5,500 for. I was so traumatised by what we had already been through that I just acquiesced to this kind of behaviour because it had taken me so long to find somewhere to live. I had a child that was in high school, and I just wanted to get on with it. But it was clear that there are some people that just want to think that they can ride over whatever rights you have as a tenant. I guess this is my opportunity to probably be a bit more forthcoming and try and say that the system is just not working.

The CHAIR: We are already over time.

AMANDA WATSON: I'm so sorry.

The CHAIR: That's all right. It sounds like this is something you could talk about all day if you had that opportunity. There may be additional questions from the Committee, and the secretariat will be in touch about that. Thank you again so much for taking the time to share your experiences with us this morning. It's been very helpful.

(The witness withdrew.)

(Short adjournment)

Ms LAUREN SULLIVAN, Science Policy and Advice Manager, Australian Academy of Science, before the Committee via videoconference, affirmed and examined

Distinguished Professor LIDIA MORAWSKA, FAA, FTSE, Fellow, Australian Academy of Science, Lead Expert, *Indoor air: The science of indoor air and pathways to improve indoor air quality in Australia*, Distinguished Professor, Queensland University of Technology, before the Committee via videoconference, affirmed and examined

Dr DOROTHY ROBINSON, Convenor, Australian Air Quality Group, before the Committee via videoconference, affirmed and examined

Mr DARRYL JOHNSTON, Affiliated Group Member, Australian Air Quality Group, before the Committee via videoconference, sworn and examined

Dr ARUVI THIRUVARUDCHELVAN, Deputy Convenor, Disease/Population Health Special Interest Group, the Thoracic Society of Australia and New Zealand, affirmed and examined

The CHAIR: Welcome back to the Committee's third hearing for the inquiry into clean indoor air. We've got a variety of experts from different organisations forming part of the next session. Before we go to questions from Committee members, you will each have the opportunity to make a short opening statement, if you like. We might start in the room with the Thoracic Society.

ARUVI THIRUVARUDCHELVAN: Thank you for the opportunity to appear today. I am a sleep and respiratory physician. From a respiratory health perspective, indoor air quality is a core determinant of health, not a secondary environmental issue. Poor indoor air contributes to respiratory and cardiovascular disease, worsens chronic illness, and increases the risk of airborne infection. Importantly, evidence shows that harm can occur even at relatively low levels of indoor pollutants, and risks are not often visible until illness develops. A central message of our submission is that clean air should be treated as a work health and safety responsibility, rather than a matter of individual behaviour or comfort.

Consistent with the hierarchy of controls, indoor air risks should be managed primarily through engineering and systems-based controls, including ventilation, filtration, moisture management and the removal of indoor pollution sources. This systems approach is particularly important in high-occupancy and high-risk settings, such as schools, healthcare facilities, aged-care settings and social housing, where individuals often have limited ability to control their environment and where the health consequences of poor air quality are the greatest. The Thoracic Society of Australia and New Zealand supports the development of clear, enforceable indoor air quality standards that set measurable expectations for ventilation, filtration and moisture control, and that are embedded in building, planning and work health and safety frameworks.

Monitoring has a role, but it must be risk based and linked to clear response pathways. For example, carbon dioxide monitoring can assist in assessing ventilation adequacy but only when supported by appropriate guidance and escalation mechanisms. The Committee should also be reassured that practical improvements are achievable now. Evidence-based measures such as improving outdoor air exchange, maintaining HVAC systems, deploying portable HEPA filtration where appropriate and removing high-risk indoor pollution sources can substantially improve indoor air quality in existing buildings.

Commissioning and post-occupancy verification are critical, as minimum compliance does not always translate into safe air in practice. Finally, clean indoor air is increasingly essential for resilience, including during bushfire smoke events and periods of heightened infectious disease transmission. Buildings must be capable of maintaining safe indoor environments if essential services are to continue operating safely. In closing, TSANZ encourages the Committee to treat clean indoor air as a foundational public health and safety protection, supported by enforceable standards, clear accountability and practical implementation. We welcome the opportunity to assist further as this inquiry progresses.

The CHAIR: Thank you very much. I will go to the Australian Academy of Science, if you want to make an opening statement?

LAUREN SULLIVAN: Thank you for the opportunity to appear today and contribute to the proceedings of this inquiry. I'm Lauren Sullivan, science policy and advice manager at the Australian Academy of Science. The academy is an independent scientific adviser to government with the purpose to bring evidence to decision-making, including for public policy, for the benefit of all Australians. The academy has engaged with indoor air quality as a scientific and policy priority for several years, including through our published report and submission to this inquiry.

Following leadership by the Australian Academy of Science and the Burnet Institute, some 250 organisations globally have signed a global pledge to achieve healthy indoor air, the first international effort formally recognising clean indoor air as fundamental for protecting health and safeguarding wellbeing. Poor indoor air quality negatively impacts the health, wellbeing and productivity of Australians. Ensuring clean indoor air in public spaces would safeguard public health, promote equity by making public spaces accessible to the immunocompromised and reduce the burden on the health system from pollution-related illnesses, including airborne pathogens. It would also enhance productivity, reduce absenteeism and strengthen workplace safety.

The COVID-19 pandemic and 2019-2020 bushfire season exposed significant gaps in Australia's readiness to protect people from airborne hazards indoors. It was clear that there was a lack of awareness and measures in place to protect people from smoke entering buildings and from airborne transmission of infectious respiratory particles. Australia has the scientific evidence, technological capacity and policy tools to act now to improve indoor air quality. There is well-established scientific understanding of air pollution, its impact on human health and wellbeing, and associated economic impacts. There are also known, available and affordable technological and policy solutions to improve indoor air quality.

Despite this, no jurisdiction in Australia consistently monitors indoor air quality in public spaces to evidence-informed standards. As a result, we cannot safeguard indoor air quality nor capture the health, productivity and wellbeing benefits from doing so. The academy's report *Indoor air: The science of indoor air and pathways to improve indoor air quality in Australia* was provided to the Committee with our submission. Our report was led by academy fellow Distinguished Professor Lidia Morawska, a globally recognised authority on airborne transmission and indoor air quality, who is appearing with me today. The report outlines the need to develop clear and enforceable indoor air quality requirements and the policy pathways to do so.

It is the academy's view that workplace standards are a strong framework from which to improve indoor air quality. New South Wales could lead the country by introducing monitoring and reporting requirements and workplace standards for indoor air quality, creating an impetus for change to our national work, health and safety framework. The academy recommends a phased approach to achieve clean indoor air in workplaces, firstly with a requirement to monitor without a reporting standard; secondly, by a mandatory workplace reporting standard; and then, thirdly, by an indoor air quality standard for all public buildings. The academy also recommends indoor air quality be elevated as a national health and infrastructure priority, establishing a multidisciplinary advisory council on indoor air quality and developing a national indoor air quality strategy. Thank you.

The CHAIR: Thank you very much. Finally, is there an opening statement from the Australian Air Quality Group?

DOROTHY ROBINSON: Yes, thank you. We are a group of scientists and others concerned about the health impacts of air pollution and we were one of the first to show that properly calibrated low-cost sensors can provide almost identical measurements to the New South Wales EPA equipment. My work, collaborating with other scientists, used low-cost sensors and official EPA measurements to estimate population exposure and associated health costs of air pollution. It was published as two articles in the *Medical Journal of Australia* and another in the *International Journal of Environmental Research and Public Health*.

Our written submission has a wealth of information on the serious health impacts of air pollution—how it affects every organ in the body, including the brain, and increases the risk of heart attacks, strokes, cancers and asthma. In children, it impairs lung and brain development. Professor Stephen Holgate, special air quality adviser at the UK Royal College of Physicians, wrote about wood stove pollution that "exposure before birth can influence health across the entire life course." A New South Wales Government study found that wood heaters, used as the main heating by less than 5 per cent of Sydneysiders, are responsible for 42 per cent of man-made fine particle pollution in Greater Sydney, costing over $2 billion a year. That's thousands of dollars per heater per year. In Armidale, the estimate was $10,000 per wood heater per year.

This is important because outdoor pollution is a major source of indoor pollution in naturally ventilated homes. It's counterproductive to open windows to ventilate homes when outdoor pollution is worse than indoors, but not ventilating creates other problems: high indoor humidity, mould growth, increased carbon dioxide, NOx and other pollutants. We urge this inquiry to find good solutions to this major health problem. Indoor air should at least have the same standards as outdoors. Publicly available data from low-cost sensors in public buildings would allow sensitive people to avoid unhealthy places and incentivise building owners to install filtration, ventilation or other ways to solve the problem. Wood heaters are a low-hanging fruit because the current standard is not fit for purpose. This inquiry should consider how and why this has been allowed to happen and make strong recommendations to remedy the problem for this standard and every other standard that might be similarly affected.

We strongly support the other clean indoor air inquiry witnesses who recommended phasing out wood heaters: Prof Vardoulakis; Dr Anthony Hull from Doctors for the Environment; Arabella Daniel from Clean Air Communities; and also Public Health Association Australia's Dr Alexander Brown, who recommended buyback schemes and making it a lot more difficult to install wood heaters. The United Kingdom Government wants mandatory health warning labels on wood heaters. Given all the health problems they cause, is there any good reason why the New South Wales Government couldn't do likewise? Wood smoke contains the same and very similar toxins to cigarette smoke and is linked to the same health problems. An evening's heating, from burning just 10 kilograms of wood in a modern Australian wood heater, produces a benzo(a)pyrene equivalent of the smoke from over 200,000 cigarettes. It's no wonder Prof Holgate wants us to know that exposure before birth can influence health across the entire life course.

Knowing this, how many people would want to choose wood heating? The New South Wales Government should therefore recommend Waverley Council's development control plan that doesn't allow wood or gas heaters as a model for all local councils and all future local environmental plans. Subsidies to phase out wood heaters would save millions in healthcare costs, as would requiring all wood heaters in urban areas to be removed when houses are sold. All consumers and downwind neighbours, who often suffer more pollution than the wood stove user, should understand that there's no safe standard for wood heaters. Neighbours currently suffering from other people's pollution need effective procedures to protect their health and lifestyle. Planning standards should include air quality considerations, so childcare centres aren't built next to busy roads or other significant sources of air pollution. Many more suggestions are included in our written submission. I and my colleague, Mr Johnston, are happy to answer questions. Thank you for your attention.

The CHAIR: Thank you very much. I've got a few of my own questions and then I'll go to questions from other members of the Committee. I'll start with the Australian Academy of Science. In your written submission you recommend monitoring of four parameters, which is extremely helpful to the Committee in a context where there's such a broad range of different pollutants and pathogens that impact health. It can feel overwhelming in terms of what are the practical steps forward. I'm interested in understanding how that conclusion was reached, why these four parameters—and I note that the written submission cites a paper by Professor Morawska, so I suspect that my question is for her.

LIDIA MORAWSKA: I can certainly answer this question. Ideally, we would monitor absolutely every pollutant which has impact on health, but realistically this is not possible. Monitoring indoors must be done differently than outdoors, because outdoors we can have a monitoring station with large instruments, noisy, which doesn't create problems. Indoors we must monitor in every single space, because we cannot predict what's the concentration in this room based on what's in the room next door. We have to do it differently. Differently means using low-cost sensors. There are low-cost sensors for many different pollutants, but not for all pollutants are they fit for compliance monitoring. They are good for, let's say, research or awareness, but not necessarily for compliance monitoring.

Reaching that conclusion, which was published in our Science papers in 2024, mandating indoor air quality for public buildings, we evaluated the quality of sensors, low cost sensors, in terms of the fit for compliance monitoring and sensors for these three pollutants, which is PM2.5, CO2 and CO, are fit for purpose, in that sense of the performance across the board, which can be used for this purpose. There are still—I wouldn't say challenges—things which have to be taken into account, that they have to be calibrated differently than calibration of outdoor pollutants, but we know how to do it and technologies exist. These three pollutants already have sensors which can be used for compliance monitoring, and this was the reason, and this is the consensus of a group of 44 interdisciplinary scientists across the world.

The CHAIR: Perhaps a follow-up question to Dr Robinson, because you mentioned that some of your research has also involved the use of low-cost sensors. Was that also your experience? I think the four pollutants identified by the Australian Academy of Science were PM2.5, carbon monoxide, carbon dioxide and ventilation rate. Do you agree that that's practical and feasible?

DOROTHY ROBINSON: I agree it's practical and feasible. Our research only involves PM2.5, but obviously carbon monoxide and carbon dioxide are extremely important, and ventilation rate will be the same.

The CHAIR: Can you speak in a bit more detail about your experience using those low-cost sensors in what has become peer-reviewed research?

DOROTHY ROBINSON: Effectively what we did was we co-located the low-cost sensors on top of the EPA monitoring station in Armidale. We've also looked at other relationships, and we found that as long as you do the calibration properly, the low-cost sensors are extremely reliable. Even in our research, we did a publication that showed that they kept their calibration for five years. There are obviously a few rogue sensors that do go funny, but 90 per cent of the sensors—you can tell when they go funny. Basically the ones that work

and are obviously working, they are reliable for well over five years, and they do produce almost identical readings to the official EPA measurements. There are now several different calibrations that can do the job, including the one we worked out for wood smoke and an AQ new one, and another one which works extremely well for a wide range of particle sizes.

The CHAIR: I'll just stick with Dr Robinson for a moment. In your opening statement you said that wood heater standards are not fit for purpose, which is obviously a very strong statement. Can you talk us through the evidence and your reasons for that argument?

DOROTHY ROBINSON: Certainly. The main thing—and I'll send you a link to where Professor Fay Johnston says exactly the same thing in an interview with the ABC. She says exactly that wood heater standards are not fit for purpose. The problem is that they're based on a test which bears little or no relationship to real-life emissions. They found that out by studies in Australia by CSIRO in 2008-09[1] but, more importantly, in New Zealand, where they have the same standard. Essentially, the average emissions from a modern wood heater are eight times worse than the official measurements, and the correlation, or the R-squared, is 0.04. There's absolutely no relationship. There's no way you can look at any measurement on an Australian standard and say it's going to relate to what's going to happen actually when it's installed in somebody's house.

The Hon. EMILY SUVAAL: Can I just jump in with a follow-up for that, Dr Robinson? Why is that the case that they are so much higher?

DOROTHY ROBINSON: I could refer you to an ABC article that said that the chair of the Standards Australia committee was also head of the AHHA, the peak lobby group for the wood heaters. I think the problem with Australian standards is that they seem to be—some of them anyway—dominated by industry, and for many, many years, and possibly even now, they've had a veto. If industry didn't like a change to a standard, it wasn't implemented. That certainly was the case with wood heaters. There was a Senate inquiry into air pollution in 2013, and it found the same thing—that we need a good standard for wood heaters—but that's never, ever happened.

The Hon. SUSAN CARTER: Dr Robinson, have you got any evidence for any other standards that have been influenced by industry and may not be meeting objective safety standards?

DOROTHY ROBINSON: Not particularly. I only know the one for the wood heater standard, and that was because I actually represented the Australian Lung Foundation on that committee in 2007. That was where the committee voted 15 votes to four to implement slightly tighter emissions standards and the wood heating industry objected. The whole standard-setting process was abandoned after that. All I can say is that it's worth looking into whether other standards are similarly affected. I could suggest some that I am concerned about, but I don't have strong enough evidence.

The Hon. SUSAN CARTER: When you talk about the standard-setting practice being abandoned, whose standard-setting practice are you referring to?

DOROTHY ROBINSON: It was Standards Australia that abandoned the standard-setting process.

The Hon. SUSAN CARTER: Sorry, to clarify, just so I've got it straight, you're suggesting that when there was a conflict between the Australian Lung Foundation and the wood heating industry, Standards Australia didn't proceed to set an appropriate standard?

DOROTHY ROBINSON: Yes, that is exactly what happened. You can see the transcript in the 2013 Senate inquiry into air pollution. All the evidence is there.

The Hon. SUSAN CARTER: Was there any outcome from the findings of that 2013 Senate inquiry?

DOROTHY ROBINSON: They recommended stricter standards for wood heaters, among other things. But it never happened.

The Hon. SUSAN CARTER: Was there any reassessment of the way that Standards Australia works?

DOROTHY ROBINSON: Standards Australia had a technical inquiry in 2018 where the idea of the industry veto was recognised and they said that they were trying to avoid that problem. But, in fact, the wood heater standard was reviewed only 12 months ago, or less than that. Basically, the procedure seemed to be no different from what they were then.

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[1] In correspondence to the committee received 7 May 2026, Dr Dorothy L Robinson, Convenor, Australian Air Quality Group, provided a clarification to her evidence.

The Hon. SUSAN CARTER: Your submission appears to focus on wood heaters. Are there other issues that you think we should be aware of or is it primarily wood heaters?

DOROTHY ROBINSON: I think there are many issues and many voices for others—certainly, traffic pollution. One thing that everybody suggests is you should not allow childcare centres, for example, to be situated near busy roads. It seems to be a no-brainer. And yet, unless you know what the air pollution is before you build one of these things, then it's very difficult because children like to play outdoors. There is another particular problem with road traffic, which is diesel pollution. Hopefully this will be remedied by the switch over to electric vehicles. Diesels in general are far more polluting than petrol vehicles.

If you look to some of the statements even 10 years ago—and it's probably still the case—for PM2.5 pollution and even for NOx pollution, you'll find that 70 per cent or 80 per cent or even 90 per cent of the pollution comes from diesel vehicles that only comprise only 10 per cent of the vehicle kilometres. In New Zealand they've done health and air pollution studies. They again point out that they found a lot of problems with NOx pollution. It certainly appears from their data that this is coming from diesel vehicles, which have got the same standard in Australia. We need to fix the standards for vehicles, in particular diesel vehicles, and, as quickly as possible, encourage the diesels to transfer to electric vehicles as the best solution for that.

The Hon. EMILY SUVAAL: Yes, that's quite topical at the moment.

The Hon. SUSAN CARTER: This is a question to all of the witnesses. Forgive me; I'm not a scientist. A common theme appears to me to be the difficulty of stopping outdoor pollution becoming indoor pollution. Is it your evidence that we shouldn't be using natural ventilation? Is it your evidence that we should always be using artificial ventilation?

As a practical thing, how do we address particulate matter in the outside environment in our homes? Any clarification of that would be helpful.

DARRYL JOHNSTON: If I can just add something here. I'm coming to this hearing because I've been campaigning against residential wood smoke for almost 30 years. I know from personal experience the impact that it can have. Every winter my neighbourhood is filled with smoke from wood heaters. I never knew the real danger of wood smoke until my wife and I moved to Canberra in the early 1990s. The home that we purchased at the time had a slow combustion wood heater in it. I never knew the potential health risks until we spent a couple of cold winters enjoying the warm comfort of the fire with our two small children. It wasn't until one winter when our young daughter was rushed to hospital with a severe lung infection. She spent 10 days in an oxygen tent, battling to breathe, and my wife and I took it in turns to sit with her in the hospital. When my wife and I finally got her home, our relief was short lived when our young son developed exactly the same symptoms. We rushed back to the hospital, and he was immediately admitted for a similar lung infection. He later developed asthma.

We felt the wood heater contributed to our kids getting sick. In fact, that was one of the things that the paediatrician pointed to. He asked us what sort of heating we had in our home, and we told him we had a wood heater and he told us to get rid of it. He said it was like our children were living in a house with chain smokers, and we were devastated. We thought we were doing the right thing, using the wood heater properly with the right wood, keeping it maintained and trying to reduce the amount of smoke emitting from the chimney. Instead, we'd endangered our children's lives because, as the paediatrician said, not only did the wood heater pollute outside but it also polluted inside the house. Since then, I've been personally trying to raise awareness about the health impacts of wood heaters with our local politicians, our local environmental health authorities, our local medical experts and my general community to try and encourage them to move to cleaner, more efficient and healthier forms of heating.

However, it's still a big problem in our community. I live in the south of Canberra in the Tuggeranong Valley, which in the year 2000 was identified by Dr Melita Keywood from the CSIRO as being the second most heavily polluted residential area in Australia, the first being Launceston in Tasmania. I have one of these cheap personal air quality monitors in my home—a PurpleAir monitor. We have a network of around 30 of them in Canberra, where citizen scientists measure air quality in their neighbourhoods. There are only three government air quality monitoring stations in the whole of the ACT—one in Belconnen, one in Civic and one in Monash. The PurpleAir monitoring network in the ACT gives us real-time locations of where air pollution is the highest.

What you see when you look at the PurpleAir monitoring map is that we have pockets of residential areas in Canberra where air pollution is absolutely through the roof. These are not picked up by the ACT government air quality monitoring stations. The air pollution in my neighbourhood is so bad at times that, while the house is warm inside, the air pollution from the outside is being drawn into my home. It fills my home, and I've had instances where it has been so bad that it has actually triggered our internal smoke alarm systems and our alarm

systems. I'm getting phone calls from my alarm monitoring station in Sydney saying, "Mr Johnston, you've got a fire inside your house." It's not; it's the air pollution from the outside being sucked inside. We're living with this.

I have friends in Canberra who have health conditions. They have serious heart or lung conditions. They're elderly, and they are imprisoned in their own homes over the cooler months of the year—what we call in Canberra the wood smoke season, which runs from the middle of April to the October long weekend. For several months of the year, they're imprisoned in their homes. They cannot walk outside because the air pollution is so bad, and if they do, they will end up in hospital. I have statements here that I could read to you from these elderly residents who have heart and lung conditions and are imprisoned in their homes.

One of them, she sleeps with an oxygen mask. Her medication is delivered to her by her local chemist. Her groceries, she has to order online; they're delivered to her home. Her hairdresser comes to visit her, her physiotherapist comes to visit her and her family comes to visit. She can't step outside her door. She has to save up her pension. If she has enough money, she's lucky enough to escape to Townsville during the wood smoke season to spend Canberra's wood smoke season with her daughter in Townsville. No-one should have to live like that. I believe that not only does this impact on the people of the Canberra but this impacts on people throughout New South Wales and throughout Australia.

The CHAIR: Mr Johnston, the other witnesses have been patiently waiting with hands up to answer the question, but perhaps the statements that you prepared to provide us from other residents you've spoken to you could provide on notice as a follow-up to the hearing.

DARRYL JOHNSTON: Yes.

DOROTHY ROBINSON: What I was going to say is that it's a difficult issue because there are so many houses all over Australia that are old weatherboard houses. They're probably the majority of the stock, and they're called leaky tents. Certainly I've heard of stories of people who've tried to fix the ingress of air from outside into inside. One person I have been told about spent $100,000 on trying to seal his house, and it still didn't work.

The Hon. SUSAN CARTER: Dr Robinson, I wonder if I wasn't clear. I suppose what I was asking was is it your submission that we should be trying to stop natural ventilation coming into the house and should rely entirely on artificial ventilation?

DOROTHY ROBINSON: My argument was it's probably not practical, unless you want to spend $100,000 per house.

The Hon. SUSAN CARTER: I struggle to see how that would be practical. I agree.

LAUREN SULLIVAN: I can add a couple of things if it would be helpful. Outdoor air being used to ventilate spaces is quite important when that outdoor air is safe. In our report—and I'm sure Professor Morawska is able to add—there are also solutions to ventilate indoor air through HVAC systems and with filters and things like that. One thing that I would like to emphasise to the Committee is that managing indoor air pollution in residential spaces is a challenge. One area that we think governments can have a really strong, immediate impact is in setting enforceable indoor air quality standards for public buildings and workplaces.

The Hon. SUSAN CARTER: Could I ask a follow-up about a slightly different area? On the use of HVAC, there have been some issues raised recently in hospital settings in relation to mould and other contaminants, and questions were raised in relation to whether it is perhaps HVAC related or the improper maintenance of HVAC. I'm thinking particularly of situations at RPA. I wonder if we could start with you, Dr Thiru, about anything you could share with us or any thoughts. Is HVAC the answer? What are the maintenance issues? How do we address air quality for really vulnerable populations in hospitals?

ARUVI THIRUVARUDCHELVAN: That's an interesting question. I can't comment specifically on the issue at RPA. I think HVAC systems are a solution, but they're not a complete solution. Part of what is reflected in that particular situation is the fact that there's not much routine monitoring that's occurring. What I'm trying to say is it's not just in terms of whether the HVAC is working properly; it is also whether monitoring is occurring for other potential pollutants that may not necessarily be well managed by the HVAC, and identifying when the filtration is suboptimal.

The Hon. SUSAN CARTER: I understand in that RPA example that there was construction outside, which is a known risk. I don't know whether there was any additional monitoring undertaken in relation to that construction, but that appears to be the added factor, which sadly caused the deaths of two people in the hospital.

ARUVI THIRUVARUDCHELVAN: I think what's really important is that, while it did result in some people passing away or becoming quite unwell, it probably also affected a lot more people who we don't necessarily know about. The moisture and the mould in the air, and some of the other pollutants that are around,

can make people quite sick with diagnoses that we associate with normal illnesses, like asthma or a little bit of airways disease, and we don't recognise that it's because of the poor indoor air quality, because we're not monitoring and looking out for those other causes.

The Hon. SUSAN CARTER: How common do you think it is that indoor air quality as a factor in deteriorating health is missed or misdiagnosed?

ARUVI THIRUVARUDCHELVAN: I wouldn't say a lot, but I would say probably maybe around 15 per cent or more. I think it's definitely under-recognised, because I think a lot of the time we don't ask the question. We recognise a syndrome or a collection of symptoms as a diagnosis, and we don't always ask why. If there isn't a clear identification, because there's no regular monitoring, we don't notice that. You don't expect to get asthma by going to the hospital, for example. If there's no evidence of poor quality air or of frank mould in a room, you might not ask the question and you might not recognise it.

The Hon. SUSAN CARTER: Is it an education piece for doctors and others to ask those questions? Is it a patient education question? Do you have any thoughts on that?

ARUVI THIRUVARUDCHELVAN: It's all of the above. I think routine monitoring of indoor air quality will be helpful, because having that information shared will often prompt us to think about it. I think it definitely requires education of both patients and doctors, and one of the triggers for that will be routine monitoring.

The Hon. SUSAN CARTER: Again, this is a question to everybody. Perhaps if I start with you in the room, Dr Thiru, and then we can go online. We heard evidence before about air monitoring, and I notice the low-cost monitors have been raised in the submissions. The question I have that keeps being raised is—and the issue of calibration was discussed earlier—can the average person monitor their own air, and who should take responsibility for the results of the monitoring and acting on those results?

ARUVI THIRUVARUDCHELVAN: That is a very good question. To be honest, I'm not sure if I know the answer about who should take responsibility, because everything in life is somewhat shared. I think it's really important that, when people who aren't necessarily aware of the research on these monitors are given them, it's clear what they're expected to look out for and how they're expected to manage it. I guess the point that I make is that I sometimes see patients who come in with a CO2 monitor and they tell me the numbers are very high, and what do I do with this? To be honest, I don't really know because we don't have, as far as I'm aware, a clear recommendation of target ranges. Often what I say is, "Well, if you notice a pattern of a higher trend of carbon dioxide in certain areas than others, then look into improving ventilation." I guess, I think, before we introduce these monitors into the community, we should have some clear instructions about what it means so that people aren't worrying about things that they shouldn't necessarily be worried about.

The Hon. SUSAN CARTER: Professor Morawska—

The CHAIR: I might just try—third time lucky, hopefully—Professor Morawska. Have a crack and see how we go.

LIDIA MORAWSKA: [Audio malfunction].

The CHAIR: I'm sorry. We're losing the sound quality again. What I might suggest, if we can't resolve that during this session, we'll take all of these questions that you've been unable to answer as questions on notice, so you'll have the opportunity to write an answer and submit that, so that we don't miss out on your evidence.

LAUREN SULLIVAN: Do you mind if I comment on the last question?

The CHAIR: Go ahead.

LAUREN SULLIVAN: I can't comment on residential spaces, but the academy's proposal to look at indoor air quality standards through a workplace health and safety framework, we recommend that for a couple of reasons. Through our interaction with experts in the space and stakeholders, it's emerged that the work health and safety framework would be an appropriate way to pursue this because that framework deals with issues around safety and productivity and has that existing duty of care in place for employers to provide a safe work environment for people. It would capture a lot of or a good range of different settings of public buildings where people can be exposed to poor indoor air quality. Through that framework, as well, you can also provide an incentive where businesses that are being tenants and occupants of buildings. If they're interested in having these monitoring systems in place and they're required to report to a standard, that then provides an incentive for those buildings to provide the infrastructure to do that as well. Thank you.

The CHAIR: Dr Robinson's had her hand up for a while.

DOROTHY ROBINSON: I would like to correct what I said earlier: that it's not practical in residential buildings, but it definitely is practical in public buildings, and this is where we all know that public buildings should have monitoring. The way to manage the monitoring is if the low-cost sensors say there's no problem, then you just carry on and we assume that they're right. But, if there is a problem, then there are various qualities of other portable sensors that can be used to check and verify that problem. If the building is high CO, CO2 or NO2—I know NO2 hasn't been mentioned there, but it is an important pollutant and there are low-cost sensors for that—then you can take and use a more high-quality sensor to verify the problem. Again, the thing is, once you're found a problem, you should be looking at benefit-cost analysis to see how much it's going to cost to fix this problem. If it really is something in the thousands of dollars a year by making the air inside that building healthy, whether it's HEPA filters or whether it's more ventilation or the sort of high-quality air conditioning that we have in Parliament House, then why not? I'm getting feedback now.

The CHAIR: I apologise for the feedback. I think that's part of our final attempt at trying to get Dr Morawska's audio working. Professor Morawska, do you want to try one last time?

LIDIA MORAWSKA: It is still a problem. [Audio malfunction].

The Hon. EMILY SUVAAL: I have a follow-on. It might be a question for you, Dr Robinson, or others. There's been a lot of discussion about low-cost sensors this morning. What is a low-cost sensor, and how much does it cost?

DOROTHY ROBINSON: I can answer that. For PurpleAir, they're about $300 to $400. In Armidale, where we've got several, the air quality group bought several of our own monitors, and then we persuaded the council to buy another 20 to 30 monitors. They are important not just because of the fact that they're low cost and they're almost identical to the expensive equipment but because of the spatial variation in air pollution. In Armidale, if you live on the top or out in the country, you've got very clean air, but you can go 50 or 100 metres and you can be covered in pollution. So it's important to know where the pollution is, and it also varies with time of day. Again, the low-cost sensors are really helpful because they tell you when the air is polluted. If you're sensitive, you can look at the monitors and you can say, "I'm going to go into town from, say, 10 o'clock in the morning until four o'clock in the afternoon because the air will be clean then. Then I'm going to keep away and use my HEPA filter at home to solve the problem elsewhere." They're really useful, but they can be $300—even less—or several thousand dollars.

The Hon. EMILY SUVAAL: So they're low cost, but it's relative to other sensors, which are a lot higher in cost.

DOROTHY ROBINSON: Yes. The others are quite expensive—hundreds of thousands.

LAUREN SULLIVAN: If Professor Morawska is in the meeting, she's an expert on these low-cost sensors.

LIDIA MORAWSKA: Can you please repeat the question? I think there were a few questions in the meantime, and I want to ensure I'm answering the right question.

The Hon. EMILY SUVAAL: I was just asking what low-cost sensors were and how much they cost.

LIDIA MORAWSKA: When we're talking about low-cost sensors, we are really talking about low-cost monitors because the sensor by itself is just sometimes like a button—that small. A low-cost sensor—for PM2.5, for example—is about $30, but the sensor by itself is not enough to record the information and transmit the information. So we have to put the sensor in, like, a little box, and once we have it in the little box, protecting, transmitting data and so on, we then have a low-cost monitor. These low-cost monitors vary in price, depending on what they can do in terms of monitoring, storing the data and so on. So there's a difference in price, but we can wire the sensor, for example, into building management systems. So it really depends on how we want to operate them and in what situation to lower the cost but still receive the data.

The Hon. EMILY SUVAAL: There was some discussion earlier on about calibrating them. I'm keen to understand what is involved in that and who can do it.

LIDIA MORAWSKA: When we are talking about who can do it—there was a question before, "Who should take care of monitoring?" and the idea was that an individual would do the monitoring. We are not asking individuals to check the quality of the water from the tap. So when we are talking about who is responsible, it shouldn't be individuals. I'm talking now about public places, workplaces and so on. It shouldn't be individuals responsible for monitoring. It should be done by the operators of the building. This is their responsibility. How to calibrate them? There are, again, many different fields of calibration.

However, calibration of low-cost sensors in the buildings will have to be done differently than it is done in relation to calibration of sensors for monitors in outdoor monitoring stations. If we have, let's say, 200 sensors in a building monitoring CO2 in 200 spaces, it will be not possible for a person—it will be very costly and time-consuming to monitor each sensor by itself. But there are newer network solutions, so this can be automated and done automatically. We've published papers on this. There are methods for doing this. It is to be done. But, again, I'm stressing it's not a responsibility of an individual. I can provide the papers we published on the topic of how to calibrate low-cost sensors operating in buildings.

The Hon. EMILY SUVAAL: Mr Johnston, do you have something to contribute?

DARRYL JOHNSTON: I use the PurpleAir monitor, which is a low-cost sensor, and I have it calibrated to PM2.5 Australian standards and to wood smoke. It's part of a much larger network throughout the ACT. As I mentioned earlier, we only have three ACT Government air quality monitoring stations. I find, just from going to the PurpleAir network on the internet and looking at the map, that we are getting real-time, on-the-ground measurements of air quality in our neighbourhoods around Canberra. You can look right across New South Wales as well, and right across Australia. We're getting real-time, on-the-ground measurements which outweigh what we're getting from the ACT Government. All you have to do is walk around your own neighbourhood and you can see for yourself that there are pockets in Canberra suburbs which have extremely high levels and unhealthy levels of air pollution. But the network shows—not only are we monitoring outdoor air quality, there is also monitoring of indoor air quality in some parts of the ACT as well.

The Hon. EMILY SUVAAL: From the sounds of it, any recommendations the Committee might make may look different in terms of addressing indoor air quality issues in relation to commercial or public buildings, as opposed to indoor air quality for residential settings. We've heard some of the issues around that this morning. If the Committee was going to make recommendations around one or the other, what would that look like? I'm keen to get your views on where we would get the most bang for our buck, if that makes sense.

LAUREN SULLIVAN: I can provide the Academy of Science recommendation in terms of opportunities for immediate impact. It would be in the non-residential space of public buildings, and achieving that through workplace health and safety legislation, which would, as a first step, be putting monitoring in place and then gradually progress that to an enforceable indoor air quality standard.

LIDIA MORAWSKA: If I can add to this, I completely agree. That's what we recommend. In relation to residential buildings, what we briefly mentioned in that science paper from two years ago is that while it didn't directly address this type of building, what we expect in the future is that potential buildings must be designed such that they could meet indoor air quality standards. This means that they must have adequate ventilation, and the ventilation not only relying on opening windows, because when windows have to be closed because of all kinds of reasons, then we have buildings with no ventilation.

Whether this is a completely mechanical ventilation or whether this is hybrid ventilation is an open question. Both those options are available. But they must be, in the first place, designed such that they can provide good indoor air quality and ventilation. But the second aspect is removing the sources of pollution, because if we operate the source of pollution indoors, it may be very difficult to achieve good indoor air quality—in this case, operating wood heaters or smoking indoors, like some people still do, or not having a kitchen hood over cooking devices. These are the things that should and could be done to remove indoor air quality sources. That's an aspect of this.

The Hon. EMILY SUVAAL: Dr Thiruvarudchelvan, I think you mentioned in your opening remarks your expertise around patients with sleep apnoea and respiratory issues. For what proportion of patients that you see would you say their respiratory issues arise from or are exacerbated by the environments in which they live?

ARUVI THIRUVARUDCHELVAN: That is a very interesting question because there is ongoing research on a spectrum of respiratory and other illnesses that are exacerbated by inhaled antigens. I would say at least 30 per cent or 40 per cent of my patients could potentially point to an environmental trigger to their airways disease. Not just airways like fibrosis, interstitial lung diseases through issues—we know that, for example, gas stoves indoors can increase your risk of asthma by 30 per cent. We also know that the PM2.5 particles outdoors coming in can increase your risk of interstitial lung diseases. I'd say that a not insignificant proportion of my patients' problems are probably exacerbated by that.

I suppose the other thing that I think about often is HEPA filtration and the transmission of illnesses in our workplace, for example, and using machines like CPAP for sleep apnoea or having oxygen on at home. Those things can increase the transmission as well. Just like Professor Morawska was saying before, the effects of indoor air quality are not just transmitted from outside; they're created from inside as well. Recognising that is one way

that people could improve their indoor air quality in a residential situation. I agree with the Academy of Science that we should regulate that in workplaces.

The Hon. EMILY SUVAAL: Looking to advice that you would give or how we can raise awareness, it seems to me that workplaces and commercial settings are one thing and residential settings are another. There are obviously levers that we have around that. But, in terms of an individual's own level of awareness, are there things that you would suggest that we could perhaps recommend in order to raise that? Because it does seem to me to be, to some extent, an awareness issue—as we've heard from one of the witnesses today talking about their own wood heater. What would that look like?

ARUVI THIRUVARUDCHELVAN: Often when people develop symptoms, just like Mr Johnston's children, we ask about their environment. I do have patients with asthma, allergic or otherwise, who have filters. They use portable filters in their living rooms or by the bed to reduce the risk of the outdoor pollution and anything that might be going on indoors. Just like with any patient, if we find a trigger, we try to limit it. If they've got a gas stove, we suggest they find an alternative way of cooking—although, as my mum says, gas stoves are the best in terms of flavour.

The Hon. EMILY SUVAAL: That's challenging, right? How does someone afford to then retrofit their house, supposing they even own it? If they're in a rental, that's more challenging still.

ARUVI THIRUVARUDCHELVAN: It is. There isn't an easy solution. I have patients who've moved from some areas to other areas—from the North Sydney area where the plane trees might exacerbate their asthma. They've moved elsewhere to avoid pollution and those sorts of things. They aren't always easy solutions, unfortunately.

The Hon. EMILY SUVAAL: You'd have to be aware of what that trigger is to then be able to address it. When we look to the issue of monitoring, is that something that you would say is of benefit or useful that you've seen?

ARUVI THIRUVARUDCHELVAN: Yes and no. I always find that the public health message has to balance up the anxiety that people will feel with the benefits that they can experience. I definitely agree there is a role, but I agree that if we focus on the workplace and then on symptoms, that might be a good start because I don't want people sitting at home worrying about things that are going to be difficult for them to manage. It's not a perfect answer.

LIDIA MORAWSKA: With awareness, there's no immediate solution. This is something which builds over years—over generations, really. For a very long time, we've been arguing that, first of all, training of medical doctors should include information and training about the role of air pollution. This is right now not included in the textbook for medical doctors. That's one. The second is awareness of the society. If it starts at a later age, how to do it? We've been also arguing that this should be part of school curriculum. It isn't necessary to have it be a long section but something which would teach all kids about this. When we talked about it with the Department of Education, the answer has been there's no room in the curriculum for this, so that's a problem. If we don't teach the society, kids—well, the adults will not know about it. If we don't train the doctors, they won't be taking this into account.

DOROTHY ROBINSON: Can I just add one thing in relation to that? We've mentioned public buildings, but the key public buildings also are schools, hospitals, aged-care centres and childcare centres. We've talked about education. If we have monitoring in all New South Wales government schools, then you will be able to put that into the curriculum so that children will be aware when it is high pollution and when it is low pollution, and they can learn how to do things about it. I think this is one of the things, and it's the same for aged-care centres and for hospitals.

If hospitals don't have proper filtration, then that should be a priority, because the more sick you are—the young people, elderly and infirm people are the ones who suffer worst from air pollution. They're most likely to suffer premature deaths. If you have monitoring in all these places and for hospitals and schools, the New South Wales Government—this inquiry could actually recommend that this happens. I would also suggest for schools we have monitoring not just indoors but also in outdoor play areas. Then we're starting to improve the education and help increase the public awareness of the health effects of air pollution. That would be something that could come out of this inquiry, and I hope it does.

DARRYL JOHNSTON: If I could also add something here, we were talking about the impact that air pollution has on individuals. I just want to draw your attention to the fact that in Canberra—which paints itself as being a clean, green and environmental city—wood heater smoke is the largest single source of air pollution in the ACT. The Australian National University found that wood heater smoke causes an estimated 11 to 63 premature deaths in the ACT each year, at a cost to our economy of $333 million annually.

The Hon. EMILY SUVAAL: I don't know if the Committee can make recommendations to the ACT Government. Anyway, food for thought.

DARRYL JOHNSTON: I wish you would.

DOROTHY ROBINSON: But you can for Sydney and for Armidale.

The Hon. EMILY SUVAAL: Yes, indeed. I have a final question to Dr Thiruvarudchelvan. You mentioned in one of your earlier remarks about issues in relation to various forms of non-invasive ventilation, CPAP and other things. I just wondered if you could expand on that and whether that is something that there are sufficient parameters around, in terms of aerosolising diseases or otherwise, or whether there is work to be done in terms of strengthening some of the infection control guidelines or recommendations in various settings.

ARUVI THIRUVARUDCHELVAN: That's a good question. I would say I think that there is a lot of room for improvement in that area, and I think we really recognised it. We've always been somewhat aware of it, but it really became an issue in the COVID era because that virus was so deadly. We realised that a lot of people, when we got them into hospital, we weren't really able to manage that risk. They weren't allowed to use their CPAP. If they needed non-invasive ventilation, we had to isolate them in separate rooms, in negative pressure rooms, and things like that.

I'm not sure what the answer is, but I think there's a lot more work to be done. Currently, our hospitals are probably not fully equipped for the risks that are associated. COVID was a particularly virulent pathogen, but some of the less virulent ones can spread—cause a minor cold or a flu in somebody—and there is evidence that these can go on and increase your risk of various cancers and other things moving forward. I think it's an evolving space, and I'm not sure that we're necessarily in a position to say that we are doing all the right things at the moment.

The Hon. EMILY SUVAAL: Is there something more we could do, other than putting people in a negative pressure environment whenever they're on a CPAP and have a respiratory illness in an acute setting? Are there other things that society or you with your expertise would recommend as best practice or could work?

ARUVI THIRUVARUDCHELVAN: To be honest, I don't know the answer to that question. I think at the moment the current best practice is in play, but I'm not sure if it's necessarily good enough yet.

LIDIA MORAWSKA: Everybody remembers that at the beginning of the pandemic the recommendation was to clean the surfaces to address the infectious spread of COVID. It took us a lot of time and effort to persuade the WHO and the public health authorities that the virus is spread not through the surfaces but mainly through the air. This applies to basically all the viruses. All respiratory viruses are spread through the air. If they are spread through the air, we cannot measure directly the viruses. We will not be able to measure—that's not something which will be possible soon. We must improve ventilation, which is removal of viruses from every space which is shared by people including and starting with hospitals. It's not just in spaces like negative pressure rooms and so on, but in any space. When people arrive to the hospital, to emergency for treatment, they wait together in the areas which are not properly ventilated. This is a perfect place to get infected. So everywhere, it should be completely accepted that transmission is through the air and measures should be taken to remove the virus or pathogens from the air. This is not being done.

The Hon. EMILY SUVAAL: With those measures, Dr Morawska, are you talking about HEPA filtration and HVAC systems?

LIDIA MORAWSKA: I'm talking about the whole of the HVAC system, which is ventilation and filtration, because the ventilation of an HVAC system has filters as a part of it.

The Hon. SUSAN CARTER: Just to follow up, Dr Morawska, is it possible to filter all viruses out of an indoor air system?

LIDIA MORAWSKA: In principle it is, but we have to realise that those viruses are being generated all the time. As long as there's a person who is infected, the fact that we are removing the viruses, the viruses are still being added; it's a continuous process. The question here is what level of removal is necessary to lower the risk of infection, below so-called RO, so the infection doesn't spread. We're not talking about completely removing the risk but reducing the risk. Appropriate ventilation for the right patient, for the number of people, is critical to lower the risk.

The Hon. SUSAN CARTER: My last question is a general question. To be honest, this is me thinking aloud; I understand you may not have an answer to this. If we adopted air quality standards—conscious of the fact that outdoor pollution also becomes indoor pollution—when we have major events, for example, bushfires, the particulate in the air is going to increase. Do we have any guidance in terms of standards for how long we may

have to suspend air quality standards because of major events outside of our control? Has anybody got any thoughts on that at all?

LIDIA MORAWSKA: We wouldn't have to suspend it because, when we are talking about mechanically ventilated buildings with the right level of filtration and the ability to recirculate the air, we can reduce concentrations to quite low levels. Whether it would be completely meeting the national standards on air quality or the WHO guidelines, there is a question. It depends how long the pollution outdoors prevails. But we could go very, very far with reducing the concentrations.

The Hon. SUSAN CARTER: But conscious of what happened at Prince Alfred Hospital, where it appears that perhaps the filters weren't cleaned to take into account the construction next door, would we also need to have natural disaster guidelines and be cleaning filters more often because of the extensive particulate in the outdoor air?

LIDIA MORAWSKA: Yes, this is that starting point. If maintenance is not adequate, this is a big problem. But if we have routine monitoring, this monitor will also alert to the fact that the pollution concentration is significantly increased, which may alert to more frequent cleaning of the filter.

The Hon. SUSAN CARTER: Do monitors pick up mould and viruses?

LIDIA MORAWSKA: No, monitors don't pick up mould or viruses. They pick up, in this case, particulate matter. But for mould—

The Hon. SUSAN CARTER: So a monitor wouldn't have stopped what may have been a maintenance issue at RPA leading to the aspergillus outbreak?

LIDIA MORAWSKA: No, but when we are talking about—I'm not aware of exactly the details there. But there's WHO guidelines on mould and dampness, and the key issue is to make sure that there's no dampness in buildings. That can be checked and monitored.

DARRYL JOHNSTON: If I can add something here, too, talking from the aspect of someone who's affected by residential wood smoke pollution, when it comes to situations like the Black Summer bushfires, authorities gave us all plenty of warning and those with serious health conditions were able to take steps to protect themselves and prepare. Organisations such as the Lung Foundation Australia and Asthma Australia also advertised and promoted ways that people would be able to protect themselves from the impact of bushfire smoke. However, when it comes to residential wood smoke pollution or wood heater smoke in your neighbourhood, you're given no warning and you have very little time, or no time at all, to be able to prepare yourself for the health impacts of that pollution source.

DOROTHY ROBINSON: Just mentioning that humidity and temperature is a good indicator of indoor air quality. One thing that the Victorian schools did in the COVID crisis was install HEPA filters to reduce the virus load. I think that would be something—the problem is they haven't continued using them because some of the teachers found them noisy. If you try to use filtration, you've got to make sure it's human-friendly and it works. Then again, if you've got the indoor monitors, you can tell that.

The CHAIR: This has been a very long session and we've gone into a few issues in quite a lot of detail. Were there any key points from your submission that you haven't had the opportunity to speak to that you'd like to raise?

LAUREN SULLIVAN: One thing I did want to mention is just going back to the question on what the Committee could recommend around public awareness. The Academy of Science put in a submission to the Federal budget and one of those recommendations was that a public awareness and education initiative could be pursued. I think that's an opportunity that the Committee could recommend to uplift awareness around indoor air pollutants, airborne pathogens, smoke and how individuals might be able to monitor or manage that. Providing that kind of education and guidance would also be an important component if you were to implement enforceable indoor air quality standards to ensure that building owners and operators and employers could comply with those.

DARRYL JOHNSTON: The only thing I would like to add is that our community leaders have taken steps to protect the community from second-hand cigarette smoke, tobacco smoke, but for some unknown reason they appear to be reluctant to take decisive action when it comes to one of the largest single sources of air pollution in our neighbourhoods, and that's been from wood heaters. I hope that this is something that we'll see in the future because wood heaters are polluting our outdoor air and it's impacting on our indoor air as well.

ARUVI THIRUVARUDCHELVAN: The only thing I wanted to say is part of the reason why it's important for us to go down this path is a lot of the people affected by indoor air quality, other than families and individuals in their residential environments, are people who work in hospitals, in Parliament House, in roles that

serve. The consequences of these exposures can result in long-term harm. I think we really should be protecting people in their workplaces.

LIDIA MORAWSKA: If I can add from a very broad perspective, there's a UN resolution declaring that access to clean air, which means clean indoor air and outdoor air, is a fundamental human right. If that is so, it is the responsibility of governments to protect people and to ensure access to clean indoor air. That's the very important role of the Government to take on that responsibility.

The CHAIR: On that note, we'll end this session. Thank you all so much again for the time you've taken to prepare your written submissions and to provide evidence today. If there were questions on notice, and I think there were a couple of questions that Professor Morawska was unable to answer at the start of the session, the secretariat will be in touch with you about those and any supplementary questions.

(The witnesses withdrew.)

(Luncheon adjournment)

Ms YASMIN COX, Executive Director, Regulatory Capability and Harm Prevention, SafeWork NSW, affirmed and examined

Mr MAHINDA SENEVIRATNE, State Inspector, Occupational Health and Environment, Specialist Harm Prevention Directorate, SafeWork NSW, affirmed and examined

MAHINDA SENEVIRATNE: I am a certified occupational hygienist and a Fellow of the Australian Institute of Occupational Hygienists.

The CHAIR: Thank you for making time to give evidence today. Would you like to start by making a short opening statement?

YASMIN COX: If I may, just to outline SafeWork NSW's role as the work health and safety regulator. Work health and safety is overseen as SafeWork NSW is responsible for ensuring the health and safety of workplaces through compliance, education and advisory—and I'm happy, if the Committee will allow it, to set out the framework. The framework essentially stems from the Act that is overseen by the regulator, supported by work health and safety regulations and codes of practice. In this particular context, I start by providing just a brief overview of the primary duty that stems from the Work Health and Safety Act, which essentially imposes upon what are referred to as persons conducting a business or undertaking an onus to provide a safe work environment and minimise risks, or certainly attempt to eliminate from the outset so far as is reasonably practicable and, in the event that a PCBU was unable to eliminate the risk, then to minimise that risk so far as is reasonably practicable.

The regulations that support the Act then set out more detailed prescribed areas and, in this context, there are work environment provisions set out that look at areas of workplace layout and consider, in this case, ventilation in particular. The codes of practice then underpin the regulations, all of which will become mandatory in July, but certainly the work environment code of practice is also a source of information that sets out in further detail what can support PCBUs in this regard, but equally within that code of practice it also calls out relevant Australian standards, particularly in relation to ventilation. One of the prescribed regulations, aside from general work environment within the regulation, also sets out what's referred to as workplace exposure standards. There are over 600 workplace exposure standards that relate to what's referred to as airborne contaminants. These are all dusts and chemicals, which include carbon dioxide, silica, asbestos, formaldehyde—a whole raft of various chemicals.

Certainly in this context, to assist the Committee and the Chair, dust and chemicals that are referred to and supported by workplace exposure standards are referred to as pollutants, and the pathogen would be an example of a microorganism, such as mould and other means of bacteria or virus, that don't form part of that framework by way of the workplace exposure standards. Also, aside from those provisions set out closely under "work environment", there's also our hazardous chemical framework that more broadly sets out requirements in the regulation, in particular detailed information to support businesses or PCBUs in how to identify hazards and assess risks—namely, it calls out different items such as safety data sheets, chemical registers and the like, to be able to support. There's a number of provisions that assist businesses in that regard.

The CHAIR: I might start with a couple of very broad questions and I'm sure we'll have some specific ones as a Committee as well. There's already been lots of evidence provided around indoor air quality in the context of providing a safe workplace, whether that's in private-sector workplaces, offices or public buildings—particularly schools and hospitals which are obviously directly controlled by the New South Wales Government. Broadly, under that current framework that you've just outlined, what is your capability to intervene if an employee in any of those workplaces is concerned about their exposure to poor indoor air quality as a workplace hazard?

YASMIN COX: Certainly, there are avenues as a regulator to be able to respond. An example would be a request for service, if an employee had concerns and could notify the regulator in that regard. That would then go through our triage protocol and framework and, if warranted, then an inspector response. An inspector would go out to site and make the necessary inquiries, in the first instance understanding how risks are being managed, importantly, and just making those general inquiries in that regard. Aside from the formal avenues, that a request for service could be sought in that regard, there's information also available on our website that could assist someone to understand the nature of some of these hazards. There's different avenues that could be taken in that regard.

The CHAIR: I understand this may need to be taken on notice, but are you able to provide how many of those requests for service you've received relating to indoor air quality?

YASMIN COX: I would have to take that on notice, if that's okay, because it's certainly a complex area. As I identify, there's a number of dust, chemicals and certain areas that may not necessarily be classified as indoor air, if that makes sense. I can take it on notice and see if there's relevant data that we can—

The CHAIR: Thank you. I appreciate you taking that on notice so that it's accurate.

YASMIN COX: Absolutely.

The CHAIR: My follow-up question, which I appreciate you're about to take on notice as well, would be what, if any, actions were taken in response to those requests for service—an outline of work you've done, for example, in the last 12 months.

YASMIN COX: In the last 12 months. Certainly. I can take that on notice.

The CHAIR: One of the themes of the evidence we've received is that air quality indoors is not routinely monitored in many of these spaces. I'll start with schools as one example, because we've got School Infrastructure next, but this is obviously an issue in a number of different contexts. Without monitoring, how are you then effectively able to ensure the safe workplace environment from an air point of view?

YASMIN COX: Thank you for that question. As mentioned earlier, within that workplace exposure standard framework there's a provision set out in the legislation that says, in simple terms, when in doubt then air monitoring would be undertaken in that regard by the PCBU. That's for determining if there are dusts or chemicals present within the work environment. But equally, as an aside, if the work setting—or in this case, the workplace you just described—had hazardous chemicals in the workplace, equally there would be information, or should be information, readily available from their safety data sheets or information that's prescribed in the legislation that's required to allow insight into what potential chemicals may be present in the air quality or within that work setting.

The CHAIR: For a pollutant like carbon dioxide, which is obviously always present in regular air and exhaled by all of us, what sort of exposure limits are you working to for carbon dioxide in the workplace?

YASMIN COX: There is a workplace exposure standard for carbon dioxide that I can provide the Committee and take that on notice, and that sets out the relevant provisions, or I can certainly turn to my colleague, if he wishes to expand in further detail that will assist.

MAHINDA SENEVIRATNE: In relation to carbon dioxide, the workplace exposure standard for carbon dioxide is 5,000 ppm. That is for an eight-hour time-weighted average, so for your average working time. The workplace exposure standards are based on preventing health effects, physiological health effects, preventing illness and disease caused by the exposure. All the workplace exposure standards that Yasmin mentioned for about 600 chemicals are based on those health effects. For carbon dioxide, I think you are referring to the indoor air quality limit of around 800 ppm in a workplace. That is an indication of poor air quality in there due to inadequate ventilation. Outdoor levels are usually about 400 to 450 ppm. If you have something around 800 in an indoor environment, that's an indication of poor ventilation mixing of air.

The CHAIR: Thank you, and that's consistent with other evidence we've heard. I'm interested in an example where you had a busy classroom, for example, with a level of 2,000. That would be representative of poor ventilation, risk of pathogen transmission and other things, but that's not high enough to trigger your threshold for direct causation of illness or disease. Am I correct in interpreting your evidence that you don't have capability to intervene in that regard unless it were to hit that threshold of 5,000?

MAHINDA SENEVIRATNE: In that situation, we would look at it as an indoor air quality issue. We are aware of those guidelines around 800. If you have measurements showing it's up to 2,000, we can take action to improve the air quality in it. The mandatory standard is 5,000, so we can't enforce that, but we can take action with the broader legislation, with the working environment requirements and our clause 40 (e) to provide good ventilation for the safety of the occupants. We can take action if you have evidence of high levels of carbon dioxide.

The CHAIR: This is helpful. Can you just explain that a little bit further? In that scenario—I'm going to continue with this hypothetical 2,000 in a classroom—what is that pathway that's available to you to intervene?

MAHINDA SENEVIRATNE: If you have 2,000, it's clearly an indication of poor ventilation, too high than normal, so we would look at what are the sources of the high CO2. Of course, the large number of occupants would be a contributing factor, but then we would look at the ventilation system. If it's a mechanically ventilated building, are you keeping your windows shut? Maybe in winter you keep them shut. If it's an air-conditioned workplace, we'll look at the air-conditioning system, the intake of fresh air, whether that's adequate. As you know, there's an Australian standard for minimum amount of fresh air intake. That's something we can check with the operators of the air-conditioning system.

The CHAIR: In the first part of your answer, I think you said that it wasn't enforceable at that level. Can you clarify that?

MAHINDA SENEVIRATNE: Under clause 49 of the legislation, if you are exceeding the exposure standard, we can enforce it, because it's mandatory. Here, this is below the standard, but we are looking at poor air quality as a working environment issue. We can enforce through our clause 40 (e), which is about better ventilation.

The CHAIR: In the event that a PCBU—in this hypothetical example, the school—was unable or unwilling to address those issues voluntarily, what actions are then available?

MAHINDA SENEVIRATNE: We can issue an improvement notice referring to the clauses that are there. They are in breach of clause 40 (e) if they don't provide adequate ventilation. We can enforce it through taking better control measures. If it's a ventilation system problem, they can improve the air conditioning to provide adequate ventilation.

The CHAIR: In a context where carbon dioxide is not routinely monitored—we've heard from a whole variety of community members, like parents, children and people who are voluntarily bringing monitors in with them to school or to work. Are you aware of any environments where that's actually routinely monitored and reported to you as standard, or are we relying on those vulnerable people to measure this themselves?

MAHINDA SENEVIRATNE: Usually, if they have got someone to do the measurements, then we get a report and we have that evidence. But also, if we do an investigation like that and if there are no measurements, we do have our own capabilities to monitor CO2 within our team. We can go and get a routine measurement and check what the level of carbon dioxide is.

The Hon. SUSAN CARTER: Thank you for your discussion about the number of standards and the different standards that apply in different workplaces. We've had a lot of evidence talking about what would be appropriate standards for indoor air quality generally, thinking about public spaces, private homes, schools. Is there a standard that you use that could be replicated for an indoor air quality standard, or does it need to be more nuanced and special purpose standards for each particular type of building or environment?

MAHINDA SENEVIRATNE: There are no mandated indoor air quality standards, as you know. But for many years there have been guidelines, not just for carbon dioxide but also for thermal comfort, temperature, humidity and all that. We will refer to those guidelines. For a lot of other areas where there are no exposure limits, we can look at acceptable sources. There are a lot of international bodies that have established guidelines that are available. I think there's a lot of wider consensus among people, especially in the occupational hygiene area, about what should be the guidelines. For example, for CO2, around 800 to 1,000 is widely accepted.

The Hon. SUSAN CARTER: This is one of our challenges. We have been invited by any number of witnesses to make regulations for indoor air quality, but a number of different standards have been offered to us, some of which seem to be broadly compatible and others which seem not to be. I'm really asking, if we were inclined to recommend that there was a regulated indoor air quality, what, in your opinion, would be the safest or the best standard to look at? Is it possible to say that indoor air quality should be one, two, three or are we saying indoor air quality in schools should be one, two, three; in hospitals it should be five, six, seven; and in private homes it should be 12, 13, 15? Should we be going as far as to talk about thermal comfort and humidity or should we just be looking at gases and particulates? For a lot of the sensors, people are saying, "They only measure CO2, but that's a good rough guide for other things." I admit to being very confused. I'm wondering if there's a bright line that we should be looking at that could guide us in this area.

MAHINDA SENEVIRATNE: Yes, I can understand the confusion. Indoor air quality is a multifactorial issue, you would have gathered by now. There are thermal comfort issues of temperature, humidity, air velocity and all the pollutants involved. Like any standard-setting process, you need to get the various expertise and people involved in there to come up with a standard that looks after health with indoor air quality. It's beyond workplaces. You have a broader population to look at—a more susceptible population than the adult population that we regulate for. You need a broader consensus to come with different standards for these different elements of it. But I can say that there's a lot of international work done on this, and there are some consensus standards around the world.

The Hon. SUSAN CARTER: Is there an enforcement challenge if we have lots of different standards for different areas? With the best will in the world and people wanting to comply, if there's a number of different standards, does that create challenges with monitoring, getting the right equipment to check that we are meeting those standards and then actually complying with those standards?

YASMIN COX: I may just provide an overview, and I may turn to my colleague to provide further detail. Within the risk management framework and the onus of the PCBU having a general duty and needing to consider the elimination as far as reasonably practicable, within the limbs of reasonably practicable, it requires a PCBU to consider what's available, what's suitable and what one ought to know. There are a few examples of

limbs contained within that particular section. Currently, if there are standards called up in the codes of practice or if there are guidance materials readily available within the State, Territory or overseas, then that would form part of the risk management process for a PCBU to determine their work setting, depending on their risk profile and factors associated, whether that be health, education or various different kinds. That information can assist to inform decision-making in what's appropriate and what's suitable. In light of high-risk areas, when there are instances where there is more than one standard, it's an opportunity to seek relevant advice from a competent person—which may be the case, certainly when it comes to health and hygiene—or there may be internal resources available to the PCBU to step through that process.

The Hon. SUSAN CARTER: This is a left-field question. Let's say we're talking about a retail setting and the PCBU is aware that the indoor air quality is generally okay, but there would be certain people in the community for whom it may not be good enough. Can the PCBU adequately respond by putting a notice on the front door saying, "Our indoor air quality is suitable for the average adult but, if you are immunocompromised, we recommend you take your own precautions"?

YASMIN COX: Again, it would come down to, within that particular retail setting, the nuances associated. If a retail setting, for instance, had cleaning activity that used hazardous chemicals or what's referred to as an engineering control, which is the ventilation, a level of inquiry of whether or not that was suitably maintained or whether it was the correct, fit-for-purpose ventilation or filtration to support work environments would need to be determined before a PCBU can step through its process of "If I can't eliminate what may be determined as poor air quality, or substitute or isolate"—it's the hierarchy of control that would be applied in that sense, and then an admin control. If there is information provided to others that are entering into that work environment, that would be considered a lowest form of control. Essentially, a PCBU would have to demonstrate that they've worked through those steps. That would then assist to inform the best course of action, and that may include one or more different steps.

The Hon. SUSAN CARTER: In terms of standards and the appropriate response of a PCBU and SafeWork, I'm just thinking about the recent example at RPA where there was an issue that led to deaths in the transplant unit. It may well have been because of construction activity outside that could not be or was not properly controlled by air filtering monitoring. It could also have been because the air conditioning units weren't maintained properly and kept damp free, so mould was able to grow. What role does SafeWork play in looking at the causes of those things and then reflecting on, for example, maintenance guidelines or steps that are appropriate to take?

YASMIN COX: My answer is twofold, if that's okay. For that particular scenario, there are lines of inquiry occurring currently, so that's an active matter. I'd probably be inclined, if I may, just in general terms to say what line of inquiry may be taken in a similar scenario. Certainly an inspector would be undertaking its inquiries just to determine and just that fact finding, for want of a better word, to look at any source of causation, or in some instances that line of inquiry may escalate to a more comprehensive investigation to determine that. Each setting will turn on its own facts. If there is a particular event or if it has been related to an incident or injury, that line of inquiry would then be undertaken to determine, to your point, what factors have been associated with that from a regulatory perspective and then take the appropriate course of action, whether that be from a regulatory standpoint. Enforcement tools may include but are not limited to notices or prosecution or the like in that regard. But there would be broader considerations that would need to be looked at.

The Hon. SUSAN CARTER: I suppose the second part of my question was: After the inspector's investigation is completed, is that then reflected back into changes to maintenance requirements? For example, if an investigation finds that the ducts should be cleaned every month to make sure that they're dry, are relevant standards and guidelines then changed?

YASMIN COX: In general terms—and I may refer to my colleague—in relation to any ventilation plant or structure, quite often a line of inquiry will seek maintenance records or seek general upkeep. Certainly if it's part of its work environment or, in this case, ventilation or system is considered an engineering control to provide a safe work environment to ensure there are no risks being posed to cause injury, illness or death, that would be a general line of inquiry in that case. Should maintenance records not be provided or should, in a particular case, an inspector form a reasonable belief that there's poor risk management or certainly a contravention specifically to the legislation, then a notice would be issued, or, as I said previously, it may be escalated to consider further tools.

The Hon. SUSAN CARTER: At the end of that process, are guidelines ever changed because of what the inspector learns? For example, if everything was done according to what people thought was best practice, but in that process people found out, "Actually we haven't been looking whether the ducts are dry and we should have been doing that", are the guidelines then changed?

YASMIN COX: I'll turn to my colleague to answer that question.

MAHINDA SENEVIRATNE: Maintenance is an important part of the Australian standards for ventilation. That's the responsibility of the building owner to have proper maintenance, and that includes cleaning your ductwork to prevent mould growth.

The Hon. SUSAN CARTER: But are the maintenance standards ever changed as a result of what an inspector discovers?

MAHINDA SENEVIRATNE: If what we find brings out that the standard is not adequate, then it's up to Standards Australia, who develops those standards. It's up to them to improve the standard.

The Hon. SUSAN CARTER: Do you make a report to Standards Australia and recommend that they do this?

YASMIN COX: SafeWork NSW has various representatives on a number of different standards. SafeWork's contribution is provided in relation to any standard that's considered for review.

The Hon. SUSAN CARTER: How would the SafeWork representative get information from the inspector or from an inspection process that there may be an issue that needs to be revisited with respect to a standard?

YASMIN COX: In general terms, data or if there are any trends in relation to ongoing matters, that would certainly form part of a contribution to a standards committee or standards meeting to say that there are trends being observed, if that's the case.

The Hon. SUSAN CARTER: Who would cause that note to be given? Who looks at those trends and who writes the note that would go to the SafeWork representative?

YASMIN COX: Who within SafeWork?

The Hon. SUSAN CARTER: Yes.

YASMIN COX: It would vary depending on the nature of subject matter. Quite often standards are typically of a technical nature. In this instance, Mahinda and his team of occupational hygienists or, in some cases, if the standard relates to a plan or structure, it may warrant one of our engineers. It depends on the subject matter, but quite often—

The Hon. SUSAN CARTER: It sounds to me as if it relies on the goodwill, interest or attentiveness of somebody who is involved to pass it up the chain, rather than any sort of monthly meeting or formal process for things we have noticed that perhaps we should be considering. Am I misunderstanding the process, or am I correct?

YASMIN COX: Standards Australia would be best placed, because they have governance in place around the standards.

The Hon. SUSAN CARTER: But how do they know? How are they getting the fruits of what SafeWork inspectors are learning?

YASMIN COX: In some cases with the standards, if not all cases, if there is a representative from SafeWork, it is a combination of other various representatives from industry or academics that equally contribute toward that issue at hand, if there is an issue, to enable that process and undertake due process.

The Hon. SUSAN CARTER: But if SafeWork are in the field, they're much more likely to become aware of issues than anybody else, aren't they? It just seems a shame that that expertise isn't being captured and passed on for consideration. It doesn't mean that if an inspector says "X" then that should become the standard, but it seems that Standards Australia aren't getting access to all the good work being done by SafeWork.

YASMIN COX: I can turn to Mahinda.

MAHINDA SENEVIRATNE: Within our team we have regular meetings and we discuss issues that come up, so we would know within the team that an issue like this has come up. Most likely it would be one of our specialist inspectors or someone from our specialist engineering team who would be on the standards as a representative. Within our team's discussions, surely the rep would be able to know if there's an issue they can take to the standards committee.

The Hon. SUSAN CARTER: To summarise, it's an informal process and it relies on the SafeWork representative on the standards being part of an informal discussion about what inspectors learnt?

MAHINDA SENEVIRATNE: Yes, because the rep on the committee will have direct participation in the standards committee.

The CHAIR: I want to come back to the hypothetical school example. As you're aware, there are a number of schools—I think it's the majority of schools across New South Wales—that are reliant on natural ventilation in terms of their design. In terms of the hierarchy of control for eliminating hazards, it's obviously a preference to eliminate hazards or then control hazards through engineering design before you go to administrative requirements like a policy that requires a teacher to open a window or, even worse, having vulnerable students wearing a mask. Under that framework, how is it possible that we're still reliant on policies like that, that are requiring teachers to open windows, rather than actually requiring schools to have an engineering solution for ventilation?

MAHINDA SENEVIRATNE: This would be more in the building design stage. When indoor air quality issues were first raised in Australia in the '90s, there was an involvement of Public Works and architects in looking at how to design buildings to prevent indoor air quality problems. That would be more the responsibility of building management. From our enforcement action, what we can do is to require the building owners to take measures to improve air ventilation. It is up to them to make those changes within the building.

The CHAIR: Under the current framework, you haven't got the capability to intervene and require those engineering or more permanent solutions?

MAHINDA SENEVIRATNE: We can issue notices to improve ventilation, as I said, under our clause 40 (e) and some of the measures would be something immediate—maybe having a ventilation or air-conditioning system for that area of the building. Those we can require as a reasonably practical measure that the building owner can do.

The CHAIR: If something is brought to your attention, like individual staff members and individual parents who are particularly interested in an issue like this, what capability do you then have to investigate the broader issue, or are you required to look only at one classroom at a time? It seems like a very ad hoc approach.

MAHINDA SENEVIRATNE: Yes. We are looking at the occupants of the workplace. The school we see as a workplace. These are also the occupants in there who are affected. Then we can work with, say, the school management to look at are there any other ways that you can improve the air quality? For example, if it's during summertime, you might be able to have additional fans to improve the air quality without making changes to the building as a whole. So you can look at different control measures that we can recommend through the improvement notices.

The CHAIR: The Teachers Federation, in their evidence to this inquiry, have argued that requiring teachers to manually operate windows represents "a systemic failure of the State's duty of care under the Work Health and Safety Act 2011". Their argument is that there's a statutory responsibility to provide a safe workplace by eliminating risks insofar as it's reasonably practical and that these sort of discretionary or advisory guidelines are not sufficient. What's your response to that?

YASMIN COX: If I may, in general terms as described, the onus would be on the PCBU to be able to provide evidence of a safe system of work. Essentially, how are risks being managed within that work environment and certainly stepping through ways to eliminate any risks. But, importantly, the PCBU has to be able to identify the hazard—what hazards exist within that work environment—and a hazard could be any hazard that presents itself. In this case, if it's relating to ventilation and an indoor air quality or, equally, other hazards in the work environment that have the potential to cause harm, then work through how that risk is assessed and then determine what are appropriate controls or suitable controls, stepping through a hierarchy of control: from eliminate, substitute, isolate, all the way through to a point of either being coupled or supported by admin controls.

The CHAIR: The two environments that are of particular interest to this inquiry and our terms of reference are schools and hospitals. You're saying that under the current framework the onus is actually on the New South Wales education department and NSW Health to be identifying these risks and taking steps to eliminate them.

YASMIN COX: As a PCBU, Health and Education, or any other PCBU, the onus or general duty is on the PCBU to be able to demonstrate the risks are being managed to provide a safe work environment.

The CHAIR: I just want to come back to the question of mould, which my colleague has raised. We've already received evidence that though mould is complex to measure, the best way to prevent mould is to prevent the type of environment that causes mould to proliferate: so controlling temperature, humidity, dampness—for example, rectifying buildings that have had water damage. Where does that fit in your current framework—I forget what the number was you had of dust and chemicals that you're monitoring for—in terms of that response to water damage or humidity?

MAHINDA SENEVIRATNE: Mould is part of fungi, a group of microorganisms. So, as you know, there are no exposure standards for mould within workplaces or any other environments. With mould issues, it's to look at where the source of the problem is and fix the problem. Often we have seen problems through wet carpeting. Issues like that have caused a mould problem. That can be dealt with at the source if it's a problem. But, as you say, if it's a humidity issue that is causing it, then there can be measures taken to improve the humidity in the environment. Often, with mould issues, it is the source problem that you need to deal with, and there are ways to remediate mould in buildings to mitigate the problem as a whole.

The CHAIR: Without an exposure standard for mould—and I know an excuse that's often given is that there are certain species of fungus or mould that are in the natural environment, particularly outdoors, all the time—what are those preventive measures, or what are the things that should be assessed in terms of providing a safe workplace that's not at risk of causing mould proliferation?

MAHINDA SENEVIRATNE: The various sources of having mould growth—as I said, often it's something like damp conditions that cause it. If you have measures in place to prevent that sort of issue or to take quick action when you have a damp issue—the other thing is that you can get some mould from poorly maintained duct work. That is, again, something that the building owners can take action on to prevent exposures. With mould issues, it is to target the source of the mould contamination and take action to remediate it.

The CHAIR: I had a particular question in the context of the mould contamination at the Calvary Mater hospital in Newcastle, which is of interest to this Committee on a separate inquiry. We have heard that, when air contamination was detected, staff were reassured that it was at a level that was unlikely to cause harm to healthy people, while there was no effort to ascertain whether staff were immunocompromised or had other medical conditions or reasons where this would actually be a significant hazard for them. What response would you expect in this scenario, where you had mould contamination at a level that was determined to be harmful to immunocompromised patients but not harmful for healthy people? Surely that would still require a response from the PCBU.

YASMIN COX: In that instance, I'm not in a position to comment. But, to your point, there would be a line of inquiry that would seek information from the PCBU to be able to demonstrate that the risks are being adequately managed. To my colleague's point earlier, I'd be looking at evidence of the source that has created that hazard. I can refer to Mahinda, if he wishes to provide anything?

MAHINDA SENEVIRATNE: If the workplace has immunocompromised people, then the person investigating should be made aware of it and take that into consideration. If you're made aware that there are immunocompromised people, then action should be taken to consider their safety too.

The CHAIR: Just to clarify, because, to me, this is quite unintuitive, there should be a requirement for those employees to have to disclose their personal health information to their employer rather than the employer being required to provide air that's safe enough for everyone in that workplace.

MAHINDA SENEVIRATNE: There are privacy issues with that. But, say, when an inspector investigates, you can speak directly to the worker and ask if there is some likelihood of that. But I recognise there are privacy issues where we may not be aware of the person's medical condition in such a situation.

The Hon. EMILY SUVAAL: In terms of your previous comments around the lack of workplace exposure standards specific to mould, I wondered if you had any awareness of other jurisdictions that may have workplace exposure standards in place—whether there's anything at a Safe Work Australia level or perhaps internationally?

MAHINDA SENEVIRATNE: With regard to mould or fungi as a group?

The Hon. EMILY SUVAAL: Yes.

MAHINDA SENEVIRATNE: This is a difficult area of setting standards, as you know. It's not just fungi but also bacteria and all the other thousands of species involved. Many years ago, the American Conference of Governmental Industrial Hygienists, who are the main standard-setting body, tried to have an arbitrary figure, but people recognise that you can't take microorganisms as one group, so you have to look at what is involved. Often one of the avenues of investigating moulds is to—if you want to know what is involved, there are ways to identify them through microscopy and all, but you need specialised labs that can do that. But without a standard, you can't monitor in there. There are instruments and all to monitor, but you can't have a limit to say, "This is unsafe." Microorganisms is a difficult area in occupational hygiene to use the approaches we take with chemicals and dust. You need specialised skills with microbiological knowledge to look at it. That is why we want to focus on looking at the source of the problem and fixing it. You can see mould growth. Unlike a chemical in the air, you could see mould growth on a surface and take action to remediate it quickly.

The Hon. EMILY SUVAAL: That's helpful. You mentioned the Act earlier; I believe it was section 40 (e). Can you provide the Committee with any information about whether there has been any enforcement taken under that Act, and whether there have been any PINs issued at any workplaces with respect to that specific clause?

YASMIN COX: I'd have to take that on notice, if that's okay, and certainly in relation to any PINs for that particular provision.

The Hon. EMILY SUVAAL: What I'm trying to understand is whether or not, at the moment, it is something that's being utilised, and whether there is a general awareness of that and how it's enforced.

MAHINDA SENEVIRATNE: As I said, if the issue was clearly evident to us as a ventilation issue, we will take action under that clause in the legislation.

The Hon. SUSAN CARTER: You indicated before, when I was asking about RPA, that there was an investigation occurring. If patients suffer adverse consequences or if students at a school suffer adverse consequences, when does that become a SafeWork issue, if the nurses or the teachers don't suffer adverse consequences?

YASMIN COX: Can I answer in two ways? To your point earlier, I indicated it was an active matter, so there's some line of inquiry occurring in relation to that particular matter. In light of any information that stems from either employees or patients or otherwise, if that information is brought to the regulator, then it is triaged and appropriate action is taken, if any, to then undertake that line of inquiry. That may mean an inspector response.

The Hon. SUSAN CARTER: So it doesn't need to be a worker who is injured?

YASMIN COX: If anything is alleged that has occurred within a workplace setting, if information is brought to the regulator, then that's triaged accordingly to determine if it warrants, then, an inspector response, or information is provided to that person, whether that be a worker or otherwise. But certainly the focus for the health and safety regulator is any work activity that occurs within a workplace setting. If information is brought to the regulator's attention through the appropriate avenue, then it's triaged accordingly and action is taken or inquiries are undertaken.

The Hon. SUSAN CARTER: If half of year 3 in a particular school developed asthma, that could be a matter that is brought to the SafeWork regulator?

YASMIN COX: It could be, but equally it could be a public health issue. It could be brought to NSW Health. Quite often, in these complex hazards and harms, there is an overlap with whether that is a work health and safety or, in that particular case, potentially a public health issue that's addressed by NSW Health or, in some instances, an environment issue. That could require that line of inquiry, too. If I use the example, if I may, of COVID—obviously a public health issue with the lead being a public health lead, but equally a work health and safety regulator played its role in that regard.

The Hon. SUSAN CARTER: Thinking about COVID, did standards for indoor air quality or maintenance change as a result of what we learnt from COVID?

YASMIN COX: I'll turn to my colleague.

MAHINDA SENEVIRATNE: There's a code of practice for managing biological hazards that has just been completed by Safe Work Australia. That was the outcome of the learnings from COVID, especially regarding exposure to a biological hazard. There are a lot of measures that will be in that code of practice to prevent that sort of problem again.

The CHAIR: If there are no further questions, that brings us to the end of the session. The secretariat will be in touch with you about the questions that you took on notice and any additional questions. Thanks again for your time today.

(The witnesses withdrew.)

(Short adjournment)

Ms LISA HARRINGTON, Deputy Secretary, School Infrastructure, NSW Department of Education, affirmed and examined

The CHAIR: Thank you for taking the time to give evidence this afternoon. Would you like to start by making a short opening statement?

LISA HARRINGTON: No, I'm happy to answer questions that you have.

The CHAIR: My first burning question is about the Clean Air Schools program. I asked you about this at budget estimates last year, and you told us in September that you had just received it and weren't able to speak to it yet. Are you able to speak to those results now?

LISA HARRINGTON: Yes, I am. The clean air study was a partnership with the University of New South Wales. We started it in 2023 and we got the report late last year. The objective of the study was really to understand—post-COVID, we got a greater understanding of classrooms and the sort of ventilation that they had—any concerns there. We did a lot of work with fixing windows and ceilings and fans. As you know, in that time, though, we were really encouraging windows to be opened as much as possible and we wanted to really understand what were the CO2 levels in classrooms. The University of New South Wales clean air study looked at 59 schools with a mix of urban and rural. There were three levels that they were checking.

First of all, particulate matter—and that's of 2.5 microns or less in diameter. That was indoor and outdoor: nitrogen dioxide for outdoor in the urban schools and carbon dioxide for indoor. I'll start with the particulate matter. The report found that, across those studied schools—so both indoor and outdoor—particulate matter largely remained below the current New South Wales Government thresholds for annual and daily exposure. For nitrogen oxide, for the most part, monitored schools rarely experienced outdoor nitrogen oxide concentrations that posed an elevated threat to students or staff. For CO2, there were some inconsistent results.

Generally, the report says that most classrooms did not exceed the 850 parts per million CO2 threshold for most school hours, but there were some classrooms that did have elevated results. The report says that the findings indicate that some teachers may be teaching with closed windows, so that's something that we are really looking into now. The report makes various recommendations, including better awareness of the need to flush fresh air through the classrooms, and mechanical ventilation where required. What we're doing now is we've got asset management teams in eight regional areas. We've got asset services officers that look after 10 schools. What we're really doing now is—as I said, at COVID time, we got a better understanding of the learning spaces. Do they have fans? Do they have mechanical ventilation?

About half of our school classrooms have mechanical ventilation. Are they using them the way they should? If they've got air purifiers, are they using them the way they should? What we're doing at the moment now is really those ASOs—the asset management unit has these findings and they're working out with schools whether more action needs to be taken to make sure that, for those areas where we have had those elevated readings, is it simply that the teachers using those spaces are not aware of what's best in terms of ventilation, or do we need to do something differently?

The CHAIR: Coming back to the carbon dioxide levels, you said most didn't exceed the threshold of 850 for most of the school hours. How many of the 59 schools did exceed that?

LISA HARRINGTON: Yes, that's what the report states "most". There are a few classrooms, in particular, that there were consistently elevated levels, and they're the ones that we're really doing some extra work.

The CHAIR: So how many were those out of the 59?

LISA HARRINGTON: Three classrooms. We have engaged a specialist to help us understand why it is that there are elevated readings. Obviously ASOs have a lot of skills in terms of assets, but we do rely on specialists. For example, as with asbestos, we engaged independent hygienists. We're engaging a specialist as well just to help us understand for those classrooms what extra action we should take.

The CHAIR: You mentioned that mechanical ventilation was being considered, where that's required. Are any of those 59 schools now being upgraded to mechanical ventilation?

LISA HARRINGTON: What was interesting is that some of those 59 were some of the Cooler Classrooms schools that do actually have mechanical ventilation. Some of them were classrooms that have cross-ventilation. That was something that we just need to look at more—that it isn't necessarily a case that if there's mechanical ventilation, you don't have any concerns at all. That was something that was a bit surprising to us, and we are looking into it more: Why is it in those classrooms that did have mechanical ventilation? Part of

the Cooler Classrooms, there is actually the CO2 monitor as well. We just need to understand—there were less elevated readings in those classrooms, but it didn't mean that they never had elevated readings.

The CHAIR: Can I just clarify part of your answer there? You said that the air conditioning includes CO2 monitoring. We've had evidence from other parties to this inquiry that some of the cooler schools installations were split systems, so it's recycling and cooling the same air and not actually ventilating the air.

LISA HARRINGTON: My advice is that the Cooler Classrooms rollout included CO2 sensors. Basically, when it gets to a certain level, it kicks in.

The CHAIR: That's across all of the cooler schools installations?

LISA HARRINGTON: That's my advice, yes.

The CHAIR: When the Clean Air Schools program was announced, my understanding was it's supposed to include 100 randomly selected schools.

LISA HARRINGTON: Yes.

The CHAIR: You're saying there are now only results for 59. What happened to the other 41?

LISA HARRINGTON: I wasn't in this role at that time, but what I understand from the report is it was just a challenge of getting the amount of schools that they could at that particular time. My assumption was it was perhaps at that tail end of COVID. For whatever reason, I can't say specifically, but my guess is that there was an attempt to get 100 and only 59 could participate. I can come back to you with more detail on that.

The CHAIR: Yes, please. I understand that those initial 100 were randomly selected. With only 59 participating, I'm interested to understand if the researchers did any analysis to understand if there was then selection bias, of which were the 59 that ended up being included and which were the 41.

LISA HARRINGTON: I can try and find out more, but from the report, they describe it as representative classrooms in 59 schools across urban and rural New South Wales. Obviously, University of New South Wales undertook this study, and there was very much an attempt to have a representative sample.

The CHAIR: My last question then is on the Clean Air Schools. You said in your answer that most of the school studies didn't exceed the carbon dioxide threshold of 850 for most of the school hours. My reading of that is, therefore, those classrooms were breaching that standard some of the time. Was there any work done to further understand what those circumstances were?

LISA HARRINGTON: Yes, that's the work that we're doing at the moment. Definitely the report, as I said, raises concerns that in some classrooms there is teaching being done without any open windows, so it is getting that inconsistency, or there are some classrooms with elevated results. That's the work that our asset management teams are doing at the moment. In 2021 we went into all 150,000 spaces to check if there is adequate ventilation, and we did a ventilation report on each school before we brought people back for learning from the classroom. I think that was day one, term 4 in 2021, I believe; it's a little bit dated now. We're going and doing some more work to understand. Again, at that particular time, there were windows that needed to be fixed because they couldn't be opened. We're doing that work now. It's not just in the 59 studied schools; it's actually to go around. The other thing that does happen is that while we might have central data that might show a school does have or doesn't have a certain system, on the ground it might be different. P&C might have raised funds for air conditioning; we're not aware of that centrally. So we're just going and doing an assessment, basically, to understand on the back of these findings whether there is anything else we need to do in those spaces.

The CHAIR: You accurately predicted what my final question was going to be. It's obviously concerning there are some classrooms in New South Wales that are not a safe work environment for teachers or a safe learning environment for kids. Are you able to provide more detail? I appreciate that may be on notice. More broadly—not just for the 59 schools that happened to be studied—what specifically does that mean for schools? Are you now going back to every school to do carbon dioxide monitoring in every classroom? If not, what are you doing?

LISA HARRINGTON: There are various recommendations in the report which we are following. One of them is to make sure there's enough awareness of the importance of ventilation. That means regularly making sure that teachers are aware of the need for fresh air. It does say "mechanical ventilation where required", so that is absolutely an option if it's needed. We're also making sure that the systems are operating as they should. That's something our ASOs can do. We go to regularly check the systems, but we need to make sure that they are operating as they should. It is a bit of a case by case.

As I said, we've got a lot of data from COVID times and particular ventilation reports for each school, so that's a very good base to start from. The big message we often relay is, "If there are any concerns with any spaces, please reach out to your ASO so that we can address those." We've got a large system with 2,200 schools. Yes, we are concerned that in some of those spaces, as the report indicates, teaching is maybe being done with closed windows. Is there a reason for that? Is it because there's noise or there is a flight path or something that means teachers are feeling that they shouldn't open the windows? In those instances we might need to do something different.

The CHAIR: Will that report be made public?

LISA HARRINGTON: I can come back to you on notice. I'm happy to provide the report to the Committee if you're interested.

The CHAIR: The Committee is very interested in the report, but I know that there are also many members of the public who are interested in the report.

LISA HARRINGTON: I can come back to you on notice, but I can imagine we would, yes.

The Hon. EMILY SUVAAL: Thank you so much for your appearance today. I want to start with a clarification. It may seem obvious, but the 59 schools that you looked at through the UNSW study, I assume, are all public schools?

LISA HARRINGTON: They are public schools, yes.

The Hon. EMILY SUVAAL: Has there been any work done to look at, or is there any knowledge of, whether this is an issue in non-government schools, and to what extent it is an issue in non-government schools?

LISA HARRINGTON: I think it's a good point. It is 59 public schools but the issue of indoor air quality is obviously not specific to public education. As far as I'm aware, a lot of spaces have this issue of making sure there's adequate ventilation. It's not unique to schools and not unique to public schools. But, yes, the study that we did just had a look at public schools.

The Hon. EMILY SUVAAL: Has there been any work undertaken at any point in time, to your knowledge, to assess the air quality in all schools across New South Wales, as opposed to just—

LISA HARRINGTON: I'm not across that, but I suspect what this study found in terms of the behaviour of teachers would not be unique to New South Wales public schools. It would probably be a similar situation in other schools, in terms of is there a reason why they're not opening the windows? Either they're not aware or there's a reason—there's noise outside or there's something like a flight path issue, which just means that their behaviour is not to open the windows. But my suspicion is that that's not unique to New South Wales public schools.

The Hon. EMILY SUVAAL: On the basis of the report, in those three classrooms you identified, would it be fair to say that there are some classrooms that are unsafe? Is that a fair characterisation?

LISA HARRINGTON: That's not what the report said, no. It makes some recommendations to increase awareness of the importance of ventilation. But, no, as I said, basically the report says that most did not exceed the threshold, but it does give some suggestions of how we can increase awareness to make sure all classrooms are getting adequate fresh air.

The Hon. EMILY SUVAAL: In terms of the classrooms, or at least the greater awareness that is needed and the recommendation around that, have there been any initial steps taken by School Infrastructure—or, indeed, the department—as to what that body of work would look like?

LISA HARRINGTON: There's very simple things, like we have a communication channel staff noticeboard. We do regular updates on that, and we did one this term. As I said, the work that we're doing at the moment is really through our asset management unit—because they were the ones who were involved in 2022—to go and understand the spaces, to check that the windows were able to be opened and that the ceiling fans worked, the exhaust fans worked and those sorts of things. The work that we're doing at the moment is really to make sure that case by case, first of all, schools know that if there's any concerns they should speak to their asset services officer, but also that, proactively, asset services officers are going in and assessing spaces and making sure that there's adequate ventilation.

The Hon. EMILY SUVAAL: Just to clarify, for my benefit and the Committee's benefit, the report that was a representative sample in terms of the recommendations has arrived at the conclusion that the classrooms are safe and that air quality within the classrooms is sufficient.

LISA HARRINGTON: The report certainly doesn't say that classrooms are unsafe. The report gives some suggestions of how we can ensure that there's adequate ventilation, whether that be natural ventilation or whether it be mechanical ventilation. But it makes the point that while the particulate matter readings were below thresholds—and that was a very good sign—closing the windows obviously helps when you've got particulate matter outside. As a result, we need to make sure that teachers are still opening the windows to make sure that, within the classrooms, the CO2 levels are diluted. We look at that—it does need to be case by case because it's depending on the size of the room, how many kids you've got in the room and whether there's mechanical ventilation or natural ventilation.

The Hon. EMILY SUVAAL: One of the earlier witnesses we had to the inquiry—I can't recall, Chair, which witness it was—talked about instituting across the board a "no idling" zone in the school pick-up and drop-off sections, which was obviously a novel suggestion. Is that something that could be achieved or has been looked at at all?

LISA HARRINGTON: I am aware of that—no idling. I think that there are some schools that do that. This study wouldn't indicate that it's necessarily needed across the board because the particulate matter thresholds didn't raise concerns. If there was a concern around the particulate matter thresholds being exceeded, that would be something that perhaps we could look at, but it wasn't something that was raised as a concern.

The Hon. SUSAN CARTER: I'm just curious, based on some of the earlier evidence we've heard, about the operation of the CO2 monitors in the classrooms where they are. How long have CO2 monitors been in any classrooms?

LISA HARRINGTON: That may depend, but my understanding is that the Cooler Classrooms Program was where there was widespread installation, obviously, of the CO2 monitors with the air-conditioning system, and that was really over the last few years.

The Hon. SUSAN CARTER: What experience do we have of the need to recalibrate? How often are those monitors checked for accuracy?

LISA HARRINGTON: It's a good point. We follow the National Construction Code, which I believe is 850 parts per million as the threshold. If there's any change to that, obviously, we can adjust that threshold. The role of the asset services officer is to make sure that the facilities are functioning and fit for purpose. We regularly go in and check systems and make sure that they're operating effectively, but also reactively. If schools have any concerns, they can log a call through our FM Web system and then we can come out and reactively repair that.

The Hon. SUSAN CARTER: I suppose my question was more a systems question. What have we learned? Because there's issues around how often would those monitors need to be replaced. What involvement is required from the teacher or the school to make sure they're operating?

LISA HARRINGTON: We try and not put any of that burden on the teacher or the school. Obviously, they are there to educate the kids, which is why we have the asset services officers and we have recently increased the number of asset services officers so that they look after fewer schools. There's now the ratio of one to 10. Regularly, there will be proactive maintenance schedules to check that systems are operating as they should. Reactively, there's always the option to log a call and then we will come out and send somebody out to check that. We try to not have that responsibility on the principal or the teachers.

The Hon. SUSAN CARTER: If the air monitor detects an excess level, there's an alarm, the teacher's told—

LISA HARRINGTON: It kicks in.

The Hon. SUSAN CARTER: What's the "it" that kicks in?

LISA HARRINGTON: The mechanical ventilation kicks in.

The Hon. SUSAN CARTER: So the windows are opened automatically?

LISA HARRINGTON: No. The Cooler Classrooms system, from what I understand, will kick in. If it reaches a certain threshold, the mechanical ventilation will kick in.

The Hon. SUSAN CARTER: So we're talking air conditioning?

LISA HARRINGTON: Yes, but I believe, and again I might come back to you on notice, I am not a technical expert.

The Hon. SUSAN CARTER: And neither am I, and I'm struggling.

LISA HARRINGTON: My understanding is you can have air conditioning without that mechanical ventilation threshold functionality but the Cooler Classrooms does have that. That was embedded. I can come back to you with more information, if you'd like, on how that technically works?

The Hon. SUSAN CARTER: I'd be keen to understand that. CO2 monitors, how do teachers or schools know when particulate levels are too high?

LISA HARRINGTON: It's measuring CO2 rather than the particulate matter. Hopefully they don't need to do anything manually, that when it gets to a certain level it kicks in. From my understanding, you can see the levels—

The Hon. SUSAN CARTER: I guess my question is, and again this is reflecting on evidence we've heard from other witnesses, CO2 seems to be used as a common measurement tool. It doesn't, I think, measure particulates or other pollutants. I'm wondering if CO2 monitoring is sufficient to indicate indoor air quality? We were talking about idling before and the issues of particulates came up. How do we know about particulates?

LISA HARRINGTON: It's a good question. I guess for this study it is the fact that it measured the three different levels in particulate matter, and that's mainly outside. It did check indoor and outdoor, in terms of this study. The nitrogen dioxide is for outside and the CO2 is for inside.

The Hon. SUSAN CARTER: If I'm right, I think you said it was only particulate matter in the city schools, not in the regional schools.

LISA HARRINGTON: No, that was for nitrogen dioxide, just for the urban schools. The fact that this research looked at those three different levels and assessed those is an indication that you do need to look at more than just the CO2 within the classroom.

The Hon. SUSAN CARTER: Of the schools in that report, was elevated CO2 a good indicator or elevations in other areas, or were there examples where particulate matter was very high but CO2 was quite low?

LISA HARRINGTON: I'd have to come back to you on notice on that one.

The Hon. SUSAN CARTER: If you could, thank you.

The CHAIR: I want to raise a couple of concerns with you that were raised with us by the Teachers Federation. One of them was the issue of unflued gas heaters. It's my understanding the latest publicly available statistic was for 2023-24 and that 1,402 New South Wales public schools still had unflued gas heaters. What's being done to replace those with electric heating?

LISA HARRINGTON: There's about 1,100 schools now that have unflued gas heaters. We used to repair and replace them. Now we will, if it comes to end of life, replace it with an alternate heating source. My understanding is back in 2009 there was a big piece of work through Public Works for conversion of the high-NOx unflued gas heaters. Our system now, if it comes to end of life, we will replace it with an alternate heating source. We also make sure that we regularly go in and assess those each year before winter. The asset services officers will go in and make sure there is maintenance and checking of the unflued gas heaters and awareness of how to operate them safely. But it is a program over a period of time that, when they come to the end of life, we will no longer repair them; we will replace them.

The CHAIR: Certainly it's been argued by health advocates that, despite best practice operation, there are still harmful health effects of gas heaters. I am interested to understand, of the 1,100 that remain—and I suppose I'm pleased that that number is lower than the 1,402 we've previously had—what is the expected lifespan of those appliances and over what time period would you reasonably expect the rest to be phased out?

LISA HARRINGTON: I might need to come back to you on notice with that, if that's okay?

The CHAIR: Okay, thank you. Coming back to ventilation, you referred earlier in your evidence to reiterating guidelines and education of teachers around opening windows, and that's something that started during COVID. Why is the department choosing this approach that puts the onus back on teachers rather than controlling or eliminating the hazards through those mechanical ventilation upgrades?

LISA HARRINGTON: As I said before, we try not to put the onus on teachers for anything that's not education related. We do, though, follow the advice of experts. My understanding is fresh air is a great form of ventilation, so we want to make sure that, where possible, there is natural ventilation. As I said, about half of our classrooms do have mechanical ventilation, so there's a mixture of natural and mechanical. We certainly don't put the onus on the teachers to not do the work ourselves. Obviously, the teachers are in the classrooms and we try and raise awareness that, for a really optimal learning environment, you do need ventilation. It's great if that can be natural; mechanical might be required. Often it's a mix in the classroom. There is a ceiling fan in all of our

classrooms. About half of our schools have Cooler Classrooms, so you've got the CO2 sensor in that and the mechanical ticking in, and then, as I said, what we try to do is make sure that asset services officers are really aware of the facilities in each school and make sure that, if there's anything else required, they work with schools to provide that on a case-by-case basis.

The CHAIR: We've been told by experts to this inquiry that best practice modern HVAC systems do incorporate fresh air, so I don't think there's a question of whether natural or mechanical offer fresh air; they both do. Is it the view of the department that you're currently meeting your obligations under the Work Health and Safety Act in terms of managing that hazard for your staff?

LISA HARRINGTON: Yes. We work really closely with the health and safety team within the department. When we're building new schools or upgrading schools, we have to get that signed off by all the relevant experts. We also have lifted our standards in terms of how we build. We have a pattern book and the standards that we have for our pattern book in terms of ventilation are higher than what the National Construction Code is. We aim for the four-star Australian best practice for our buildings for Green Star accreditation, so we do try to make sure that we provide more than what is required and we work very closely with our work health and safety teams to make sure that what we're doing is safe for students and for staff.

The CHAIR: Should parents, and particularly parents of immunocompromised kids, be comforted that new schools are being built to a better standard than existing schools that aren't actually being upgraded?

LISA HARRINGTON: We do have 2,200 schools. The average age of our buildings is about 50 years, so it is quite an old fleet or asset portfolio. I am very conscious that our new schools look fabulous and there are some schools that are old and require more attention, but that's why we do have asset services officers for all our schools to work really closely with the schools and to make sure that they have the facilities that they need to operate safely. It is the case that, in some of our schools, they've got new facilities and other schools are a lot older, but we have an obligation, which we take really seriously, to make sure that there's an optimal learning environment in every school.

The CHAIR: Has there been any modelling or cost analysis done of what it would take to bring all of those old assets up to the same standards in terms of ventilation?

LISA HARRINGTON: It wouldn't just be the clean air standards, it would be all construction code standards. When we do go in and upgrade schools, obviously if we upgrade it to a certain amount we've got to bring the buildings up to the current standards. But no, as far as I'm aware, for our 2,200 schools we don't have a figure on how much it would cost to bring everything up to the latest standards. I'm conscious as well that standards across building do change, so it would be something where you'd probably be up to standards at a point in time and then the standards would change again. In relation to clean air, though, we are ensuring all spaces across all schools have the right learning environment. As I said, that's the work that ASOs are doing at each school to make sure that's provided.

The CHAIR: Has there been any modelling or cost analysis done for faster replacement of those remaining 1,100 unflued gas heaters?

LISA HARRINGTON: We are doing a piece of work because we believe that some of those unflued gas heaters might actually not be being used, because from when our data was collected, schools, as I said, sometimes work with P&Cs or fund their own systems and are actually not using those unflued gas heaters anymore. As part of the work that the asset management teams are doing, we're hoping to validate that assumption.

The CHAIR: What's the time frame for that work?

LISA HARRINGTON: That's this year.

The CHAIR: I'll ask you again at another hearing. I just want to double-check my notes before I give you an early night, Ms Harrington, to make sure we haven't missed anything.

LISA HARRINGTON: Sure.

The CHAIR: We had evidence from Professor Geoff Hanmer about the 40 schools that had been sealed previously in response to aircraft noise from Sydney airport. If I recall correctly, the assertion was that was a really ideal control group for different kinds of buildings. Is the department involved in that work, or what data or information have you been able to support that research with?

LISA HARRINGTON: I don't know about that particular research but, out of the 59 schools, three of those schools were sealed schools.

The CHAIR: Three of those schools were in the Clean Air Schools report?

LISA HARRINGTON: Yes.

The CHAIR: I don't have any more questions at the moment, but there were a number of questions taken on notice so the secretariat will be in touch with you about those, as well as any supplementary questions that we might have from the Committee. Thanks again for your time.

(The witness withdrew.)

(Short adjournment)

Dr KATHY DEMPSEY, Chief Infection Control Practitioner and Healthcare Associated Infection Adviser, Clinical Excellence Commission, NSW Health, affirmed and examined

Dr VICKY SHEPPEARD, Senior Medical Adviser, Health Protection NSW, NSW Health, affirmed and examined

The CHAIR: Thank you both for making the time to give evidence. Would you like to start by making a short opening statement?

VICKY SHEPPEARD: Yes, if that's okay, just to give you some context of where we're working and what we do in regards to indoor air quality. Thanks for the opportunity to come today. I'm a public health physician and I specialise in health protection, which includes environmental health and communicable disease control. Recognising the contribution of poor air quality to poor health outcomes, NSW Health has had a longstanding focus on indoor air quality, commencing with a statewide survey of indoor air quality in homes in the year 2000. Many of the findings of this survey remain relevant today, with indoor sources of air pollution such as gas appliances, wood heaters and tobacco smoke being the chief causes of poor indoor air quality in that survey. We also found that outdoor air pollution, particularly wood heaters, impacted indoor air quality due to the leaky nature of much of New South Wales housing.

The Smoke-free Environment Act 2000 mitigated tobacco smoke as an indoor pollutant in many settings. As vaping emerged as a new pollutant source, the Act was amended to place identical restrictions on vaping in indoor spaces. This is supplemented by public campaigns to raise awareness of the harms from tobacco smoke and vaping indoors and encourage behaviour change. New South Wales has led the development of national work on health effects of unflued gas heaters, particularly a monograph in 2010, and we also collaborated with the Department of Education to undertake additional research on health impacts of low-NOx heaters in schools.

We continue to advocate against gas appliances, particularly unflued gas heaters, and also wood heating. We do remain alert to emerging indoor air quality risks. For example, the Poisons Information Centre noted increased incidence of carbon monoxide poisoning due to combustion heaters and cookers designed for outdoor use being used indoors, mainly impacting new migrant and refugee groups, so we developed a campaign in collaboration with the Multicultural Health Communication Service to reach at-risk groups and work with them and settlement services each winter to make new migrants and refugees aware of safe ways to heat and cook indoors.

More recently, we're participating in national work conducted by the Australian Centre for Disease Control through the Environmental Health Standing Committee on the impacts of indoor air quality. The Australian Health Protection Committee has tasked enHealth to prioritise indoor air quality. This work has commenced and, when completed, the evidence-based advice will be used as a basis for policy development to reduce the health impacts of poor indoor air quality. It's anticipated this work will be published soon. Through that work, the Australian CDC has produced guidance for the public on health impacts of indoor air quality. I'm happy to provide the link to that if that hasn't already come across the Committee's attention.

KATHY DEMPSEY: I equally would like to thank you for the opportunity to appear today. I am a registered nurse with over 40 years experience in the NSW Health system, with 26 of those in infection prevention and control. The quality of indoor air is most definitely an important component of NSW Health and our public health facilities. I do, however, believe there is a generalised misconception about NSW Health's approach being less prioritised, given it is less visible than other environmental risks. The COVID-19 pandemic obviously highlighted the issue and role of airborne transmission in the spread of infectious diseases, but this issue has been a fundamental component of infection prevention and control in our hospitals. Certainly, in my 26 years in infection prevention control, it has very much been a focus.

Addressing indoor air quality requires a coordinated, evidence-based approach that integrates engineering controls, infection prevention practices and system-wide guidance. Whilst there may not be legislation that supports this, there are some very good policies and guidelines that are implemented in NSW Health that we comply with. The NSW Health Clinical Excellence Commission plays a key role in supporting the health system to be able to manage these risks. Through the infection prevention and control program, we provide leadership, guidance and practical tools to support our facilities to reduce the transmission of infections in healthcare settings.

This includes developing policies and resources aligned with current scientific evidence, supporting local health districts to implement those, and promoting a risk-based approach to ventilation and air quality management. We also work very closely to translate evolving evidence into clear, actionable guidance for frontline staff. The issue of preventing infections and managing airborne infections and indoor air quality requires a

multidisciplinary approach which sits at the intersection of clinical care, infrastructure and occupational health. There is an opportunity to strengthen our approach to indoor air quality across all settings, informed by the lessons learnt in recent years.

The CHAIR: I'll start with a couple of my own questions. I'm sure all the Committee members will have questions as well. One of the consistent themes of the evidence that this Committee has received has been about monitoring and standards for indoor air quality. I know that your opening statements referred to the broader community as well as NSW Health facilities, so I'll try to unpick that for a second. If we're talking only about NSW Health facilities, how is indoor air quality actually monitored?

KATHY DEMPSEY: I'm happy to take that one. If we really start at the beginning, that is how we actually manage our air quality in our hospitals. We have a layered approach. We have many systems in place in terms of increasing air exchange. There's the use of HEPA filters. We really rely on those systems at the outset. In terms of monitoring, we don't, essentially, do air monitoring. Monitoring really just tells you whether or not you've got a problem. There's a focus on monitoring but, unless you fix the problem—for example, if I know there's mould in an environment, then you fix the mould and you fix the leak. Doing air sampling doesn't necessarily fix the problem. You already know you've got a problem. There's no point in doing air sampling to prove that you've got a problem.

The CHAIR: For something like ventilation—and there has been a lot of discussion around carbon dioxide as a really helpful proxy for ventilation—for example, are you measuring carbon dioxide in hospitals?

KATHY DEMPSEY: We don't, essentially. I think some of the problems with aligning some of the community monitoring systems is that much of the research and most of the evidence aligns outside of health. Very little is done in health care. What we don't know is how that impacts on patient care. What do those figures actually mean in relation to patient outcomes? I'm not an air scientist, but normally the more people you've got in an environment will increase your level of carbon dioxide. I can't reduce the number of patients that I have in an environment. It's around managing what clinical care is required versus what indoor air looks like. But if you look at the air changes, for example, in our hospitals, we operate in our worst kind of environments at around six air changes an hour. If you look at the general community, most general community buildings operate on four or less. Most of our indoor standard rooms would operate on eight, and then any of the rooms that are required to do AGPs operate on 12. Then it increases depending on those environments. If you've got functioning HVAC systems that are ventilating and have got good air flow, then you've got good ventilation. We're not actually monitoring those.

The CHAIR: I understand requirements and standards for new buildings change often, so you'll have standards in place now that weren't in place when many hospitals were built. Is there any work being done to upgrade older facilities to meet modern standards?

KATHY DEMPSEY: That's probably a Health Infrastructure question, but there are a lot of works in place around continually upgrading from an infection-control perspective. Certainly, local ICPs are always looking at the environment that they're managing and then what the airflows are doing and what the HVAC systems are doing, and then putting in risk assessments to get those improved. I know that there were a number of enhancements during COVID to a lot of our HVAC systems to increase ventilation and essentially change some of the airflow. In terms of a coordinated approach, I'm going to say that that's probably a Health Infrastructure question.

The CHAIR: Is it possible to take it on notice and pass it to your colleagues at Health Infrastructure?

KATHY DEMPSEY: I can take that on notice.

VICKY SHEPPEARD: My understanding is that the ventilation rates are monitored and set in all those settings.

KATHY DEMPSEY: At a centralised area, it would be within the engineering controls. From an infection-control perspective, we don't monitor them, but centralised in engineering controls, they would be monitoring all those levels, and alarms would be set and those sorts of things. But that's engineering controls.

The CHAIR: Obviously, from the point of view of airborne pathogen transmission, the ventilation system being filtered is absolutely essential. Are there HEPA or similar grade filters in every NSW Health facility on every ward?

KATHY DEMPSEY: There would be HEPA filters in the majority. I can't say that it's in all of them; it would not be in absolutely every single room. There would be HEPA filters on various intake airs. There would be HEPA filters on various high-risk, vulnerable groups. There would be HEPA filters in some corridor areas, again, depending on the risk level of those groups. If you look at the Australasian Health Facility Guidelines, there

are guidelines around where HEPA filters are recommended particularly. Then, on rebuilds or new builds, there's usually risk assessment done based on the level of infectious diseases that are usually seen through their organisation or their service delivery, and then they would change and adjust those accordingly.

The CHAIR: Does the work that you've already described apply equally to non-clinical spaces, or is that only in clinical spaces of NSW Health facilities?

KATHY DEMPSEY: There's still a requirement to have certain air exchanges in all of those, including the office areas. Whilst the standards require those to be sitting at around six or less, in a recent table that I looked at for all of our engineering controls, we have nothing that sits underneath pretty much six or eight air changes an hour.

The CHAIR: I want to raise in particular that in the submission from ASMOF, the doctors' union, they raised particular concerns around non-clinical spaces like staffrooms, offices, registrar workspaces—spaces that can often be very crowded during handover periods and other times. Are carbon dioxide levels measured in those spaces when they're particularly full?

KATHY DEMPSEY: Not that I'm aware of, no.

The CHAIR: I also had a follow-up question for Dr Sheppeard about the wood heaters, which you mentioned in your opening statement. I'm looking at the NSW Health website information. We had expert evidence earlier today that the Australian standard for wood heaters is not fit for purpose. The NSW Health advice to people is to check that your wood-burning heater conforms with the Australian standards. Do you think that that's sufficient?

VICKY SHEPPEARD: That's what we put as a minimum. I think our key recommendation is that wood heaters can be harmful to health, and we discourage people from having them. But the advice on our website is acknowledging that some people, for either economic or personal reasons, have a very strong affiliation with wood heating. Recognising that some people will use wood heaters despite health advice, then we try to give them the best information available so that they can minimise the impacts of burning wood in the home. We have Australian standards. I'm not close to the current Australian standard. That's what we're relying on. I imagine if others think it's not adequate then the Australian standards should be reviewing their wood heating standard.

The Hon. SARAH MITCHELL: Thank you both for being here. I just wanted to ask a few questions, and, again, you may need to take them on notice. It might be towards Health Infrastructure as well. Obviously, of late there has been some news about what has happened at RPA and some of the concerns around construction. I know that Health put out a report—I think it was just last week—saying they thought that construction might have contributed to what happened there. Are there standards that you're aware of that construction companies have to follow when it comes to air monitoring, particularly in spaces where patients are immunocompromised? Can you talk to that? I just want to understand that a little better.

KATHY DEMPSEY: We have the Australasian Health Facility Guidelines. We also have a policy for New South Wales, which is the engineering guidelines, which requires there to be extremely rigorous infection prevention and controls around construction zones and sites. The issues around construction are probably more heavily written about than other scenarios, so they are definitely available. Last year's part D, which is the infection control part for the Australasian Health Facility Guidelines, was updated, and part of that was to strengthen the involvement and the sign-off, if you like, by infection prevention and control and making sure that they actually have plans in place. But those plans are actually continually monitored and reported through their various governance channels.

The Hon. SARAH MITCHELL: With the requirements under those plans, who does that ultimately rest with—the responsibility of making sure that's followed if there is construction on a hospital site?

KATHY DEMPSEY: The responsibility lies equally with the construction company as it does with the health organisation. There's a responsibility for the health organisation to make sure that those things are in place. As an infection control practitioner, our role is normally then to sort of do daily rounds and look at those things and to make sure that what's written on paper is actually what's being translated in actuality.

The Hon. SARAH MITCHELL: In terms of air monitoring, I have seen some reporting that that is sometimes part of—and I'm speaking more generally rather than specifically, because I appreciate that could be hard. Certain air monitoring is required to take place. It might be checking for asbestos and other things. Is part of that also looking at, with the air monitoring, things like mould, or is that not required under those guidelines?

KATHY DEMPSEY: There's a requirement to monitor the outdoor air. As part of that, you will inherently monitor for like fungal spores, which are essentially mould. But often when we talk about mould, people sort of—

The Hon. SARAH MITCHELL: Fungal spores is a better way to put it.

KATHY DEMPSEY: That's right. They do test for that and they're able to report. Depending on the methodology that they use, they can report on just numbers of spores without speciating those. Not all species are pathogenic, so virulent. It will give them a certain level of what's happening outdoors. In relation to the dust and all the other things, it should then trigger things. If their dust levels are high, if they've got high spore counts and things like that, it means they've got a lot of floating remnants around the environment and that they need to control those much better.

The Hon. SARAH MITCHELL: That's in the outdoor testing, but inside clinical spaces when construction work is happening adjacent to it, is there a requirement for that indoor air monitoring to also capture the same data?

KATHY DEMPSEY: There's less of a requirement to do air monitoring. The requirement is around trying to mitigate against communication between the construction zone and the internal hospital environment. If you do that really well—if you seal all of that up and there are no leaks or areas that are open—essentially, you've created a barrier. The other thing you can monitor for, which is very visible, is the tracking of dust inside the hospital. They're the things you can look at. As soon as you see any of that, that's a trigger that you've got some sort of a leakage, and then you look at rectifying those. In my experience—I've been involved in a few builds—the only time we've used internal air sampling was when we've had an issue or we've had cases and we haven't been able to basically find what the causative factor was. There was no construction, there was no clear leak, there was nothing obvious in any of the environment and things like that, so we couldn't actually locate it. With air sampling in that scenario, we were able to pinpoint exactly that it was in the bathrooms, but you had to pull the walls down to actually see that it was in there.

The Hon. SUSAN CARTER: I have a couple of follow-up questions. When you were talking about construction and making daily rounds, who makes the daily rounds? Is it an infection control physician? Who is responsible for that?

KATHY DEMPSEY: Part of administering infection prevention and control at any facility is around doing clinical rounds. It's about going out, looking at the environment, talking to patients, viewing patients that may be infectious, talking to their families and making sure that they're isolated. That is normally someone from the infection control team. That may be variable across the facilities, depending on how many ICPs you have and how big the hospital is.

The Hon. SUSAN CARTER: In a situation where you have a ward but it's not dealing with people who have an infection—say they're in for a transplant—would there still be infection control rounds occurring?

KATHY DEMPSEY: It would depend. They may not go to that ward on that particular day. It does depend on how the lead infection control practitioner administers the program. Our advice usually is that there should be full visibility of units routinely. On top of infection control, we also have regular mandatory environmental cleaning audits that are reported through their facilities. Part of that, and part of the policy, is a requirement to walk through a facility annually to make sure that every part of the facility has been viewed.

The Hon. SUSAN CARTER: But when construction is occurring, are there elevated environmental cleaning requirements?

KATHY DEMPSEY: Normally there are but, again, it just depends. The requirements, based on the guidelines, are that there is additional cleaning in place and that there's monitoring.

The Hon. SUSAN CARTER: Who checks that that's happening?

KATHY DEMPSEY: It would be multidisciplinary, so infection prevention and control or corporate services. Some sites may implement a governance team that has responsibility for that.

The Hon. SUSAN CARTER: At RPA, who is ultimately responsible for checking that that has happened?

KATHY DEMPSEY: Again, it would be those same people, but I'm not sure what systems they put in place to do those checks.

The Hon. SUSAN CARTER: Where would we find out what the systems are that are in place?

KATHY DEMPSEY: The governance and the guidelines are fairly flexible in terms of saying that it needs to be done. In terms of who has to do it, my assumption is that the GM or the CE is ultimately responsible for what happens at a facility.

The Hon. SUSAN CARTER: I just want to make sure I've understood. You're saying that there are guidelines in place, but they are flexible as to who has responsibility for making sure that they are carried out?

VICKY SHEPPEARD: I've seen the report on RPA, and I think it does go into some detail about the role of infection control and the auditing of the construction impacts. I can't recall the exact detail, but if you did want more detail, then we'd go to the chief executive of the Sydney Local Health District to get information about that.

The Hon. SUSAN CARTER: On notice, can we have a copy of that report?

VICKY SHEPPEARD: I believe it's public, but happy to provide the link, yes.

The Hon. SUSAN CARTER: Also on notice, any information about exactly who was responsible for supervising the fact that that elevated maintenance due to construction occurred. The only other question I have is that I think you were talking about construction guidelines and I believe you said you talked about sealing the hospital.

KATHY DEMPSEY: Yes.

The Hon. SUSAN CARTER: It's the hospital that should be sealed, rather than the construction site?

KATHY DEMPSEY: It would be a layered approach. It really depends. There may be some areas that you can seal the construction zone, and there may be some areas that you would then, on top of that, seal some areas of the hospital. If you're building on top of a roof and you've got an intake vent, then you'd want to protect that vent so you may actually seal the construction area; but, depending on how large the construction area is, you might instead make sure that there's protection and sealing of the vent itself.

The Hon. SARAH MITCHELL: In those scenarios, is it the construction company that makes that determination, or is it the health district, or is it a combination of the two?

KATHY DEMPSEY: It should be a combination.

The CHAIR: Are there questions from the Government?

The Hon. EMILY SUVAAL: At this stage, no.

The CHAIR: A lot of the questions so far have been about patient safety, but I also want to ask questions about staff safety. We have a written submission from the Nurses and Midwives' Association, so I'm quoting the data from them that in 2024-25, there were 629 WorkCover claims resulting from exposure to biological hazards in the workplace. Is that something that you're monitoring as well? I suppose my first question is: What are you doing to reduce that?

KATHY DEMPSEY: Biological hazard exposure comes in many forms. It's not just airborne. There's blood, body substances, laboratories—so they are mandatory reportable. Then locally there are systems in place to look at, I guess, causative factors and reducing those. From a State perspective, it's around the policies and guidelines that we write for mitigation to make sure that there are protective measures in place, that we've got the right PPE in place, or engineering controls or environmental controls to reduce those hazards that we've got—so consumables that have engineering controls and safety controls in place from a State perspective.

The CHAIR: We had very specific evidence around to exposure to chemicals in operating theatres. There was a particularly concerning anecdote about a rural operating theatre in an earlier hearing, but there was also evidence from the ASMOF survey where members identified surgical plume as an issue. The ASMOF survey had only 25 per cent of respondents being aware of local plume evacuation being in place. Is there regular monitoring of those air quality hazards in operating theatres?

KATHY DEMPSEY: I'm not sure I can answer that because it doesn't really come under infection prevention and control.

The CHAIR: That's okay. Are you able take it on notice and pass it on to someone who can for us?

KATHY DEMPSEY: I can take it on notice and find someone.

The CHAIR: Thank you. Just to better articulate that question: What are the standard protocols that are in place to assess those risks?

KATHY DEMPSEY: Sure. I'm aware that there is a surgical plume policy that originally came out of workforce, so protective measures around managing that. But, again, I will take that on notice.

The CHAIR: I want to come back to a topic that I've asked you about many times before, Dr Dempsey, which was hospital-acquired COVID infection. Have you got up-to-date figures for this year or this financial year for hospital-acquired COVID infection in New South Wales?

KATHY DEMPSEY: We still do not really collect those statewide figures due to, I guess, the challenges around trying to allocate and call what is hospital acquired and what is not. My understanding is that those figures are still not available.

The CHAIR: Unsurprising, but disappointing then.

The Hon. SUSAN CARTER: In terms of protection of staff, what are the protocols about notifying staff if elevated levels of mould have been detected or air quality issues have been detected? Who's informed? How are they informed? When are they informed?

KATHY DEMPSEY: Again, it would be dependent on the level of risk and whether it's contained in a unit. First and foremost, it would be the responsibility to those staff. That would usually be led by a nursing unit manager, a senior nurse manager or the director of nursing down. As the issue gets bigger, obviously, it would come under, basically, a corporate comms system, where it would be either a mail-out to all staff or it would be town hall meetings. There would be requests to put it on ward meeting agendas to make sure that it's discussed. You would include things like how to escalate issues and where those would need to go to and, again, depending on the extent, whether or not you would potentially pull together a remediation group to look at that.

The Hon. SUSAN CARTER: When you say "depending on whether it's contained", if something is seen to have arisen but is controlled, would staff automatically be informed that this had happened and this risk had been present, or would the view be taken that there's no need to inform anybody?

KATHY DEMPSEY: Again, I think it depends on the level. If you've got a cleaner that cleans a spot of mould somewhere, that would be part of their auditing process that they'd report, and then it's just making sure that there would be ongoing monitoring and that next time they cleaned for that. You wouldn't necessarily alert the entire ward that there was a mould spot somewhere.

The Hon. SUSAN CARTER: If you'd had deaths of two patients, would you alert all the nursing staff that this had happened?

KATHY DEMPSEY: I think the issue is that, when we have any serious adverse events for patients, there is usually an expected approach that staff are informed of, particularly, any contributing or causative factors. If mould was thought to be the case, yes, it would be communicated to staff.

The Hon. SUSAN CARTER: What would that look like? Is it an email? Is it verbal?

KATHY DEMPSEY: In my experience, we would use any and all of the above. You would start with your local verbal ward meetings. You would potentially send emails out. You may do an all-staff notice. You may put flyers on safety boards in tearooms. You may decide to hold town hall meetings.

The Hon. SUSAN CARTER: When it's an environmental factor—air quality, mould—at what stage do you then go out and inform visitors and other people who may have been in the hospital that this risk either did exist or may continue?

KATHY DEMPSEY: Again, it would depend on the extent and who was impacted. In an oncology unit, for example, if there was heavy mould detected, obviously there would be discussions to make sure that patients and carers were alerted to those. It's usually quite complex. It depends on whether or not there's any movement of patients and what's happening in that environment, but there is usually a discussion with family.

The Hon. SUSAN CARTER: Is there an assumption that everybody who visits is perfectly healthy, or is there an awareness that you could have people who—

KATHY DEMPSEY: God, no.

The Hon. SUSAN CARTER: If something's been happening for two months and you haven't—I presume hospitals don't capture the details of every visitor. How is the general public informed? Is it in the same way that you hear announcements like, if you were at Winston Hill shops yesterday, you might have measles—watch out?

KATHY DEMPSEY: I'll start and then I'll hand over to Vicky. What happens inside the hospital is that infection prevention and control usually take a lead role in managing a lot of this. Then, as it becomes a greater public health issue, infection control works very closely with our public health units to actually divert the messaging from in-hospital patient risk to now we've got a generalised public health risk. Then we would work closely with public health and trigger the public health response.

VICKY SHEPPEARD: Yes, focusing on a particular environmental risk. But other exposures can happen in hospitals—a person with TB and unknowingly infectious, or with measles. We can readily extract lists of the patients and then, if they're discharged, we go via the discharged patient and who came to visit you. We have those measures that are in place for contact tracing. It's when it's needed. When the information may have had an impact on health, they may need to take some steps. Whatever arises, we have quite well-practised systems to contact the people that may need to know.

The Hon. SUSAN CARTER: Dr Sheppeard, were you or was anybody else from public health involved with the discussions about who should be informed about the aspergillus outbreak at Prince Alfred Hospital late last year?

VICKY SHEPPEARD: No, I understand that was managed by the hospital. I'm not sure if the public health unit was involved, but certainly their infection control practitioners—I can't imagine—

KATHY DEMPSEY: There's a normal internal process for those things, so it would be quite reasonable for that to be managed locally. If you've got some issues where you may have some identified cases, you have a look at causative factors—is it triggered above and beyond what you would normally see in those environments?—then work backwards from that and do any contact tracing, if you need to. There is a policy requirement on triggers for escalation. When you start to see outbreaks, then there is a requirement to report that up to the ministry. In fact, RPA did do that just prior to Christmas, which then triggered an expert panel from the Chief Health Officer down to come together and work with RPA around where they were currently at and what needed to happen from that point.

The Hon. SARAH MITCHELL: When that gets triggered, does that come up through the Clinical Excellence Commission, or are you separate to that?

KATHY DEMPSEY: We're really separate to that in the sense that it goes directly to the ministry and then it'll come down to us. If it does, sometimes it may come to us from the ICPs, but then we'll make sure that the trigger is then sent directly up to the ministry.

The Hon. SUSAN CARTER: So nobody from public health was part of the ministry expert panel that was convened?

VICKY SHEPPEARD: The Chief Health Officer convened that expert panel.

The Hon. SUSAN CARTER: And the Chief Health Officer is public health?

VICKY SHEPPEARD: Yes, she's a public health physician.

The CHAIR: A number of the submissions to this inquiry have called for public education campaigns around the health risks of gas appliances and wood heaters in residential settings. Is that something that has ever been requested of NSW Health? Has any work been done in that regard?

VICKY SHEPPEARD: I can't recall that there have been public campaigns. We certainly have information on our websites for people to go to, and the Commonwealth has a new suite of quite detailed information on wood heaters and gas heaters on the CDC website. I do understand that perhaps one component of this emerging national work will be more active communication about how to keep indoor air quality good, and that's particularly focused on homes.

The CHAIR: Have you been involved in any cost modelling? One of the figures from recent research that has been submitted to us is that 12 per cent of childhood asthma is now attributable to those kinds of appliances in the home. Has there been any analysis of what the cost savings might be to Health from those avoidable presentations?

VICKY SHEPPEARD: I'm not aware that that's been done, but obviously we aim to minimise health impacts overall. Irrespective of the costs, measures to reduce childhood asthma would be a very desirable thing.

The CHAIR: The remainder of my questions were about other non-biological pollutants. I'm happy to put them as supplementary questions because I think they're also for your colleagues in Infrastructure. As there are no further questions from my colleagues, we'll end the session here. A number of questions were taken on notice. The secretariat will be in touch with you about those, as well as the additional supplementary questions. Thanks for your time.

(The witnesses withdrew.)

The Committee adjourned at 15:40.