

**REPORT ON PROCEEDINGS BEFORE**

**PORTFOLIO COMMITTEE NO. 2 - HEALTH**

**HEALTH IMPACTS OF EXPOSURE TO POOR LEVELS OF AIR  
QUALITY RESULTING FROM BUSHFIRES AND DROUGHT**

**Virtual hearing via videoconference on Friday 12 June 2020**

**The Committee met at 10:00.**

**CORRECTED**

**PRESENT**

The Hon. Greg Donnelly (Chair)

Ms Cate Faehrmann

The Hon. Wes Fang

The Hon. Emma Hurst (Deputy Chair)

The Hon. Natasha Maclaren-Jones

The Hon. Taylor Martin

The Hon. Walt Secord



**The CHAIR:** Good morning to everybody. I welcome you all to the second hearing of the Portfolio Committee No. 2 inquiry into the health impacts of exposure to poor levels of air quality arising from bushfires and drought. Before I commence, I acknowledge the Gadigal people, who are the traditional custodians of this land. I also pay respect to the Elders past and present of the Eora nation and extend that respect to other Aboriginals present and who may be joining us today on the internet. Today is the second and final hearing for the inquiry. Today we will hear from four separate panels of representatives, two panels of researchers, a panel of stakeholders dealing with the issue of ongoing impact of reduction of emissions, and a panel of representatives from the New South Wales government agencies, including NSW Health, SafeWork NSW, the Rural Fire Service and the Department of Planning, Industry and Environment.

Before we commence, I make some brief comments about procedures for today's hearing. Like many things that we needed to adapt to in the face of the COVID-19 health measures, the hearings for this inquiry have been conducted via videoconferencing. This enables the work of the Committee to continue without compromising the health and safety of its members, witnesses and staff. This being new territory for upper House inquiries, I ask for everyone's patience and forbearance for any technical difficulties that we may encounter today. If participants lose their internet connection and are disconnected from the virtual hearing, they are asked to rejoin the hearing by using the same link as provided by the Committee secretariat.

Today's hearing is being broadcast live via the Parliament's website. A transcript of today's hearing will be placed on the Committee's website when it becomes available. All witnesses have a right to procedural fairness, according to the procedural fairness resolution adopted by the House in 2018. There may be some questions that witnesses could answer only if they had more time or with certain documents to hand. In these circumstances, witnesses are advised that they can take a question on notice and provide an answer within 21 days. I remind everyone here today that committee hearings are not intended to provide a forum for people to make adverse reflections about others under the protection of parliamentary privilege. Therefore I request that witnesses focus on the issues raised by the inquiry's terms of reference and avoid naming individuals unnecessarily. Finally, everyone should mute their microphones when they are not speaking over the course of the next session. I welcome our first group of witnesses today.

**STEPHEN DUCKETT**, Health Program Director, Grattan Institute, sworn and examined

**WILL MACKEY**, Associate, Grattan Institute, affirmed and examined

**FAY JOHNSTON**, Head of the Environmental Health Group, Menzies Institute for Medical Research, affirmed and examined

**The CHAIR:** I acknowledge that your submissions have been received and processed by the Committee secretariat, and stand as submissions to this inquiry. With respect to the Grattan Institute, your submission stands as No. 38 to the inquiry. With respect to the Environmental Health Group, Menzies Institute for Medical Research, University of Tasmania, the first submission is submission No. 35 standing in the name of that organisation, and then we have specifically submission No. 35A from Associate Professor Fay Johnston from the same organisation. They have all been received and stand as evidence for the inquiry. They can be taken as read, and have been read, by the Committee members. I will ask each organisation representative to make an opening statement. But in making your opening statement, be conscious that people have the submissions and have read them, so there is no need to go through what is the content in detail, but perhaps set up the opportunity for the questioning, which will immediately follow. With respect to the Grattan Institute, Dr Duckett, are you making the opening statement for the organisation?

**Dr DUCKETT:** Yes.

**The CHAIR:** That being the case, would you please make your opening statement?

**Dr DUCKETT:** Yes, thank you very much, Chair. I have three points to make. Everybody knows that the last bushfire season was bad, and that smoke haze was terrible. My sister lives in Lane Cove and could not see her back fence from her back door. We demonstrate in figures 1.4 and 1.5 of our submission just how terrible the air pollution was. Secondly, it is highly likely that there was an increase in presentations to New South Wales public hospital emergency departments as a result of that smoke haze. We did an analysis of the Victorian and Australian Capital Territory [ACT] emergency department data and found that the worse the air quality was, the greater the number of people presented to the emergency departments. This is shown in figure 1.6 of our submission. Thirdly, messaging about air quality risk is not as good as it could be. New South Wales should adopt more nuanced messaging—and we give an example of the ACT's messaging in figure 2.1—and more targeted messaging to people at risk, an example of which is in figure 2.2. Thank you very much.

**The CHAIR:** Thank you very much, Dr Duckett. That has set that up very nicely for our questioning. Associate Professor Johnston, would you like to make an opening statement?

**Associate Professor JOHNSTON:** Yes. I have been studying with my group the health effects of bushfire smoke for about 20 years. What I will do is make some general points about the evidence and how it might inform us going forwards.

**The CHAIR:** That will be great.

**Associate Professor JOHNSTON:** In brief, things are set to worsen as our environment gets smokier and we need urgent action on climate change. That is not my direct area of expertise but that is the context from which we are operating. Smoke is a complex mixture of toxic gases and particles. Particles are the most important for health but they are not the only determinant. The health effects are not equal and underlying risks in an individual person could be even more important than the absolute concentration of smoke in the air. There are lots of well-recognised, different vulnerable groups who need specific advice for their situation—pregnancy as opposed to age as opposed to lung disease, for example. A lot of the health impacts occur at lower levels. That is very important that there is no safe lower threshold. Managing the very extreme days will not help us avert the impacts of bushfire smoke pollution in Australia.

It is a public health priority because so many people get affected—millions of people, in the context of the recent bushfires. Ongoing repeated impacts can be just as serious; because it all adds up, it can be more serious than brief, severe impacts. This means that we need to manage and take all exposure seriously. The estimates that my team did of health impacts such as deaths, for example, in New South Wales—a lot of those impacts did not occur on days that might be defined as hazardous, so we need to think broadly in how we approach this problem. We need to get much better at living with, and managing, smoke. There are a number of ways that we can improve how we do this. The issues are actually very similar across all States in Australia. One, of course, is more research. We know what we know and we know that there are a lot of gaps, particularly on the effectiveness of interventions and on the longer-term health impacts. As we have already heard, we need better information for the public and for the workers, more monitors, information in real time, and good forecasts. An app that my team developed, AirRater, was downloaded 30,000 times in New South Wales alone in a period of two weeks because at that stage

it was the only source of hourly information for people in New South Wales as the agencies had not got their system going at that point.

It needs to be accessible and understandable to the public. We also need community education. Everybody is different. There is a lot of complexity with the health advice we give. Simple advisories based on simple thresholds do not quite capture it. We need a much more systematic way of doing it. In concluding, I think we should also acknowledge the New South Wales responses in terms of early setting up of expert advisory groups as far as health and health messaging go, rapid expansion of the network, making hourly information available in real time, sharing information with anyone who asked for it by the environment agencies—all those responses in my view deserve recognition and commendation. Thank you. I will leave it there.

**The CHAIR:** That is great. That has set up very nicely, Associate Professor. We will move now to questioning. Just to explain the format for the witnesses, we have representatives on this Committee from the Government, the Opposition and the crossbench. If you are agreeable, we will share the questioning between the three groups as equally as we can. We will move through those questions as people indicate they wish to ask the questions. If you are agreeable to that format, we will get things underway. I see the Hon. Walt Secord putting his hand up.

**The Hon. WALT SECORD:** Thank you, Chair and participants. Dr Duckett, I would like to take you to figure 2.1 of your submission on page 10. You make reference to ACT Health versus New South Wales DPIE. Is the ACT measurement the best practice in Australia?

**Dr DUCKETT:** Thank you very much for that question. I think I would say probably yes, but the reason that we included the ACT is that obviously it is surrounded by New South Wales. It was affected by exactly the same bushfires as New South Wales. The air quality in the ACT was worse than that in New South Wales. The staggering thing is that the advice to residents of the ACT and the advice to residents of Queanbeyan was totally different, even though there is a bus that goes from one to another. What we are trying to show there is that you can be much more nuanced in the provision of information to the public.

**The Hon. WALT SECORD:** You have actually taken my second question. Would there be much difference between Queanbeyan and Canberra, or Queanbeyan and Yass, or Queanbeyan, Goulburn and Canberra?

**Dr DUCKETT:** It was exactly the same smoke that caused the high levels of admittance to the ACT emergency departments. We asked for information from NSW Health but at the time we asked for it, it was busy addressing the bushfires and then it got busy addressing the COVID-19, so we were not able to get New South Wales information, so we could not actually study the impact on New South Wales emergency departments. But it is exactly the same smoke and exactly the same air quality issues that would affect Queanbeyan and the ACT, and probably Yass and Goulburn as well.

**The Hon. WALT SECORD:** Take me through the various categories in the ACT. There is "hazardous extreme", "hazardous high", "very unhealthy for all" and "unhealthy for all". Is it difficult to transfer the ACT system to New South Wales? Is there something that we are not seeing? Is it simply just a matter of putting a system in place? Is there something that we are unaware of why we cannot simply just put the ACT system in New South Wales?

**Dr DUCKETT:** My view is that it is preferable to have the same system across the country. We saw—and probably you are hearing evidence of—problems at the border between New South Wales and Victoria in the way bushfires were managed. I think bearing in mind that radio stations, TVs and so on across the Territory-State border, it would seem to me that consistency is the right thing. As Associate Professor Johnston pointed out in her introductory comments, there is no safe level. As we say in our submission, in figure 1.6, basically the poorer the air quality, the more admissions there are. So, whether you divide the dividing point at 250 or 245 or 260 for the "hazardous extreme" is a matter of judgement. My preference would be that you have the same system, but I could understand why different jurisdictions might argue for different ones. But I think this is the case where jurisdictional agreement on what the best categorisation would be would be a good thing.

**The CHAIR:** Mr Secord, I think Mr Mackey was going to jump in. I think he put his hand up.

**Mr MACKEY:** I will add that the ACT updated its system in February this year. It updated its system after the worst of the bushfires. Beforehand, it had a rating system identical to that of New South Wales. It has updated it. In our eyes it has improved it and made it clearer whilst New South Wales has not updated it. That kind of thing should be done if not around the entire country, at least through the ACT and New South Wales, given their proximity.

**Ms CATE FAEHRMANN:** Can you hear me all right?

**The CHAIR:** Yes.

**Ms CATE FAEHRMANN:** I have a question first for Associate Professor Johnston. Thank you so much for your submission and for submitting the research paper, which is incredibly useful for the Committee's work. You mentioned in your opening statement firstly how much the AirRater app was downloaded. I was particularly interested reading in your submission that your team is inundated with hundreds of emails from individuals seeking personal advice and support. We heard on Wednesday from the Maritime Union of Australia and Transport Workers' Union, who mentioned your app and the good work that you did with that. Did you approach NSW Health or the Government at the time you were receiving all of these requests for advice to offer them assistance or to work with them in any way during the bushfires?

**Associate Professor JOHNSTON:** We have had AirRater operational for about five years, but funded by health departments in Tasmania and the ACT. As part of the response to the bushfires, it was made available in New South Wales, mainly for residents of Port Macquarie in June. But it meant geographic restrictions on the app were limited and so it was discovered by word of mouth at the time when it was not possible to get hourly readings in any other way for people in New South Wales. We worked closely, as we have done, with DPIE in New South Wales throughout that period. They provided AirRater hourly data directly for us to share as they transitioned to their system. They nearly shut it at one point; when they realised 30,000 people were using it, they delayed and kept the system operational for AirRater just to make sure that no service was stopped at the time. We did work closely with them. In terms of advice, that is more for health departments. We tended to give advice, explaining all the complexities and all the different systems around the country and, indeed, internationally, and tended to refer people to health departments for advice because we did not want to be yet another source of information, so we recommend people to go to their department.

**Ms CATE FAEHRMANN:** I just want to pick up on this in terms of the air quality monitoring more broadly and then maybe the Grattan Institute wants to jump in on this as well. Associate Professor Johnston, in your submission you say:

The current air quality monitoring network has inadequate reach, failing many vulnerable individuals in regional and remote areas who need access to air quality information to protect their health.

Page 5 of the New South Wales Government submission to this inquiry states:

The NSW Department of Planning, Industry and Environment (DPIE) runs a comprehensive air quality network and program to monitor, map and forecast air pollution, characterise the impacts of air pollution and develop an evidence base for improving air quality.

The Government also talks about its expansion of the rural quality monitoring network. There is that as well. Do you have any criticisms of what it is doing in terms of air quality monitoring, which you seem to imply in your submission, and what the Government should be doing better?

**Associate Professor JOHNSTON:** Historically, air quality monitoring throughout Australia was focused in the huge, urban cities. That was the reason for us setting up standards. It is quite expensive—the gold standard methods. That is not suitable for fire smoke and it never really has been because a lot of smoke is in rural and remote areas where we do not have really good air quality networks. Then there are the whole issues of robustness of the machines and quality of the data that you get. New South Wales has been rapidly expanding its network and using other lower-cost sensors. That is highly commendable. But across Australia we still have huge gaps; in New South Wales there are still gaps. There are a lot of smaller towns where this issue is really crucial, where there still are not monitors. There is a lot of complexity in deciding the best way to monitor that. But it is certainly the direction that New South Wales is moving in. I would encourage it to keep moving in that direction.

**Dr DUCKETT:** Thanks, Ms Faehrmann. Further to what Associate Professor Johnston had to say, in our report on figure 1.3, we have mapped where the air quality stations are in New South Wales. You can see that there are almost zero in the west of the State, and also not many along the Great Dividing Range. Especially in the south, in the south-east of the State, where there is extensive forestation, they are not very many air quality monitors.

**Ms CATE FAEHRMANN:** Chair, is there more time for one more question in relation to the remote stuff? Is that possible?

**The CHAIR:** Yes.

**Ms CATE FAEHRMANN:** Dr Duckett, you mentioned specifically Goulburn in your report. Those high particulate matter [PM] days of hazardous air quality, I think it was 24 days, was stark. What would you suggest the Government should have done at that time during those 24 days that Goulburn, particularly, for example, registered hazardous air quality? What should the Government have done for the residents of Goulburn—this is, say, NSW Health recommendations in terms of alerts for people during that time?

**Dr DUCKETT:** Unfortunately, I do not know precisely what they did already, so it is hard for me to say what they did not do. But in general, the infrastructure—we now have the technology to give personalised advice by text message. It is possible, for example, to give nuanced messaging to, say, a person with asthma, which is different to a person who is pregnant, which is different to a person who is neither. In the contemporary 2020 world, we should be able to be giving nuanced messaging to people who are at different risks. But maybe Associate Professor Johnston is a better person to answer that than me.

**The CHAIR:** Any comment, Associate Professor Johnston?

**Associate Professor JOHNSTON:** Most public health responses to severe smoke events have fairly simple messaging on ways to avoid smoke, and rely when people have not got monitoring on detecting, seeing and smelling smoke. That is fairly basic advice, but it is the standard and it is probably the standard globally. I think we can do a lot better, but doing a lot better is not just what we do when the air quality is hazardous; it is a systematic approach to air quality and bushfire smoke in particular for the whole country that lets you know what to do when it is beginning to get worse and what different people in different situations should do, how to detect the air quality and how to protect themselves from it. That is quite a big job. It is not just the case of what to do when we cross a particular, very high threshold.

**The CHAIR:** I note the Hon. Walt Secord has a question but do any Government members have any questions that they would like to ask?

**The Hon. NATASHA MACLAREN-JONES:** Yes, I have a couple. My first question relates to the air quality index and the 24-hour rolling data and then having one-hour data. I am not across all the detail and we have the department coming in this afternoon. But I wanted to ask whether or not aware, or can give a bit of an overview, of how that works and how easily it would be to implement full-time rather than just when we have a basic bushfire crisis occurring?

**Associate Professor JOHNSTON:** I can probably explain that if you like. Australia's air quality standards are based on historical research and health evidence. That historically all came from data that was measured over a 24-hour average. Our standards are pegged to a 24-hour average. Our standard is 25 and when our air quality over a 24-hour period is 25, the index is actually multiplied by four. We say it is an index of 100 because it is the same as what our standard is. That is one major point of confusion because some jurisdictions will give that index and some will give the actual concentrations and then they will give different descriptors such as "very poor" or "hazardous". There will be according to State-based preferences. That is not helpful in the context of a bushfire because air quality changes rapidly in bushfires. It can change with the wind; it can accumulate overnight. We know now from the evidence that health effects can happen within an hour. That has been documented in quite a few studies now.

So you do not have to wait for 24 hours before your asthma gets worse or, indeed, before you have a serious cardiac event of some sort. So, for people to manage their own health, they need something close to real-time. They need a heads-up when it is beginning to creep up because a lot of the actions you do to protect yourself from smoke are preventive. There is no point in shutting the doors after the smoke is thick around you and you have been told it is a hazardous environment out there because by that stage the smoke will be inside as well. Indeed, with asthma, you take preventive medication. It is a bit like to take that when the air quality is poor. The reason there is very strong argument for presenting real-time, hourly data is to help people take action to protect themselves.

**The Hon. NATASHA MACLAREN-JONES:** You may not know this but how difficult would it be to present that on an hourly basis? Are there a lot of technical issues to it or is it just a matter of saying that is what we will now do and move to it?

**Associate Professor JOHNSTON:** For most jurisdictions in Australia, it is simple and the vast majority are doing it, I think. I cannot quite recall where Queensland is at at this point but it means a lot of them are presenting both hourly and 24-hourly, and there is no standard for hourly, so there is no agreement on how to label the hourly data. So, it is still not clear and not uniform but technically it is easy, yes.

**The Hon. NATASHA MACLAREN-JONES:** The other question is relating to air quality stations—and we have heard evidence that we obviously need more—and whether or not you have a view on where they should be located and what the ultimate number would be.

**Associate Professor JOHNSTON:** That is a very good question. It partly goes to the technicalities of the machines. Wherever there are people, there should be monitors. Then it is a case of what population threshold do you think should have a monitor in Australia. There are different ways of monitoring. There are very low-cost sensors, which are less accurate, but they can work well if they looked after properly and calibrated. That is actually a way to get huge reach for air quality monitoring. Then there are better calibrated and maintained but far

more expensive reference monitors that government departments will be able to tell you a lot more about this afternoon. But between all those kinds of monitors, I think we can get actually very good population coverage. That is what we should be aiming for.

**The Hon. WALT SECORD:** I was actually going to ask Assistant Professor Johnston about the reach of air quality stations. I notice from the submission of the Grattan Institute that there are no monitors in the central-west past Orange. I just wondered if it was possible to set up a series of them where you did not need human staffing of those monitors, so you would be able to put them in facilities around the State and get indications, and if it was feasibly possible. But you did touch on that. Could you explore that a bit for me?

**Associate Professor JOHNSTON:** It is possible to have them uploading data to the internet in real-time where it can be read. That is all technically possible. It is also a bit of buy, but where there are a lot of low-cost sensors on the market with very poor detection limits unvalidated, buying your own and deploying your own—some are reasonable and some are not. It is a case of getting advice. I think that is where our agencies have a major role in identifying, evaluating and deploying low-cost sensors and keeping an eye on their function and replacing if they drift and no longer work well. But technically, it is possible to do with low-cost sensors with the right expertise to calibrate them and evaluate their ongoing performance.

**The Hon. WALT SECORD:** Because we are a parliamentary Committee and we make a series of recommendations at the end of our deliberations, would you recommend low-cost sensors in parts of the State where they currently are not provided?

**Associate Professor JOHNSTON:** Validated ones, yes.

**The Hon. WALT SECORD:** When you see "validated ones" and they are low-cost, what are we talking about?

**Associate Professor JOHNSTON:** The ones we know that work and the ones that can be monitored for their performance. Tasmania has a network of machines called DustTraks. They are intermediate; they are \$10,000 to \$15,000. But compared with standard ones, that is lower cost. Then there are very low-cost sensors, less than \$1000. Some are acceptable and some are not acceptable. They are the ones that need to be deployed with oversight of air quality scientists, who know how to manage them. But definitely those kinds of sensors also have a role for Australian air quality monitoring.

**The Hon. WALT SECORD:** I am not trying to lead you into something but what I am trying to say is that would you recommend an expansion of appropriately monitored, proven sensors in parts of the State that are currently not covered. I guess that is what I am currently trying to say.

**Associate Professor JOHNSTON:** Yes, I would.

**The Hon. WALT SECORD:** Thank you very much.

**Ms CATE FAEHRMANN:** I suppose one of the things that we saw in New South Wales during the bushfire season was that largely in relation to air pollution and smoke, it was not until the smoke became very visible that people became extremely concerned about it. But as both of your submissions show, it is often the PM 2.5 particulates that you cannot see that are the most dangerous. We also saw it has been suggested that we should have had a much more proactive system of alerts. Are you suggesting then, given both of your submissions say how dangerous these particulates are and that research has shown time and again that there are no safe levels, that the Government should move towards a much more proactive alerting to people about dangerous air quality as opposed to asking people to opt in? At the moment people have to be very proactive to find out what the air quality is on any given day. Does the current system of alerts match the relative danger of air pollution because it just does not seem to be? Do you have any general comments about that?

**Associate Professor JOHNSTON:** I can comment. With the influence of air pollution, it can have extremely serious events such as death, for example. But that is very rare. For a day with an air quality exceedance of the standards, you might expect one death in a million people. The serious events are actually quite rare, but it impacts on everyone. The reason that it is of public health importance is because millions and millions of people get affected. What I am saying is that what we really need is for people to understand how they are affected and their personal risks, and to give them the information so that they can manage the air quality day to day. In all of us, our bodies will make immune responses to it. It might not affect me as a healthy person but if I have asthma it can make me seriously unwell.

If I am already at high risk of a heart attack, it could give me that heart attack. But it is not like a cloud of cyanide that is really dangerous. It is a bit like managing ultraviolet radiation from the sun. It is there, it is a hazard, we live with it. What we really need is to give people the tools to be able to live with it. Just waiting and giving government's centrally-issued alerts, which governments are reticent to do because of alert fatigue, will not



actually minimise the health impacts in a way that enabling people to have the knowledge, tools and easy apps where they can see what is going on will do. That will do a lot more to help them protect their health before the air quality gets extreme. My view is that it is not a command-and-control emergency-type response that is needed for bushfire smoke; it is a much more systematic, informed health promotion and health education with all the tools to support them. But to get to that vision, we have got a way to go.

**Dr DUCKETT:** I would add to that by saying that if you have a threshold for labelling something hazardous, which is 50 parts per million [PPM], then it is not a very nuanced approach. I think we need to have an approach that signals that things can be unhealthy and you should be managing that yourself, and things can get really bad and that is really bad. The way in which the Government organises its messaging should be much more nuanced and not just this yes or no, it is hazardous and do something, but also, as Professor Johnston says, thinking about assisting people with self-management. If you use the sunshine issue, people know now not to go out and get sunburnt and all those sorts of things because there have been systematic campaigns over years about really watching these things and I think we need to have the same sort of build-up of community awareness that bushfire smoke can be hazardous even if you cannot see the PM 2.5s floating around in the air.

**Ms CATE FAEHRMANN:** If I could jump in.

**The CHAIR:** I thought Mr Mackey might have had some comment to make, sorry.

**Mr MACKEY:** Just to add to that, I think lots of people's behaviour from day to day is kind of determined by their employer.

**Associate Professor JOHNSTON:** I agree with that.

**Ms CATE FAEHRMANN:** I was just going to jump in on that issue in relation to outdoor workers in particular, because on Wednesday we heard from the unions who were expressing the need for greater regulation in relation to unsafe levels of air or hazardous levels of air pollution; examples were wharfies, essentially, working outside a lot and displaying various symptoms as a result. Do you think that hazardous levels of air quality—let us use, say, the ACT levels—warrant particular regulations in terms of outdoor workers to be able to say, "You have to wear this kind of personal protective equipment [PPE]"? You mentioned, for example, UV rays and sunscreen, potentially a big hat and long sleeves and gloves or whatever are going to protect workers more than a mask will against PM 2.5. So what are your recommendations to the Government for, for example, during hazardous air qualities for outdoor workers? What more should they be doing there?

**Dr DUCKETT:** Many industrial agreements already provide for construction workers not to have to work in days when the temperature is over 40 degrees or some number, so it is already in enterprise agreements. Obviously, unions and employers should negotiate similar things about air quality. I am not sure whether the Government should regulate in that way; I have not thought that one through.

**The CHAIR:** You can take that on notice if you wish. Associate Professor, were you going to jump in?

**Associate Professor JOHNSTON:** I was just going to add that there is a really overwhelming need for clear guidance for outdoor workers in this and for employers, to help employers and employees. Not only do we need to take into account thresholds, but the underlying health of the employee or the person working outside, because that really determines their risk, and the risk could be at relatively low levels if somebody has a severe lung condition, for example. So the guidance needs to incorporate these complexities and how to protect workers who are in certain categories of risk.

**The CHAIR:** Associate Professor, could I ask you a question in regard to the matter of the more nuanced measurement that we are seeing with respect to comparing the ACT with other States and Territories? We referred to this earlier in the hearing with the Grattan Institute's submission where, on page 10, we saw the more nuanced scaling of categories from ACT Health compared to New South Wales, but this may be also in other jurisdictions. Do you have a knowledge of the ACT's framework for measuring and, if you do, do you have any comment about it?

**Associate Professor JOHNSTON:** I have reviewed all the States and they do not all come to mind. Some are based on 24-hour averages and some present hourly averages—Tasmania and Victoria, for example, present hourly—and some present both. So there is complexity in it all and I think—and in fact, this has happened already—the agencies have all got together to talk about how different it all is and talk about unifying it. I do not necessarily think that we should all standardise to the ACT; I think we need to step back and think exactly what the aims are and what will be the most useful to Australians across the country. But I agree with the principle that more nuanced and clear information is what we need for a range of circumstances.

**The CHAIR:** Does your knowledge take you to an understanding of jurisdictions overseas, and any that we might consider looking at as best standards in terms of the way in which they deal with air quality in their jurisdiction?

**Associate Professor JOHNSTON:** With respect to bushfires, or wildfires as they call them, the vast majority of research that is comparable to our situation, is North America, USA and Canada. The United States Environmental Protection Agency [US EPA] and Canadian guidelines—I am more familiar with the Canadian ones—are based on hourly advice and I think they are a good model, but there is a plethora internationally of approaches as well.

**The CHAIR:** There are many. But does any stand out to you in terms of something that we ought specifically look at, or you are just not in a position to say? You can take that on notice if you wish but I am just wondering if there is anything specific we should be looking at.

**Associate Professor JOHNSTON:** Probably not. I think Canada's approach is good, the British Columbia guidelines, but I am not necessarily across the detail of all of them.

**The CHAIR:** That is fine. Ms Hurst, did you have any questions?

**The Hon. EMMA HURST:** I am okay. I have been listening in and all my questions have been covered by others.

**The CHAIR:** That is fine. I was just checking with you. Any final last question. We have gone to time, but if there is one last question. If not, I thank the witnesses very much once again for making themselves available today. It has been very helpful to have you elucidate additional information to that provided in your submissions. I suspect that following the reading of *Hansard* from this hearing today there will be some supplementary questions. If the witnesses are agreeable, we normally have an arrangement of a 21-day turnaround time where our secretariat will liaise with you with respect to supplementary questions and answers to come back. That too will form part of the evidence to the inquiry. If that is agreeable, that would be appreciated. Once again, thank you all very much for taking the trouble to prepare the submissions and to make yourselves available today. It has been most helpful for our inquiry.

**(The witnesses withdrew.)**

**(Short adjournment)**

**GUY MARKS**, Chief Investigator and Head, Centre for Air pollution, energy and health Research, affirmed and examined

**SUZANNE HOLLINS**, Head of Research, Nuclear Science and Technology and Landmark Infrastructure, Australia Nuclear Science and Technology Organisation, affirmed and examined

**DAVID COHEN**, Distinguished Research Scientist, Nuclear Science and Technology and Landmark Infrastructure, Australia Nuclear Science and Technology Organisation, affirmed and examined

**The CHAIR:** I invite opening statements from the respective organisations. Can I just confirm that with respect to submissions made to the inquiry from the Centre for Air pollution, energy and health Research [CAR] your submission has been received and is No. 34 to this inquiry, and thank you for that, and with respect to the Australia Nuclear Science and Technology Organisation [ANSTO], your submission has been received and it stands as submission No. 33 to the inquiry, and thank you for that. For our witnesses to appreciate: all Committee members have copies of your submissions and have had now an opportunity to read them. So in making your opening statements you do not need to refer in detail to the content but rather perhaps set up a discussion for us which we can follow up with some questions regarding the terms of reference. If we start first with Professor Marks. Would you like to make an opening statement?

**Professor MARKS:** Yes, thank you, and thank you again for inviting me to present to you. I am sure you do not need me to say to you that these catastrophic bushfires that occurred in December and January were at the time a unique event but, sadly, as many people have not recognised, were probably a harbinger of our future. From a public health perspective, we like to think about layers of response and intervention from a prevention perspective. It is clear that much of the capacity to prevent these layers outside the domain of health are starting with, of course, action on global warming and climate change, which is the underlying cause, and proceeding through layers of prevention related to preventing the fires themselves and adequately controlling the fires, but ending with efforts to mitigate the effects of the bushfire smoke, and that comes more readily into the health space.

This was the first time really that we have had such a large population of people in our big cities that were exposed to such prolonged and high levels of smoke exposure, and for many people this was a new experience to realise that what is in some ways a natural occurrence—bushfire smoke—might have adverse health effects. Many people have thought of smoke as being a relatively benign phenomenon and the idea that this might have adverse health effects was not obvious to people. What it highlighted for us who were dealing with the health effects and trying to advise people about how to mitigate them, was how little we actually know about the short-term and long-term adverse effects of this smoke exposure and about the effectiveness of various strategies for protecting human health. Much of what we have presented to you in our submission is the little we do know and the need for further knowledge about how to mitigate this problem.

**The CHAIR:** Thank you very much, Professor Marks. Either Dr Hollins or Professor Cohen, would you like to make an opening statement?

**Dr HOLLINS:** Yes, I have a short opening statement on behalf of ANSTO.

**The CHAIR:** Please proceed.

**Dr HOLLINS:** Thank you to the Chair and Committee members for having us here today. We are grateful for the opportunity to support the New South Wales Government in its undertaking of this important inquiry. I am the head of research at ANSTO and my colleague David Cohen is responsible for leading the air quality research that we undertake at ANSTO. We, along with approximately 1,000 other scientists, engineers, technicians and nuclear medicine manufacturers, are ordinarily based at Lucas Heights campus in southern Sydney. Over 30 years ANSTO has played a leading role in measuring and characterising foreign particles in the air from a range of locations across Australia and, in fact, the world.

In New South Wales, ANSTO has around 12 air monitoring locations, from Newcastle down to Wollongong, including in the Sydney metro area, and our highly sensitive particle accelerators at ANSTO Centre for Accelerator Science analyse samples of air from these monitoring stations to determine the fingerprints of that air pollution. This analysis of those fingerprints tells us the source and origin of this air pollution with great accuracy. The measurements taken can detect more than 20 different elements including those found in bushfire smoke and wind-blown soils. This data has been used by our partners to guide environmental protection measures and to support health studies. In particular this analysis enables a greater understanding of the impact of bushfire smoke, which can inform decisions in response to and in preparation for future bushfire seasons. ANSTO is looking forward to assisting the Committee in this inquiry and enhancing its partnership with the New South Wales Government in air pollution studies. Thank you.

**The CHAIR:** Thank you, Dr Hollins, that was very good. That has set it up nicely for us. We will move to questioning now. The way we like to do it, if it is agreeable, is we have representatives on this Committee from Opposition, Government and crossbench and we share the questions around as we move through the next 35 to 40 minutes or so. We will get things underway. Would someone like to kick-off?

**The Hon. WALT SECORD:** My first question is to Dr Hollins. You made reference to these 12 air monitoring locations. How would you describe them? Are they sophisticated? What kind of monitoring stations are they?

**Dr HOLLINS:** I am going to hand that over to David Cohen because he actually runs these monitoring stations. I think he is better-positioned to answer.

**Professor COHEN:** Thank you. Our stations are actually fairly sophisticated; they have been running for quite a while. They are based on a cyclone system which was developed in collaboration with the US EPA in North America, where they had 70-odd such systems in national parks throughout North America. Their interest is visibility because if you go to one of these parks and seek a view then they set it up there. So we use their technology; it is called the IMPROVE technology, and we took that back in the nineties from them, including their cyclone systems. They are fully approved by the US EPA and what they do is they have a pump and a pump pulls air through the cyclone system, which circulates the air and the finer particles, the PM 2.5, 2½ micron diameter or less, the ones that you breathe deep into the lungs these are ones that are selected by these cyclone systems on a filter paper. We then take that filter paper and we put it in the accelerators at ANSTO and, using nuclear techniques, in a few minutes we can non-destructively analyse very small, 300 microgram samples, for 20 or 30 different elements. So they are a fairly sophisticated system.

**The Hon. WALT SECORD:** So they are not real, on-time—you have to go there. Is it correct that you have to take the paper or the filter out?

**Dr HOLLINS:** It looks like David has dropped out so I will answer that. Yes, they are not real-time systems. I guess you could say they are complementary to the real-time systems set up by the EPA in various sites including some co-located with our sites. So those EPA sites just tell you about the total mass of the particulates that are in the air. We take the sample back to ANSTO and we are analysing not so much the mass of what is in there but the constituents, the make-up of it. So we use that data and various modelling techniques and climate modelling to then apportion to say this particulate matter is made up of different sources—that could include bushfire smoke, it could include soils, it could include sea salt, it could include wood fire burning et cetera—but it is not real-time.

**The Hon. WALT SECORD:** Okay.

**Professor COHEN:** Sorry about that. That is twice my internet seems to have dropped off or something has happened.

**The CHAIR:** No, that is fine.

**The Hon. WALT SECORD:** Dr Hollins has answered my question. I would like to go to Professor Marks. In your submission—I cannot find the page number—in the section where you refer to the effectiveness of government plans for improving air quality and you talk about the messaging "not sufficiently nuanced". What did you mean by that?

**Professor MARKS:** I think the issue around the messaging is that we need to investigate better ways of informing the community about what is going on during the bushfires. Part of our problem was there was a lot of uncertainty in what messages we wished to convey, and this really comes back to what I said in my introduction that this was a first-ever event such as this and so we were trying to extrapolate from short-term exposures that had happened with previous bushfires, and much of the advice was difficult to translate to very long periods of time. For example, we were giving people advice like stay indoors and do not exercise. That might make sense when the bushfires are operating and the smoke is around for one day, but it is very difficult to sustain that when it is going for three months. So I think that is what we were referring to in that part of the submission, the fact that we really need better quality of evidence about what advice to give and then be consistent.

The other issue was there was some inconsistency around the country around the nature of advice that was given. That was before we had a National Cabinet and perhaps we needed one for this event as well. There were certainly differences between the States and jurisdictions in what advice was being given. So it comes back to knowledge and then translating that knowledge into messaging.

**The Hon. WALT SECORD:** Are you aware that previous evidence said that there were major differences or discrepancies between advice and categories between the ACT and New South Wales?

**Professor MARKS:** That was sort of what I was alluding to just then, that there were certainly differences and also between some of the States, but it is obviously much more obvious when it is a difference between the ACT and New South Wales.

**The Hon. WALT SECORD:** Do you think that that had an effect on the health of individuals who lived in the area?

**Professor MARKS:** I think it reduced people's confidence in the advice that they were given because obviously if they are getting different advice from different experts it is hard to have confidence. The actual impact on health would be difficult to quantify.

**The CHAIR:** Either the Hon. Emma Hurst or Ms Cate Faehrmann?

**The Hon. EMMA HURST:** Thank you. I have just got a question for Professor Marks. You mention in your submission that there is a need for further studies to investigate the effects of bushfires which last longer than several days. Is that a specific gap in the current research?

**Professor MARKS:** As I mentioned, this was the first time anything like this had occurred, so we are really in uncharted territories. So it is a gap and there is a need to try and investigate what the impacts of this most recent fire event were. The research designs that are necessary to do that investigation are not simple, but there are a number of different models of research design that might be relevant—some of them epidemiological, studying populations, examining what happened in the population—but some of them more basic research; experimental studies, for example, where we need to consider long-term exposures to smoke, which are novel in this country. I have to say they are not novel on a global scale, and many people in countries in our region—for example, in Indonesia, in the Philippines and Malaysia—are exposed to very prolonged fire smoke from agricultural burning, and that has been going on for a long time.

**Professor COHEN:** Can I pass a comment on that?

**The CHAIR:** Yes, please.

**Professor COHEN:** I think it brings up the need we came across back in the nineties when we started long-term sampling, and we have been doing that at ANSTO for decades around New South Wales. We have got data now going back to the 1990s. It comes down basically to cost for us. We can only sample twice a week; we do a Sunday, which is the weekend, and we do a Wednesday, which is mid-week, to look for the differences between weekends and whatever. For long-term sampling, as Professor Marks says, you need to be there, you cannot miss these events, and the advantage of the foreign particles that we talk about is that they hang around for days and weeks—in fact, the bushfires took three weeks to go around the globe and come back again; they were there for a long time. So long-term sampling is important.

**The Hon. EMMA HURST:** Professor Cohen, just to follow on from that, what do you think the Government should be doing to support the research and technology development in this space and even more broadly as well?

**Professor COHEN:** I guess it all gets down to what you are prepared to fund, again. We have concentrated on the urban areas because that is where people live; that is where you will see health effects, where people live. So we have got long-term data going back 20, 25 years on fine particles—not just the mass but the composition of that mass. We can get up to seven, eight, nine different factors that make up the mass and we have been doing that in Wollongong, Sydney and Newcastle and the Hunter Valley area for decades. If you really wanted to study a bushfire zone combined with urban areas—and you saw bushfires out in the rural areas but the impact was in the Sydney Basin—my suggestion would be that in the New South Wales context we probably need to look at some of the more rural areas like Armidale and Wagga Wagga and the South Coast and North Coast areas and monitor those as well to try and keep track. We should not just concentrate on where the large numbers of people have been, because there are people outside these areas that are also affected.

**The CHAIR:** Does Ms Cate Faehrmann have any questions?

**Ms CATE FAEHRMANN:** Yes, thank you, Chair. I have a question in relation to basically the data that ANSTO is collecting on the various elements of the PM 2.5 that you have spoken about. The New South Wales Government gets that as well. Is that correct? What happens with that data? Is that data then made public in any form, that you understand, from the Government's perspective?

**Professor COHEN:** It is entirely out in the public domain. You can go onto our website and get data from half a dozen or more sites going back 20 years. We do it in the form of graphs, and there is also a nice little Google map where you can click on the sites that you have and when you click on a site in Liverpool or up in the Hunter Valley you can see there whether there are secondary sulphates or what the mass levels are going back 20

years. We make that data available to the public. We also work with schools on citizen and science projects as well. But also we work with Professor Marks and our people as well and the CSIRO and also the NSW EPA and the Office of Environment and Heritage, and our data is exchanged with them.

For example, we have just recently put together an instrument that measures black carbon, which is a key component of bushfires, obviously. But it turns out that there are two types of black carbon: there is black carbon from diesel vehicles that is generated at very high temperatures, which is small, spherical particles; and there is black carbon from wood fires at lower temperatures, which is a larger and fluffier-type thing. We have developed a multi-wavelength instrument, which is similar to our aethalometers but it is much cheaper and can be used quite widely. We sell that to over 40 countries now around the world, and this distinguishes, as I say, between diesel and smoke. These are important things in health aspects as well because black carbon comes in fine fractions.

**Ms CATE FAEHRMANN:** You said in your submission that you have sold that to various countries, but the New South Wales Government in terms of using that, for example, to measure the difference in black carbon from smoke and black carbon from vehicle exhausts—ANSTO has that, but in terms of public policy and the Government having that here in New South Wales, is that the case?

**Professor COHEN:** They have these real-time aethalometers that work on a similar principle; they pull air into a box and they use the seven different wavelengths to scatter off the particles in the box and measure that directly. That is a real-time measurement that they get. They can get that measurement in real time and, as we said before, our measurements are not done in real-time, they are done on filters that are analysed. But the advantage and why we work with the EPA as a complement to that data is we tell them what is in the mass; they measure the mass in real-time, but we tell them what is in the mass. That is not a real-time measurement; it is one of the drawbacks of the system. If we could get a nice sensor that would give us a real-time measurement that would be really good.

**Ms CATE FAEHRMANN:** I have just got a question about the Clean Air Strategy for both organisations. Have you been consulted on the Government's latest iteration of the Clean Air Strategy, which is yet to be released—we understand it was not and now it is, so hopefully it still will be at some point? Have you been consulted on the Clean Air Strategy in terms of both organisations and, if you were, can you remember when that was?

**Professor COHEN:** We are regularly consulted. I work quite closely with Matt Reilly in the NSW EPA. He is director of Climate and Atmospheric Science. I am also a member and an honorary fellow of the Clean Air Society. These places generally distribute these sorts of documents to us for comment and we have commented both directly through the NSW EPA and the Clean Air Society. So we are aware of this and we do have input into it.

**Ms CATE FAEHRMANN:** Professor Marks?

**Professor MARKS:** Likewise, we work quite closely with what is now called DPIE, it used to be the air quality branch of DPIE. I actually do not know that we have made a specific submission on that strategy but we communicate with them and meet regularly with them and share data with them on a regular basis.

**The CHAIR:** Would any of the Government members like to ask a question of any of the witnesses?

**The Hon. NATASHA MACLAREN-JONES:** Yes, Chair. I have just got a question in relation to having a better understanding of the fine particles. You talked about black carbon and, obviously, bushfire and dust and other things. How does that relate to you being able to use your research to better target health and deliver health care?

**Professor COHEN:** That is probably Professor Marks' area.

**Professor MARKS:** Fine particles that can enter the lower respiratory tract are important for health. Much of what we know about the adverse health effects of fine particles comes from the particles that Professor Cohen was referring to, mainly from combustion and fossil fuels—in other words, urban ambient air pollution, which is from traffic and from power stations and in other industrial processes. The fine particles that are coming from bushfire smoke are obviously a different source. What we know so far is that they have relatively similar adverse health effects, but most of the data we have is from traffic-related and industry-related air pollution. We need more data actually about the adverse health effects of the fire smoke-related fine particles.

This recent episode was, I think, really a wake-up call for many people to recognise that smoke actually has adverse health effects. I think most people had never really thought about smoke—a relatively naturally occurring source of pollution—as having adverse health effects and they think of the anthropogenic- or industry- and traffic-related air pollution as being the cause of adverse health effects. But it seems likely that smoke also is

having adverse health effects similar to those from other fine particles. But the answer to your question is that we do not know for certain.

**The Hon. NATASHA MACLAREN-JONES:** Does that also mean that it is hard to determine now when it comes to protective wear, whether it is masks, that there is no difference as to the types of fine particles at the moment or is it that we have to get more research to then be able to say we need to have tailored types of equipment?

**Professor MARKS:** I think the safest assumption is that the particles from smoke have adverse health effects like all other particles. So all of our modelling so far has been on the assumption that we can extrapolate from what we know about other ambient particles to the effects of smoke, and that relates both to the adverse health effects and strategies for mitigating. But there is need for further work on both of those things, both on understanding the health effects and understanding the effectiveness of strategies for mitigating those effects.

**Professor COHEN:** Can I comment on that too, maybe?

**The CHAIR:** Please proceed, yes.

**Professor COHEN:** Our work over many decades—we published with CSIRO three major reports which are available publicly. One was on the upper Hunter. One was the lower Hunter and one was the Sydney Basin region, covering 15 years. If you go into fine particles, which we concentrated on, there are three main sources that contribute to this. There is the smoke, and surprisingly the smoke is not necessarily just from bushfires or controlled burning. It is also from domestic heating for a three-month period in the Sydney Basin. In fact, somewhere between 60 and 80 per cent of the fine particle concentrations in the wintertime can be due to this domestic heating and combustion for heating. The second one is diesel vehicles. Buses, lorries and people who drive diesel vehicles emit fine particles. The third one is power station emissions for electricity generation. They are the three key sources, if you come down to it.

The interesting thing about the smoke one is that you can see that the domestic wood heating covers a three-month period in the wintertime. But interspersed with that are these spikes that last a few days, sometimes longer. As it did in the last bushfires in December—October right through to January, really—it can last for several months. But if you go back over a 20-year history, you have these cycles with the domestic heating lasting three months, and then you have these spikes on the cycles with the smoke that last a few days to a couple of weeks. You can pick these out by doing these daily sampling that we do here at ANSTO and analysing for them. When we use our nuclear techniques we can tell the difference between the diesel vehicles and the bushfire smoke. We can partition that out of the mass. We are dealing with 300 micrograms, that is 300 millionths of a gram of material that the average person will breathe in a day.

**The Hon. WES FANG:** I was just going to ask for a bit of an expansion on that, just to talk about whether cumulative effects have played a part. For example, we talked about car and truck and bus particles in a city aspect, but what we saw during the bushfires was probably more of a higher concentration. Does that higher concentration over a short period or a lower concentration over a longer period make any difference to when we have cumulative effects? Is one worse than the other? I guess that is where I am going with that. If you could provide an explanation, that would be fantastic.

**Professor MARKS:** I think that is a good question, but a difficult question to answer. It is likely from a physiological perspective, if you like, that there are both. Both are relevant. Short-term adverse effects of very high exposures are relevant and in some cases the consequences of that are fairly transient. Many of the consequences of that are fairly transient and so people recover quickly from those exposures. Whether there are persistent adverse effects of those very high levels of exposure remains to be seen. You may have heard about this from my colleague, Fay Johnston, who spoke to you earlier—the evidence from the events in Victoria at the coal mine fire at Hazelwood.

They were able to demonstrate, by following up people in Morwell two and a half years later, a number of longer-term adverse effects from relatively short-term exposure to high levels of particulates. That of course was not bushfire smoke. That was coal smoke. But nevertheless it was smoke—fine particles. It is certainly possible and there is some evidence to suggest that there can be persistent effects from these short-term exposures. But most of the data that we have from the study of ambient air pollution of course is about people who are exposed on a daily basis to varying levels of ambient particulate air pollution, mainly from traffic and other industry sources, as David was describing. That is long term exposure. The answer is that it is very difficult to disentangle these effects, but some study has been done that suggests that there are both long-term and short-term consequences. I cannot give a very clear answer, but I hope that helps.

**The CHAIR:** That has been helpful.

**The Hon. WES FANG:** I was curious to know the effects because obviously people that live in the city—their exposure to diesel particles, et cetera, is much less concentrated but over a much longer period of time. Whereas for those of us that live in rural areas we have this bushfire smoke for a short period but we have the benefit of much cleaner, clearer air. I was just curious as to that difference and how you viewed it. Thank you very much.

**Professor COHEN:** I think the whole thing emphasises the need here to understand the composition of the mass. For instance, in Liverpool in the Sydney region there are seven or eight things that take the mass. Typically you get 4 per cent soil, 14 per cent industry, 24 per cent secondary sulphates, 30 per cent smoke, 17 per cent cars and automobiles and 4 per cent nitrates. They are a mixture of various sources. The interesting part about it is that we have found—with the bushfires everybody said, "Oh, it's smoke." In actual fact there is a lot of fine soil, which can also be a health issue with silicosis and other things like that, which is also uplifted by the high winds and the high temperatures of fires.

You can get very large variations in the composition of the smoke mixed with the soil on various days. For instance, at Liverpool on one of the highest smoke days we had 5 per cent black carbon, 2 per cent soil and 42 per cent organics. Whereas at Mascot we had 22 per cent black carbon, 10 per cent soil and 4 per cent organics. So you get these factors of two and three variation. As Professor Marks said, we do not understand which of these components may or may not have a health effect. Or is it just the particles themselves? There are a lot of unknowns in there.

**The Hon. WALT SECORD:** My question is to Professor Marks. In your submission you say that some authorities recommended wearing face masks and members of the public did resort to using face masks, but you said your organisation, CAR, does not recommend the use of face masks. Can you elaborate on that, please?

**Professor MARKS:** There is in fact investigation going on now. One of my colleagues is starting a research study on whether or not wearing face masks has any beneficial effect for protecting against smoke. The problem is that N95 or P2 face masks, to filter out fine particles, need to be tight-fitting and probably need to be replaced regularly because they only last for—as they get moist they lose their effectiveness. The likelihood that you can protect yourself from fine particles by a well-applied face mask for a long period of time is not that likely. It is not that likely that it will confer good protection against the adverse effects of particles. But it is a question that can be answered. Our view—and this also still needs to be investigated further—was that people are more likely to be protected by staying in an indoor environment with the windows closed, but of course that is also not that feasible for very long periods of time. It was a very difficult period in which to protect people for this very long period of time.

**The Hon. WALT SECORD:** Are there masks available that provide protection?

**Professor MARKS:** In theory a well-fitting N95 mask would provide protection, but it is just not feasible to wear it for the periods of time that would be necessary to confer that protection. They are meant to be worn for short periods of time. It is very interesting; we have had two crises this year in which masks have played a potentially significant role. In this latter crisis the role of them is not only in protecting the individual from inhaling things but, actually more importantly, preventing them from expelling things into the environment. But with the bushfire smoke that is of course irrelevant. It is only about protecting the wearer from what is in the environment. The effectiveness of them for that over a long period of time is dubious but able to be tested, and a study is underway at the moment to see whether or not they do confer protection, particularly for people who are susceptible—who have underlying lung disease, for example.

**The CHAIR:** Earlier today we had evidence from Associate Professor Fay Johnston, who I believe you know. We had a discussion—or at least some exchange—over the issue of expanding the number of monitoring stations or monitoring devices, to be better able to collect information and rapidly assess information and then provide that detail out to the community in the context of a bushfire emergency. Obviously, to use the colloquial, you get what you pay for. In terms of this monitoring equipment it can be highly sophisticated, but then it can scale down to relatively cheap equipment and at the lowest end—which no-one is recommending—questionable quality equipment. Looking at the issue of expanding the monitoring sites and the types of equipment used on those sites to produce information that can be then communicated to the population at large, I would welcome your thoughts about what we should be thinking about in that respect. That is an open question to all of the witnesses.

**Professor MARKS:** I might let Professor Cohen go first on that.

**Professor COHEN:** I will take that one. I think there are two aspects to the monitoring side. The NSW EPA does an excellent job with the sampling that it has currently got. It spends a lot of money and it has got a lot of sampling sites. It has got a lot of highly sophisticated equipment in large numbers of areas around the State. It



gives out real-time data and that gives the public an assurance about what it is breathing, in terms of the mass, is either good, bad or hazardous. It puts out this air quality index, working on the 25 micrograms per cubic metre maximum 24-hour average. I think that is good and that is probably best addressed by the NSW EPA, as to where they should put these and how they would best serve the public.

The other aspect to it—where I think we fall down a little bit and could really help the people looking at managing air pollution and the health people—is to understand what is in the mass, like I told you before. That is very hard to be real-time, unless we can get some sensors that you can put out there, en masse, that are very cheap. It costs about \$20,000 per year to put one of our cyclone units out there to get six to eight components of the mass. That is an annual cost. That is why we have now got six, eight, 10, a dozen of them out there doing this. That has to be funded and the NSW EPA, or what used to be the Office of Environment and Heritage, is funding those. It is funding them in key areas like Newcastle and Kooragang Island and places like that. They pick these hotspots to do it. You have got to have a two-pronged approach where you have things that run all the time and measures the mass and gives people this instant—in 20 minutes or half an hour, you go on the web and you see what you get.

The question is, "Okay. We have measured the mass. It is 100 micrograms per cubic metres. It is four times what it should be for health reasons. But what is it?" We need to know what it is. Principally the classic example that you have probably heard of—up in the Hunter Valley we had a lot of trouble with coal trains and dust from coal trains. People are going on about how this dust was affecting their health. With the CSIRO we ran a two-year study and we measured everything that was in the air at the time. We got six or eight components. Do you know what we found that it was? It was smoke from domestic burning. The actual stuff from the coal trains was coarse particles, not fine particles, and did not necessarily have the health hazards that the fine particles do. That was a real lesson in understanding what is actually in the air and which ones might be related to health. I think these two aspects are very important—to have the instantaneous turnaround, but also to understand what the composition is and what we are working with. That will help the health people.

**Dr HOLLINS:** Can I add into that, though? I think there is another component there. Professor Cohen is right in pointing out that there is an opportunity to scale up some of this data collection. But I think the other opportunity is in that collaborative model—that we actually take a more coordinated and collaborative approach to dealing with that. For ANSTO one of our key roles is actually collecting that data and analysing it, but we are not the experts in understanding the health effects. So we are really, really keen to be collaborating in the long term with more scientists and researchers like Professor Marks and some of his team, but more broadly to make sure that the data that we are providing—that we actually are collecting right now—is better-utilised in forming health research and policy decisions, et cetera. That is another suggestion, I think, and an opportunity. It is not just about collecting more data, but also ensuring a much more collaborative model, to ensure that we are getting more out of that data.

**The CHAIR:** That is very useful.

**Professor MARKS:** I support that. Can I just add something quickly to that? I think in the first part of what Professor Cohen was talking about—about measuring the actual distribution and time course of particles in the air—there has been a lot of technological development has enabled this to happen much better over the last two years than it used to be. One of my colleagues from CAR, who is based at Queensland University of Technology in Brisbane—Lidia Morawska and her team have developed a sensor which is rather quaintly called KOALA. I forget what it stands for, but it does not stand for the little furry animal. KOALA is a sensor device that is enabled with communications technology.

It is relatively cheap, and there are a number of other low-cost sensors that are now able to be deployed quite widely and give us much more nuanced spatial and temporal resolution on the distribution of particles. This together with data science and mapping technology—including information from satellites—is enabling us to get a much better picture of what the distribution of air pollution is over space and time, in real time, than we used to have. I think we need to invest further in this technology and make use of it, both for informing the general community, and for informing government agencies and other stakeholders in this process. There is much better capacity now to have knowledge about the quality of the air that we are breathing.

**The CHAIR:** That is very helpful, Professor. Ms Hurst, did you have any questions that you would like to follow up with?

**The Hon. EMMA HURST:** No, I am fine. Thank you, Chair.

**The CHAIR:** Thank you. Ms Faehrmann, did you have one final one? You had your hand up there.

**Ms CATE FAEHRMANN:** It is okay, Chair. We are over time. It is fine. I can put some on notice, if need be.

**The CHAIR:** Okay. On behalf of the committee, I thank our three witnesses. That has been very detailed and very rich evidence that we have received this morning. It perfectly complements what you provided in your submissions. We are very grateful for that. There may well be some supplementary questions arising from our members of the Committee reading *Hansard*. If you would be agreeable, our Committee secretariat will liaise with you in regard to those supplementary questions. We provide a 21-day turnaround time. That material coming back will further inform the inquiry by becoming evidence as well. Once again, we know you are very busy. We thank you very much for your time and we are most grateful for you participating. Thank you.

**Professor MARKS:** Thank you.

**Dr HOLLINS:** Thank you.

**Professor COHEN:** Thank you.

**(The witnesses withdrew.)**

**(Short adjournment)**

**CLARE WALTER**, Member, Clean Air Society of Australia and New Zealand, affirmed and examined

**BRONYA LIPSKI**, Lawyer, Environmental Justice Australia, affirmed and examined

**MAXWELL SMITH**, Clean Air Campaigner, Environmental Justice Australia, affirmed and examined

**JESS MILLER**, Councillor, City of Sydney Council, affirmed and examined

**The CHAIR:** I commence by thanking our witnesses in this next panel, who are joining us for the next 45 minutes or so. Ms Walter, I confirm that your organisation's submission is submission number 43 to the inquiry, and that has been received and incorporated as evidence. With respect to Environmental Justice Australia, its submission has been received and stands as submission number 44 to the inquiry. With respect to City of Sydney Council, the submission is number 49 to the inquiry. They have all been received and have been placed onto the inquiry's webpage. I will invite each of the three organisations represented before us to make a short opening statement. Try and keep it tight. Take the submissions as having been read by the Committee members. They are in receipt of those, so you do not need to go into detail in your opening statement about what is covered in your submission. But an opening statement will be beautiful and it will set up the questioning that we would like to engage in with you after they are done. Ms Walter, would you like to make an opening statement?

**Ms WALTER:** Thank you for having me here. While the duration and extent of public exposure to bushfire smoke last summer was unprecedented, it is an event that we should expect to occur again and prepare for accordingly. There are a range of preventative strategies that could reduce public exposure to pollution and a key part of this is education, with targeted messaging and preparation of the whole system. To best achieve this it is useful to observe that there are distinct patterns in the evidence to date that suggest likely differences in the magnitude and range of bushfire particulate impacts and key vulnerable groups when compared to general air pollution. These need to be closely considered in order to identify the best strategies in education and disseminating messages to vulnerable groups and health professionals.

The impacts of this past season were particularly severe, with exposure to smoke estimated to contribute to over 400 deaths. While I am here to answer questions about these impacts, I think it is really important to recognise that bushfire pollution is not the only source of particulate pollution in Australia. Every year there are an estimated 4,880 premature deaths in Australia resulting from outdoor air pollution. Outdoor particulate matter is in the top 10 risk factors for premature death and disease in Australia, and it is the only one of these top 10 risks that is completely beyond the control of the individual. As such, effective policy that protects the public is critical. The key sources of toxic combustion that produce particulate matter in Australia are coal-fired power stations, vehicles, wood heaters and bushfires. Compared to other developed nations, Australian policy significantly lags.

Most public exposure to pollution comes from urban vehicle use. Australia has the highest sulphur content in petrol, which creates a significantly higher proportion of particulate matter. As most of continental Europe and the UK are banning and phasing out diesel vehicles we continue to import and use them, despite the fact they produce a far greater proportion of particulate matter and nitrogen dioxide. When you drive cars to school in Australia it is not uncommon to see a line of SUVs with engines idling—an illegal practice in the States yet commonly done in Australia, despite being identified as the key source of Australian children's exposure to harmful particulate matter. While bushfires represent a serious threat to Australian public health and they merit our attention today, I suggest we also consider how we reduce public exposure for all sources of combusted particulate matter in Australia. Thank you.

**The CHAIR:** Thank you. That was a very concise and very thorough opening statement. Ms Lipski and Mr Smith, who would like to make the opening statement on behalf of the organisation?

**Mr SMITH:** I will. Environmental Justice Australia is a not-for-profit public interest legal practice and we are grateful for the opportunity to appear before this inquiry. In March this year research in *The Medical Journal of Australia* estimated that the smoke from the summer's bushfires was responsible for 417 deaths in New South Wales, Victoria, Queensland and the Australian Capital Territory. Over half of these—219—were in New South Wales. By comparison with these figures more than 4,800 Australians die prematurely each year from exposure to air pollution, which is four times the national road toll in 2019. Thousands more suffer from health impacts such as asthma, lung disease, heart attacks and stroke. In 2005 the New South Wales Government estimated that in the Sydney Greater Metropolitan Region, or the GMR, particle air pollution alone causes 520 premature deaths, 6,300 cumulative years of life lost, 1,180 hospital admissions and from \$8.4 billion up to \$15.2 billion in health costs each year.

New South Wales air pollution policy must reduce this health and economic burden from everyday ambient air pollution across the State. This means policies that seek to reduce air pollution from all major sources

to as close to zero as possible. Successive NSW Health studies, including one published this year, have concluded that reducing everyday air pollution levels by even a small amount will yield a range of immediate and substantial health and economic benefits for New South Wales, which are likely to far outweigh the costs of intervention. Strong health-based air pollution standards must be implemented to protect community health all year round, with an exposure reduction framework in place for continual improvement of emission standards. We urge the Committee to make recommendations that pre-existing sources of pollution be reduced to as close to zero as possible, to mitigate the health burden of air pollution of the New South Wales community all year round. Thank you.

**The CHAIR:** Thank you very much, Mr Smith. Councillor Miller?

**Ms MILLER:** Thank you, Chair. Our submission to the inquiry really focused on three main things. Firstly the city of Sydney is home to many, many residents, but we are also a location where we have many workers and visitors coming into the city each day. The ongoing way and methodology with which air pollution has been monitored over time, we feel, is strongly inadequate. The bushfires certainly served to exacerbate and highlight the importance of the issue among the general public. But what we knew prior to the bushfires was that the impact of air pollution in a roadside manner was being severely under-monitored because the network simply is not good enough.

What we also know is that if good information is made available to local government, that then helps better inform our planning processes. If we understand where there are higher than ordinary emissions through vehicular traffic, diesel trucks and cars, we are then able to think about and rearticulate the design of the city to help ameliorate those impacts. We know, for example, that we are not going to put a childcare centre next to a busy highway. And if there is a school that does have a lot of traffic nearby we can think of ways to help ameliorate that. One of the things that we are very conscious of in the city of Sydney, and that we hear from our residents a lot, is that when air pollution is significant they are really not sure what to do.

They do not know whether they should keep their windows shut. They do not know whether they should go outside. They certainly are not getting a consistent form of message. Within our submission we have highlighted some of the challenges that we have faced in the immediate past, going back as far as two to three years ago. But what we also really wanted to highlight is the opportunity to work more strategically and more collaboratively with the State Government, other agencies and, in fact, nationally to develop a really thorough and well-informed network not unlike what we see in places like London and Paris. That is very much what we are looking at and that is what we would like to reflect the Committee.

**The CHAIR:** Thank you, Councillor. That opening statement sets it up very nicely for the questions that will now follow. For the benefit of the witnesses, we have members on this Committee from the Government, the Opposition and the crossbench. The way we normally proceed, if you are agreeable, is that we share the questions around and roll across the time available to us. Are the witnesses happy that we proceed that way?

**Ms MILLER:** Yes.

**The CHAIR:** Okay. Who would like to start questioning? Ms Faehrmann or Ms Hurst, do you have any questions?

**The Hon. EMMA HURST:** Yes, I do.

**The CHAIR:** Please proceed, Ms Hurst.

**The Hon. EMMA HURST:** Thank you so much, Chair. I just have a question for Mr Smith from Environmental Justice Australia. In your submission you state that even short-term exposure to PM2.5 may cause long-term impact on the lung growth of children and young animals. Do you think that we will see the health of animals and children affected long-term as a result of these most recent bushfires?

**Mr SMITH:** Thank you for the question. My understanding is that exposure to PM2.5 for children and small animals is quite dangerous. They are in, I suppose, higher-risk categories. But the longer-term health impact of exposure to PM2.5 for people and animals in those groups is not something that I am particularly an expert in. I would defer that to potentially Ms Walter or perhaps Ms Lipski.

**The CHAIR:** Just so the witnesses are aware of this—with respect to a question that is posed to you, if you wish to take it on notice so you can prepare the answer better, you are entitled to do that. Ms Walter, did you have a response to that question?

**Ms WALTER:** Yes. It is a really important question. I am happy to answer it as best I can. The simple answer with respect to the bushfire pollution of last summer is that we do not know. The reason being is that there are very few studies that have looked at such a prolonged exposure. Normally bushfire exposure is acute and we

know it is associated with short-term impacts—asthma exacerbations and cardiac arrests. But in terms of long-term lung damage the short answer is: We do not know. This event went on for longer than what we define in health parlance as an acute event. Perhaps what Mr Smith may have been referring to is that we know that chronic exposure to particulate matter in children—there have been studies in southern California that look at children's exposure to vehicle exhaust.

As regulations were tightened over 20 years and their exposure reduced, their lung capacity improved significantly. Children grow bigger lungs when they have cleaner air. We know particulate matter stunts lung growth in children and this impact occurs up to the age of 15. The study in California was children eight to 15 years old and it was three cohorts over 20 years. It is pretty solid evidence. There have also been studies in other countries that back that up, as well. In terms of the specific bushfire event of last summer, would that have stunted lung growth in children? I do not think there is any evidence that could definitively tell us because of the duration of the event.

**The Hon. EMMA HURST:** Thank you, Ms Walter. I just have one other question—

**The CHAIR:** Sorry. Did Ms Lipski want to add to that?

**Ms LIPSKI:** Yes, I did. Thank you. With respect to animals and the impact of air pollution on animals during the bushfire season, there were some studies that were released I think in March or April this year that showed that the prolonged exposure during the bushfire period on small mammals and marsupials had quite a catastrophic impact on those animals. I am happy to take this question on notice to provide you with further information, but those studies were certainly released and that work was done.

**The CHAIR:** That would be great. Those references will help inform us. That would be beautiful. Ms Hurst, did you have any additional questions? Please proceed.

**The Hon. EMMA HURST:** I just wanted to have a quick follow-up on that one. Were those studies in regard to the inhalation of smoke, say, for small native animals that might be affected? Is that what that research was?

**Ms LIPSKI:** That is my understanding, yes.

**The Hon. EMMA HURST:** Great. Thank you so much for that. I have just got another question for Councillor Miller from City of Sydney Council. In your submission you say that the community does not trust the current methodology used by the NSW EPA to measure air quality. Can you explain a little bit about what you mean by that and why that is the case?

**Ms MILLER:** Sure. Many of the representations that I have had personally over the past three to four years from various community groups have largely been with relation to traffic and motorway air pollution. Within those representations there has been a serious level of concern as to what the air pollution monitoring has said in terms of inconsistencies of level. There has been confusion about the meaning of an ambient air pollution reading versus a roadside air pollution reading. Furthermore, there have been serious concerns about the extent to which the data is extrapolated from the existing air pollution monitors being used within environmental impact statements, which determine development outcomes.

They are the types of representations that we are getting from the general public. A lot of that came pre-bushfire. Since the bushfires, the nature of the inquiry has varied somewhat, because people can see that there is obviously a problem. I suppose the shift in the narrative or the concern has been really trying to understand what they can do about it and what the cumulative impact of exposure actually is. To that extent, most of the concerns that I am getting are from parents, who have the dual concern of worrying that, if they let their kids go outside in childcare centres or at schools, whether they are going to be negatively impacted and, conversely, whether it is in fact dangerous to leave them inside. Those concerns partly come from a lack of consistent monitoring and the unavailability of real-time data.

**Ms CATE FAEHRMANN:** This is probably a question for Environmental Justice Australia [EJA] and possibly Ms Walter. Would you say that New South Wales' air quality is tracking to improve or is it getting worse over the next decade?

**Ms WALTER:** I will go first. It depends on which pollutant you are referring to. There are six what we call criteria pollutants, which are regulated in Australia. I think the last State of the Air report that was produced in Australia had fine particulate matter tracking up. State specific, I think New South Wales was tracking up if we refer to that state of the environment report, but certainly the longer, warmer summers are going to see more dust and bushfire particulate, so the fine particulate matter. Ozone is the other criteria pollutant that is tracking up. [Inaudible] ground-level ozone. Ozone in the stratosphere is a good thing, but on the ground it is a bad thing. It is produced predominately in Sydney from vehicle emissions; nitrogen dioxide reacts in the sunlight and heat and

produces ozone. I know ozone-related deaths are tracking up. I would expect that that holds as ozone is increasing and certainly with the projections for the climate we would expect fine particulate matter and ozone to both increase.

**Mr SMITH:** I will add to that. As Ms Walter was saying, there are certain places where air pollution is certainly trending up. The upper Hunter Valley would be one example of that. In this region the national air pollution standards or ambient air standards for PM10 are regularly breached, often multiple times within the same day. In 2019, residents in the upper Hunter Valley received more than 1,000 air pollution alerts when national air quality standards for PM10 or coarse particles were exceeded. There have already been well in excess of 250 alerts in 2020. Every exceedance of those standards represents a dangerous threat to human health. I believe the New South Wales EPA once determined that the major source of that coarse air pollution is coal mines, representing the vast majority of that pollution.

**Ms CATE FAEHRMANN:** I will jump in with a question to follow-up on that. The New South Wales Government submission to this inquiry said the following:

NSW has strong policy and regulatory systems to improve air quality and protect the health of NSW communities from air pollution events. NSW targets its air quality improvement actions to achieve the greatest benefits for the health of the NSW population.

This is the last sentence I will read out:

These actions are developed from a sophisticated understanding of the evidence relating to air pollution sources, air quality and health impacts and best practice approaches.

Do you agree with that statement, Mr Smith, to begin with?

**Mr SMITH:** I certainly agree that air pollution control strategies should be focused on the biggest sources of air pollution, which have the biggest impact on human health, and that any air pollution control strategy should include measures that reduce industrial pollution as close to zero and that expand air quality monitoring so that you have a good understanding of where ambient air quality standards are being breached and where there is a risk to human health. If you asked me if I agree that currently existing regulation from the New South Wales Government is sufficient to do those things, I would say that it can certainly be improved. My colleague, Ms Lipski, can go into detail about what some of the policy interventions we would recommend to do that.

**The CHAIR:** Ms Lipski, do you want to elucidate on that point?

**Ms LIPSKI:** Yes, I would. Thank you. I would actually go a little bit further than my colleague and say that, whilst there have been some improvements made to certain areas with respect to improving monitoring of air pollution, there is certainly a long way to go in New South Wales to ensure that we are getting the data that is appropriate to be making the decisions that we need to protect community health. I would say that the current regulatory framework and the legal framework for air pollution is not utilised to the extent that it could in order to ensure that point source emissions, so those emissions from facilities such as coal-fired power stations, can be reduced as much as possible. There is an existing framework, including the clean air regulations, where you can intervene to ensure that emissions standards are set to appropriately reflect the types of emissions standards to protect community health and, certainly, to include the range of monitoring points throughout the State, including in areas like the upper Hunter Valley, but also in metropolitan areas, so that we understand exactly the type of air pollution that people are exposed to at ground level from traffic pollution.

I think there is a long way to go. My understanding is that the New South Wales Government has been intending to produce a clean air strategy for New South Wales. That process commenced in 2016 and has had significant community involvement. That process has not been completed and New South Wales still does not have a clean air strategy. I would certainly urge the Committee to make recommendations that the New South Wales environment Minister finalise that clean air strategy, which ought to have frameworks for reducing air pollution to as close to zero as possible and—

**The Hon. WES FANG:** Chair, I have to object to this. The Hon. Cate Faehrmann is asking loaded questions to her greenie mates and this is not an opportunity—

**The CHAIR:** Order!

**The Hon. WES FANG:** We are straying well outside the terms of reference here. I think the Hon. Cate Faehrmann knows that and I suspect that those giving evidence also know that. We are here to talk about the effects of bushfires and drought, not about coal-fired power stations. I ask you to call those to order who want to turn this into some greenie diatribe—

**The CHAIR:** I ask the secretariat to mute him.

**The Hon. WALT SECORD:** Point of order—

**The CHAIR:** I have muted the Hon. Wes Fang. You have to submit when I say so that I can rule on your point of order. You do not have an opportunity to just ramble as you did. You can just sit quietly please. The Hon. Walt Secord.

**The Hon. WALT SECORD:** To assist the Committee, maybe I could rephrase the question. If a clean air strategy was in place, how would that have impacted on the response to the bushfires?

**The CHAIR:** That is a reconfiguration of the question. I do not know whether that is acceptable to the person who raised the question in the first place, but let us move things along. Is there anything to add further to what has been said?

**Ms WALTER:** I am happy to try and address that in a reconfigured way as long as I answer Ms Cate Faehrmann. I guess the main thing was whether this situation is going to improve on our current trajectory. Is that a correct interpretation of your question? I am not going to speak to the New South Wales policy, that is outside my scope of expertise, but essentially there are strategies that are designed to improve the situation, but with the increasing urbanisation of Sydney and population growth, the trajectory is that it is going to get worse rather than better on our current trajectory. Now, in terms of the scope relating to bushfires, I would say from a scientific point of view when there is background particulate matter and volatile organic compounds produced from other sources of pollution, that compounds the issue of bushfire-produced particulate matter. It binds with that bushfire-produced particulate matter, there are synergies and it can compound that situation. Additionally, public exposure to long-term chronic pollution, not these episodic spikes, reduces our immune system and our lungs' defence and ability to then cope with an acute situation. I hope that answers the question.

**The CHAIR:** I think Mr Smith wanted to add something.

**Ms CATE FAEHRMANN:** Sorry, just to be clear so that others who answer the question are clear as well, the second part of the terms of reference for this inquiry is:

The effectiveness of the New South Wales Government to plan for and improve air quality, including:

Then there are a range of different things. Talking about the clean air strategy I would think is so within the terms of reference that it is indisputable.

**The CHAIR:** Indeed.

**Ms MILLER:** I would just add to that.

**The CHAIR:** Sorry, I will let Mr Smith respond first. Mr Smith, did you have something to add?

**Mr SMITH:** Thank you, Chair. Yes, I do. One aspect of a clean air strategy, or arguably the main purpose, is that you reduce pollution all year round. If you have a lower background level of pollution, you will ultimately have a lower concentration of pollution when events like bushfire smoke occur. As Ms Walter mentioned, there is a compounding effect that has been observed with pollution that is already in the atmosphere, especially combining with volatile organic compounds that come from gum trees, for example, creating additional ozone, which is a very dangerous pollutant for the lungs, as well as secondary sulphates and secondary nitrogen oxides combining to create additional PM2.5. You would have increased concentrations of pollution if you basically allow pollution to continue unabated. If you check pollution you would have a lot less in bushfire events. I will add one more thing, which is that there are policies in other jurisdictions overseas where major pollution sources are asked to control their loads during events such as bushfires to reduce the amount of air pollution that is in the atmosphere during that time.

**The CHAIR:** I will go to Ms Miller and then to Government members for questions. Ms Miller, did you have something to add?

**Ms MILLER:** Yes, sure. A very specific answer to the question is that, like when you have a regulatory framework or even a strategic framework that identifies an issue at State level, when you have a target and an evidence base, whether that pertains to water, energy, waste or air pollution, if those targets are embedded within the State system, that then informs the local environment plans [LEPs] and the local development control plans. The very simple answer to the question is, yes. If there is a State framework on air pollution, then that of course gets expressed through local environment plans, through gateway determinations and the Greater Sydney Commission, for example.

**The CHAIR:** Thank you. Any questions from Government members? Mr Secord, did you want to follow-up on anything or do have any further questions?

**The Hon. WALT SECORD:** Ms Miller, does the City of Sydney Council do any independent air monitoring itself?

**Ms MILLER:** We have been on a bit of a journey. About two years ago we recognised that there was not actually an ambient air pollution monitor at all within the City of Sydney and, in fact, it was decommissioned in 2004 after the Olympic Games. In response to that we asked the then Minister Gabriel Upton to consider installing an ambient air quality monitor, and at the same time I convened a hackathon called the Breathable Sydney Hackathon. The question that we posed to a variety of different people from tech backgrounds was what kind of technology exists and what kinds of networks and methodologies could we use to get better air pollution monitoring at a human level. I think it is really important to make a distinction between an ambient reading and a roadside reading, especially when you are thinking about kids and older people who are walking or who may be waiting at bus stops. The results from that were really interesting. There were a range of solutions. A lot of community groups in fact started using their own very low-cost air pollution monitoring sources. From that the City of Sydney has since been working with TULIP, which is a University of Technology, Sydney [UTS] program, to start building a network—

**The CHAIR:** Sorry, could you please repeat that program again?

**Ms MILLER:** It is called TULIP, the Technology for Urban Liveability Program. That is in collaboration with UTS. The purpose of that is to do a really thorough investigation of the type of technology and locations that are required to gather data at a human level that can then be calibrated up to the EPA's ambient air quality monitors. One of the challenges that we are experiencing with that is that you actually need a very good information network. It is a real example of smart cities coming to the fore. One of the challenges that the researchers are trying to overcome at the moment is to ensure the reliability of the data and the capacity of, not only the monitoring network, but the information and technology network, to ensure that the information can be bounced back to servers. As far as I understand it, the long-term objective of the program is to develop a network beyond the City of Sydney that extends towards the north and the south.

The New South Wales Government has committed to installing an additional two air pollution monitors within the City of Sydney, one at Green Square and one at a yet-to-be-determined location, which will be really valuable. Then, as part of our ongoing work with the 100 Resilient Cities network, which covers most of the metropolitan councils, we are looking at ways in which we can collect data from different councils within the region in addition to water, waste and energy. From there we have a really solid evidence base to make high-quality planning decisions that are in the public good. Any support that we could get from the New South Wales State Government to do that better, faster, quicker and to cover a greater area, I think that is really where the opportunity is at.

**The Hon. WALT SECORD:** To recap, you are saying that there are not any at the moment, but two are planned?

**Ms MILLER:** I am sorry?

**The Hon. WALT SECORD:** You mentioned air monitoring possibly at Green Square and at a yet-to-be-determined location.

**Ms MILLER:** Yes.

**The Hon. WALT SECORD:** Are there any at the moment?

**Ms MILLER:** No. Fortunately Minister Kean was very responsive and fantastic and, within months of assuming his position as the environment Minister, installed a monitor at Cook and Phillip. You can currently go and see the recorded data. Fortunately that was activated before the bushfires. Yes, we did have a quality ambient air pollution monitor in the City of Sydney for the bushfires. The other two are forthcoming.

**Ms CATE FAEHRMANN:** I have a question for Ms Miller in terms of what the council did for its workers on hazardous bushfire days. Did you have a particular protocol to advise them to wear PPE or not to work outdoors? How did the council handle that during the bushfires?

**Ms MILLER:** To the best of my knowledge, as part of the executive's response to work health and safety, all of our rangers and all of our outdoor workers were told to stop work.

**Ms CATE FAEHRMANN:** Would you be able to provide on notice whether there was a particular protocol or guideline for how hazardous the air had to be before—

**Ms MILLER:** Yes, I will take that on notice.

**Ms CATE FAEHRMANN:** For other witnesses, in relation to what more the Government can do, we have heard from a range of witnesses this morning who seemed to imply that there are a range of preventative measures, but in terms of people trying to avoid days of hazardous air quality—we are particularly talking here about PM2.5—the one that was most likely to be of benefit was to stay indoors, and some witnesses suggested



that buildings had to be redesigned. If we are tracking to have more and poorer air quality, which submissions have suggested will occur, it looks as though unless we reduce that air pollution we are actually looking at almost a COVID response in terms of more people having to work indoors, in sealed buildings and actually having a more unsafe environment unless we reduce air pollution. Is that what we are looking at? With all the bushfires, which all of the witnesses have said will increase, is the recommendation really about acknowledging how bad and unsafe air pollution is for the population, we have to get realistic about this and actually talk about how much time we are spending outdoors? Is it time we really talked about that in terms of health? That is a very broad question.

**Ms WALTER:** Yes, it is really difficult. In acute events it seems easy to say, "To avoid this we need to stay indoors." If you can afford a high-efficiency particulate air [HEPA] filter—I would suggest that aged care facilities and childcare centres invest in HEPA filters and look at the ventilation of the building, [inaudible] and it really is building specific. But for the duration of these past bushfires, and if we have another event that goes for that long, it is not practical to say that you need to stay indoors all the time. It is very difficult. There are trade-offs with health and with children being cooped up inside for prolonged periods. I guess what the best option would be is considering, for example, in Sydney there were times of the day, first thing in the morning, when the pollution levels were comparatively much lower over this period.

It is about identifying this and saying, "Look, this is not healthy, but if you really need to go outside, if that is something that is important for whatever reason, this is the best time to do it, these are the best conditions." Or, "If you are a middle-aged male, maybe do not go for a run if you are at high risk of a heart attack today." That is what I mean by targeted messaging. For example, we know the asthma impacts seem to be greater in women over 20 years of age. That is really odd. Is that behavioural, is that because parents keep their children indoors or is there a different biological mechanism compared to other types of air pollution? We need to look at that a little bit further. We know women have a higher risk of ischaemic heart disease two or three days post exposure. For men it seems to be the first 48 hours with cardiac arrest, so there are lots of fine detail to health messaging in terms of how we make this safe.

One thing I would definitely say, though, is that there needs to be consistency across jurisdictions, across Australia and a defined, "Okay, public sporting events at this threshold cease." Now, how do we work out that exact threshold? How long is a piece of string? It needs to be done with a group of experts and they have to look at all of the trade-offs that are involved in doing it. Tennis Australia, it was a really big deal, do they do it or not? There are a lot of ramifications for cancelling an event like the Australian Open. Consensus on those exact levels is going to be difficult, but when it is reached it needs to be consistent and the messaging needs to be consistent in terms of the way that the air quality data is reported across Australia.

**The CHAIR:** Does any other witness want to jump in before I round it out?

**Ms MILLER:** Further to that, I think it is a really important question, and one of the biggest concerns that we have in the city is addressing the issue of equity and the idea that some people have the option to be able to improve air quality and can stay at home and other people just do not. I think that is why, firstly, the evidence base is so critical. But then getting that evidence base, the framework, into planning decisions is so important. Not just planning decisions, but also transport decisions. I think what we have seen and what we have noticed, which is a really positive example, is the City of Sydney has transitioned its garbage truck fleet to hybrids and electronic vehicles, which are quieter, but also have less emissions. We would love to see the same thing happen for buses. Light rail is a really great response, but to an extent what that does is it means the emissions might be cleaner in the city, because they are not coming out as diesel exhaust, but the coal is being burnt elsewhere. We need a longer term strategy for that.

Some of the other things that we have noticed in cities throughout the world that are facing similar challenges—what will be really interesting as we emerge from COVID is to see whether or not this trend in active transport persists. We know that in densely populated areas, walking, cycling and public transport has an overall health benefit for cardiovascular disease, but there is also an environmental benefit. The congestion charge is something that we have seen work very well in London. In Chinese and other Asian cities there have been much more heavy-handed regulatory approaches, which I think we would all like to potentially avoid in Sydney, but it is something that we need to be mindful of as we move into the future and really use that evidence base to drive long-term strategic and systemic changes that have a myriad of not just environmental benefits, but also health, economic and social benefits.

**The CHAIR:** Thank you very much. On that note I will draw this part of the hearing to a conclusion.

**(The witnesses withdrew.)**

**(Luncheon adjournment)**



**RICHARD BROOME**, Acting Executive Director, Health Protection NSW, NSW Health, affirmed and examined

**JIM KELLY**, Director, Health and Safe Design, SafeWork NSW, affirmed and examined

**PETER DUNPHY**, Executive Director, Compliance and Dispute Resolution, SafeWork NSW, affirmed and examined

**ANTHONY CLARK**, Director, Corporate Communications, NSW Rural Fire Service, affirmed and examined

**SIMON HEEMSTRA**, Manager, Planning and Predictive Services, NSW Rural Fire Service, affirmed and examined

**MATTHEW RILEY**, Director, Climate and Atmospheric Science, Environment Energy and Science Group, Department of Planning, Industry and Environment, affirmed and examined

**The CHAIR:** I commence by welcoming a number of witnesses today representing various government bodies and agencies. I understand that Dr Broome, for and on behalf of the Government witnesses, will make an opening statement. I have already indicated that we have received the Government's submission, which is No. 47 to the inquiry. That has been uploaded to the inquiry webpage. All members have been provided with a copy of the submission. There is no need to go into matters in detail in the opening statement, but an opening statement will set it up very nicely because, if you are agreeable, we will then move to questioning. We have members from the Government, the Opposition and the crossbench on this Committee. Dr Broome, if you can make your opening statement we will get the matter underway.

**Dr BROOME:** As I said, I make a statement on behalf of all of the agencies. This summer's bushfires were extraordinary in their scale. There were more than 11,000 bush and grassfires and more than half a million hectares of land were burned. At the same time there were six catastrophic fire days. Nearly 2,500 houses were destroyed, while around 15,000 were saved. The reason we are all here is because smoke from those fires affected many parts of New South Wales, causing an unprecedented period of poor air quality. During smoke events each of our agencies has a role, but we work closely together. NSW Health provides advice about the health effects of air pollution to the Government and to the public. The Department of Planning, Industry and Environment's Environment, Energy and Science [EES] forecasts air quality, runs the New South Wales air quality monitoring network and also the New South Wales air quality website.

Obviously the Rural Fire Service's [RFS] primary role is around fighting fires, but it also assists in management of smoke by providing input into the modelling and supporting the provision of health information to the community. Finally, SafeWork NSW's role relates to its administration of the Work Health and Safety Act. This legislation covers all industries and work health and safety hazards through a primary duty of care to ensure, so far as is reasonably practicable, the health and safety of workers. While the legislation does not specifically describe controls for bushfires or outdoor air quality, SafeWork NSW publishes a range of guidance material online so that businesses and workers can manage this risk and meet their statutory duties. In regards to the health effects of smoke, it is generally accepted, and I think you have heard this from other witnesses to the inquiry, that PM2.5 is the pollutant in smoke that is most important from the public health point of view.

PM2.5 is very small particles that penetrate deep into the lungs and there is a very large body of evidence around the health effects of PM2.5 generally. But it is important to note that there is less evidence around the specific effects of PM2.5 from bushfires in particular. It is worth noting, however, that the United States Environmental Protection Agency recently reviewed the science around the health effects of bushfire smoke. It concluded:

The scientific evidence does not indicate that particles generated from wildfire smoke are more, or less, toxic than particles emitted from other sources.

That conclusion is broadly consistent with the conclusions of earlier reviews by groups such as the World Health Organisation. Based on this evidence, we treat PM2.5 from all sources as equally harmful when we respond to air pollution events. Our public advice is focused on empowering people to take reasonable measures to reduce their exposure and also highlighting the groups who may be more sensitive to air pollution and in whom action is more important. I do not want to go into this in too much detail, but PM2.5 obviously causes a range of health effects. We often think of a pyramid when we are describing them. At the bottom of the pyramid, a large number of people may experience relatively mild symptoms like sore eyes, throat and coughing. But some people will experience more severe effects that will result in, for example, presentation to emergency departments, GP visits, hospital admissions and even death. While these more severe effects are rare, they are more likely in people who have existing health conditions. During the event, real-time data from NSW Health emergency

departments showed increases in presentations with asthma and breathing problems, increased ambulance call-outs and increases in the number of people being admitted to hospital from emergency departments.

We used that information at the time to reinforce our messages to the public that smoke was a serious health issue, an action needed to be taken. I just want to acknowledge as well at the moment that a study by the University of Tasmania has estimated since then that perhaps around 220 deaths and 1,500 hospital admissions in New South Wales could have been attributed to this smoke event. One thing I would like to emphasise here, and it builds upon something raised by Professor Johnston—and this is an issue with air pollution generally—is that for any individual on a smoky day the probability of experiencing a serious health event like hospitalisation is low; however, when six million people or seven million people are exposed, which was the situation we experienced, these small, individual probabilities translate into a large public health burden. That is what Professor Johnston's study shows.

I want to focus a little bit on two aspects of our response; monitoring of air quality, which I think has come up in your inquiry up to now.

**The CHAIR:** It has.

**Dr BROOME:** And our communications about air quality. In regard to monitoring, the New South Wales Government has the largest air quality monitoring network in Australia with stations throughout the State. The Department of Planning, Industry and Environment—Environment, Energy and Science [DPIE EES], also has an emergency incident response system that ensures air pollution measurements and reporting can be established at major incidents and events anywhere in the State within 24 hours. That system was established in 2014 and it has been used several times, including in industrial fires in Chullora, Lismore and Kooragang Island. But last year it was first implemented in July when equipment was deployed to Port Macquarie to report the response to the Lindfield Park Road fire. Then over the following months an additional eight stations were deployed at Lismore, Grafton, Coffs Harbour, Taree, Ulladulla, Batemans Bay, Merimbula and Cooma. These represented not only the full deployment of the emergency monitoring capabilities but also redeployment of resources from the rural air quality monitoring network. Together these monitors provide a really valuable addition of information on air pollution that was made available on the New South Wales Government's air quality website.

Talking of the website, it is the principal source of information about air quality in New South Wales and during the busiest weeks the website saw in excess of half a million unique views and on the busiest days around 200,000. I think it is important to realise that placed extreme load on the reporting systems and there was a period of time when the system failed. But at the time staff worked really, really hard to bring it back up again promptly and at the same time upgraded it to handle the larger loads but also to make it more mobile friendly. I would say as well the system supports the use of information by third party apps, and it also provides SMS alerts to subscribers.

In terms of public communication, NSW Health provided information through multiple channels. We put information on our website but we also issued a number of media releases and held a number of press conferences. We pushed information out through videos on social media, we consulted with groups like the Royal Australian College of General Practitioners [RACGP] and provided information direct to GPs, pharmacies and childcare centres. We also liaised with the Department of Education to support them as they provided information to schools. I would say communication was done centrally but it was also supported locally by New South Wales public health units who were all over the State and they did local media but also supported direct engagement with local stakeholders.

To finish up, we obviously received a lot of feedback during the event and we have begun responding to much of that feedback, but there is ongoing work. I think many of the issues that we received feedback about at the time are issues that have been raised in evidence to this inquiry. At first there were questions about the accessibility of air quality and health information. In response to this the NSW Health website was fairly thoroughly overhauled during the time to try to make the information more readily accessible to people and more easily understood. The air quality website as well was also changed so that the health information also went into the same place as the air quality information so people did not have to hunt around to find the information. More generally all the government websites were altered to make it easy, whichever government entity you went to get straight to the air quality information, because at the time that is what people wanted to know about.

Again, while I am talking about the health information, we also updated our advice during that time and we did that in consultation with air pollution experts to ensure that any advice that we did provide was evidence based and relevant to the unprecedented and prolonged situation. We did that first in July in the Port Macquarie peat fire situation. Another thing we received a lot of feedback about was the need for one-hour PM2.5 concentrations and now the New South Wales air quality website does present that information. What I want to end on is the really important issue that this event highlighted the lack of national consistency around the way air

pollution is reported and communicated. I think we are all completely agreed that this inconsistency has to be addressed. We are currently working with other jurisdictions through the environmental health subcommittee of the Australian Health Protection Principal Committee [AHPPC], which is part of the COAG process, or the COAG health council, and also the national air technical group to make that happen as soon as possible. We have already met with other jurisdictions to discuss how we are going to progress that and obviously it is a priority for all of us. Thank you.

**The CHAIR:** Thank you, Dr Broome, that is a very comprehensive opening statement that covered a number of areas which will prompt some questions from members of the Committee.

**The Hon. WALT SECORD:** I direct my question to Dr Broome. In your opening statement you said that New South Wales had six catastrophic days and you had six million people at one point affected. Was the NSW Health system unprepared for an event like this?

**Dr BROOME:** The NSW Health system I think is well prepared for these kind of emergency events. As I say, we did see increases in emergency department presentations, for example for asthma and breathing problems, but we were well within our capacity and our ability to deal with those. Obviously, I think right across the health system and for general practitioners and specialists and many people in the health system, they did find that there was high demand for people who were experiencing health effects as a result of the smoke.

**The Hon. WALT SECORD:** In your opening statement you made reference to national consistency and that work is underway. When will we see nationally consistent air quality warnings?

**Dr BROOME:** At this stage I do not have a precise time frame but I would say it is a priority and we would all like to make sure that we have a nationally consistent approach before the next bushfire season, I think. That is the general consensus amongst all of us.

**The Hon. WALT SECORD:** Would you concede that the New South Wales system is inferior to the Australian Capital Territory system?

**Dr BROOME:** We heard evidence about the Australian Capital Territory system, and I think one of the important things is that until after the event the New South Wales system was identical to the Australian Capital Territory system. Subsequently we have commenced work nationally to achieve a consistent approach and our view is that we should wait until that work has been completed before we start amending our system, otherwise we may end up in a position of making multiple changes. We do not want to be in that position.

**The Hon. WALT SECORD:** My question was, is the New South Wales warning system inferior to the Australian Capital Territory system?

**Dr BROOME:** I think the systems are now different. The categories and the levels of air pollution at which particular health advice is provided are now different. I think there are a whole range of opinions about that and what we need to do is agree nationally what the most appropriate system is. At the moment I think it is hard to say one is inferior to the other until we have an agreed approach nationally.

**The Hon. WALT SECORD:** Will you concede that the Australian Capital Territory system and the New South Wales system being different led to confusion for people in Goulburn, Yass and Queanbeyan, compared to people who lived in the Australian Capital Territory?

**Dr BROOME:** And I think it was the Grattan Institute that raised this issue, but somebody acknowledged that at the time the two systems were identical and that the system in the Australian Capital Territory had changed. I think it is important, and that is why we need a nationally consistent approach to ensure that does not happen, but I am not sure that that was the case at the time because my understanding is that the two systems were the same, until February in New South Wales. That is why we need a national system, and we completely acknowledge—and that is what we are all working towards.

**The Hon. WALT SECORD:** When the next bushfire season commences will we have a different system between New South Wales, the Australian Capital Territory and Victoria?

**Dr BROOME:** That is why we are working towards a nationally consistent approach so that no, we want to make sure that we have the same information to avoid this confusion that has been raised.

**The Hon. WALT SECORD:** No. My question was simple. When does the fire season begin?

**Dr BROOME:** That is a question for all the jurisdictions. What I can say is that we are working with all the jurisdictions to achieve that outcome. But, as I am sure you are aware, there are places we have to work through. But the aim, absolutely, is to have a nationally consistent air quality information system by the next bushfire season.

**Mr RILEY:** If I may add some information that might assist the member?

**The Hon. WALT SECORD:** First question, Mr Riley, when does the bushfire season begin?

**Mr RILEY:** 1 October.

**The Hon. WALT SECORD:** Will we have consistent air quality categories between Victoria, New South Wales and the Australian Capital Territory by 1 October?

**Mr RILEY:** The intent that was made at the workshop of the environmental health standing committee and the meeting of the national technical advisory group that was formed after that was to ensure that we had consistent systems in place by the start of the bushfire season. However, I must add that COVID-19 has made this a more challenging thing to do. Dr Broome did identify this is a priority for us. At the time when we had these workshops it was quite clearly a top priority. However, COVID-19 has ensured that things have been a little slower than we had anticipated. The intent was from all of the States and Territories to work rapidly towards having in place a standardised system by the start of the next southern bushfire season.

**The Hon. WALT SECORD:** Would you concede that the Australian Capital Territory health categories are much better than what exists in New South Wales? In New South Wales 50 to 300 are all classified as hazardous, but the Australian Capital Territory has four separate categories; hazardous extreme, hazardous high, very unhealthy for all, unhealthy for all, unhealthy for sensitive groups. Whereas New South Wales just has one category for hazardous. Would you concede that the Australian Capital Territory is in fact better for providing information to the community?

**Mr RILEY:** No, I would not concede that. I would make the observation that the New South Wales system and the Victorian system are closely aligned now. Indeed, when we moved in January after listening to the feedback from the community for the need to move to hourly PM2.5 and PM10 components of the air quality indexes, we spoke with the Victorians and we actually implemented a system that mirrored the Victorian's. As Dr Broome mentioned, since then there have been some changes with the Australian Capital Territory system. I would not concede that the Australian Capital Territory system is better and I believe that you have had evidence from other witnesses, including Associate Professor Johnstone, that was quite clear in saying that the best way to approach this is to step back, take a thorough look at what is being done, both across Australia and internationally, and take a very informal decision before choosing what is the correct or the best fit system for Australia as a whole. But I would not concede that the Australian Capital Territory system is better than ours.

And if I might add as well, the messaging is just one component of the system. It probably would matter little if you had a very, very good messaging and categorisation system, yet you only had one monitoring station in your State. We are very fortunate in New South Wales that we have the largest air quality monitoring network in the country. We currently have 92 air quality monitoring stations spread throughout the State. Indeed, we also maintain some monitoring stations across the border in South Australia and Victoria so that we can be pre-warned of when dust storm events are likely to impact the State. So thinking across the whole, it is the breadth of monitoring, it is the availability of the data of the monitoring, it is marrying that up with the messaging and the categorisation of the air that is being monitored that leads to the best possible outcomes. I think it is unfair to just single out one thing, perhaps the categories, and say that this is better than the others. It is the systems that we are looking at.

**The CHAIR:** One more question, then we will rotate again.

**The Hon. WALT SECORD:** The 92 monitoring stations, will you concede that most of those are in metropolitan Sydney, Wollongong and Newcastle?

**Mr RILEY:** Absolutely not. Almost half of our monitoring stations, actually more than half of our monitoring stations exist outside of Newcastle, Sydney and Wollongong. I did note that the Grattan Institute provided some evidence that suggested that there was little monitoring beyond the Great Dividing Range. That is actually incorrect. We have monitoring stations located throughout New South Wales and the majority of our monitoring stations are outside of Sydney, Newcastle and Wollongong.

**The Hon. WALT SECORD:** I take you back to that point. The Grattan Institute gave very clear evidence that there was a dearth or a complete lack in western New South Wales. Is that incorrect?

**Mr RILEY:** That is incorrect.

**The Hon. WALT SECORD:** Can you please provide a list, and if you are unable to do it now on notice, of how many are in western New South Wales?

**Mr RILEY:** We have west of the Great Dividing Range more than 50 monitoring stations.

**The Hon. WALT SECORD:** More than 50 monitoring stations?

**Mr RILEY:** Yes. I will take it on notice and provide detail back to the Committee.

**The Hon. WALT SECORD:** Thank you. I appreciate it.

**The CHAIR:** Perhaps on notice that will provide you with the opportunity, not just the number, the type of monitoring equipment as well so we have the complete picture. That would be helpful.

**The Hon. WES FANG:** Also provide them to the Grattan Institute.

**The CHAIR:** I will move on from that.

**The Hon. EMMA HURST:** I have not worked out who the best person for these questions is, so hopefully somebody can speak up. In the Government's submission it was noted that air purifiers with high efficiency particle can reduce the PM2.5 indoors. However, we have also heard a lot of evidence that these devices are too expensive and inaccessible for many people, particularly with low incomes and also high-risk individuals if there are future bushfire situations. Is anybody in the Government, or are there any discussions about considering funding for some of these purifiers for people who do not have access to them?

**Dr BROOME:** I will try to address some of that. This is one of the questions with specific equipment, that access to it can be a challenge and obviously predicting who may or may not be likely to experience severe health effects beforehand is quite difficult. We do and we have been looking at how air purifiers can be used. For example, during the Port Macquarie bushfire we worked with the University of Tasmania to investigate whether or not it is a possibility that potentially particular buildings could use these devices to create clean air spaces within themselves, and we will continue to look at that. It is a complicated area.

**The Hon. EMMA HURST:** There was mention of an increase in consistency between jurisdictions in regards to air quality and the submission that was put in. I am wondering what work has been done so far to achieve consistency going forward?

**Dr BROOME:** The enHealth Council, which is a subcommittee of the AHPPC, has initiated some work. We held a workshop earlier this year after the bushfire season to work out how we could make a way forward. I think at that stage the issues that we needed to consider were things like should we be reporting hourly values versus 24-hour values, what should be the thresholds. It was those kind of issues. And there was full consensus, for example, that I think we want to move towards presenting hourly values as those were going to be the most useful things for helping people to make decisions about, for example, whether now is a good time to go out for a jog. Subsequent to that, as Mr Riley noted, obviously the COVID situation has intervened, but it is still a priority for us and we are continuing. We are actually due to meet again to try to finalise where we are going, in the next week or so.

**The Hon. EMMA HURST:** Thank you for that.

**Ms CATE FAEHRMANN:** I will go back to Dr Broome. You mentioned before, I think your words were that the Government was well within capacity to deal with the air pollution caused by the smoke over the summer.

**Dr BROOME:** I think what I was referring to there was the health, health concepts.

**Ms CATE FAEHRMANN:** Alerting people to it.

**Dr BROOME:** I guess what I was referring to there was the capacity of the system to manage people presenting to emergency departments and things like that, supporting people who became unwell as a result of the air quality. That is what I was referring to.

**Ms CATE FAEHRMANN:** As a result of what you saw over the summer how are you changing the way in which you alert the public to pollution levels?

**Dr BROOME:** I might hand over to Mr Riley in a second as well, but one of the things that I think came through was the need for hourly or short-term average concentrations that provide people with a good indication of what air quality is like outside at that moment so they can make an informed decision right now about how to plan their day, essentially: Is now the right time to go to the shops, for example. You could do that before with the system. There were hourly values, but I think it is fair to say that the system caused confusion. So I think that is part of it. Having a consistent approach that is the same across the country that involves hourly values and clear communication of that—

**Ms CATE FAEHRMANN:** Can I jump in to clarify and be a little bit clearer with that, I am sorry? What changes are you making to the way in which you proactively notify the community of hazardous levels? By

"proactively" I am probably asking about proactive pushing out of information as opposed to simply having something on your website. What are the changes you have made since last summer?

**Dr BROOME:** I will just mention that the current approach, I suppose, relies on an air quality forecast. When there is an air quality forecast of poor air quality, we would generally issue a media release to be proactive. We were doing that throughout the summer. We were proactively engaging with the media and other entities to get out those messages. So obviously we are in a world of new technology and things. I might hand over to Mr Riley just to talk a little bit about, I suppose, the technological aspects and how the air quality information system potentially can be turned into something that is more engaging for people, I think, and more proactive.

**The CHAIR:** Mr Riley?

**Mr RILEY:** Thank you, Dr Broome. Thank you, Chair. I thank the member for her question. I think we will start by acknowledging one thing and that is we have had a push system on our alerts since 2007. Indeed New South Wales was the first jurisdiction in Australia to have an automated alerting system for air pollution. That has now been in place for over 13 years. With that automated alert system, when air pollutant levels exceed a threshold or a value, notifications are automatically generated and sent out to not only people who have subscribed to receive them but also to each of the agencies for their awareness and also to the Bureau of Meteorology, and the Bureau of Meteorology can elect to put that information on their website.

Dr Broome also mentioned that we do daily air quality forecasts focused on the main population areas. That is forecasting air pollution a day ahead of time. If we forecast that air pollution is going to poor or worse, then we issue notices to the media. We also provide that information to all subscribers, the Bureau of Meteorology hosts it on their warnings page on their website, and it is information that is also pushed out to groups who take information from our air quality website. So there is a level of push information. It is not just all pull.

**Ms CATE FAEHRMANN:** Thank you. That is good to know, I suppose, but a hell of a lot happened over the last summer. The question was specifically how are you going to improve? For example, we heard on Wednesday from the sister of Courtney Partridge-McLennan, who died of course in Glen Innes from an asthma attack overnight. I think the warning system failed for Courtney. She clearly was not watching the media or listening to the media the day before and had not subscribed to your rates. Clearly, people possibly did more than Courtney. She was the one we heard about. We do know that others have died as a result of the smoke from the bushfires. What are you doing? What steps are you taking to make sure that people are informed? The response to COVID-19 may be a hint. Will there be much more proactive messages in the future? What work are you doing to ensure that?

**Mr RILEY:** We will build on the work that we undertook during the emergency, so ensuring that there is clear communication across all of the Government websites so that people can go to single sides and get the right information. The next thing that we are doing is we have made in particular air quality websites more mobile-friendly. It allows individuals to have better access to the information from multiple different devices. We are also about to release an application programming interface [API] to our air quality data, which will allow third party developers to develop applications that link through to our system. You heard from Associate Professor Johnston. Her web application already uses our prototype API and that is how she gets information into her application direct from us.

We are about to finalise the release to the broad public and developers of an updated API so that more people can have access to that. That will mean that people who consume their information from multiple different locations will have better access to that one approach to getting the information. They will be getting it direct from us and that API can be adjusted once we have the messaging in place to also push out the agreed messaging so that there is no lack of standardisation or no conflict in the messages that are coming out from different groups. They are the main thing is that we are working on technically at the moment and then, of course, Dr Broome spoke about the collaboration that we are seeking across all of the States and to get that done as quickly as possible

**Ms CATE FAEHRMANN:** I just wanted to get a sense as well—Mr Riley I think you mentioned earlier the start of the bushfire season technically being 1 October. Potentially I might direct this question to Simon Heemstra. Of course the bushfires started much earlier than that this year but also we heard from a number of stakeholders about the risks in relation to hazard reduction: That this is not just about forecasting for a really bad bushfire season. Of course it is hazard reduction and much more than that. Mr Heemstra, while you are responding to whether we need to be developing things earlier than 1 October, or alert systems before 1 October, it says in the New South Wales Government's submission that the NSW RFS leads public information on bush and grass fires as well as hazard reduction burning. It says:

Whilst smoke from bushfires and hazard reduction burning is a whole of government responsibility, as the lead agency for bushfires, the NSW RFS leads public information on bush and grass fires as well as hazard reduction burning.



Can I just check this with you? Does that mean, do you think, that the RFS is the lead agency to warn the public about the smoke from bushfires? I am a bit confused about that.

**Mr HEEMSTRA:** I think I will defer that to Anthony Clark to answer the public information side of things.

**Ms CATE FAEHRMANN:** Okay.

**The CHAIR:** Sure. Mr Clark?

**Mr CLARK:** Sure. The RFS is the lead agency for bush and grass fires across New South Wales. In our legislation we do have specific responsibility around the issuing of public alerts and warnings specifically around those bushfire threats impacting on communities. Across the bushfire season we provided many updates to the community through products like our website and through our Fires Near Me smart phone application providing information about smoke in the landscape and the impact on communities. I think it is important to acknowledge that we take the lead on the impact of the fire on the community—that is where that lead role comes from—but we do rely heavily upon particularly the Department of Health to be providing that very specific advice to the community about the health impacts. We of course share that information through our products as well.

**Ms CATE FAEHRMANN:** Mr Heemstra, I will get back to you around the bushfires this season potentially being earlier than 1 October, but is it that NSW Health has the lead responsibility to inform the public about the risks of the bushfire smoke? I just want to clear up that line in the submission. Dr Broome?

**Dr BROOME:** Oh, that is for me. Can I say that under the emergency management arrangements that we have around bushfires, RFS is the lead agency and under that there is a communications plan. It is coordinated so when we communicate around bushfire smoke, I think it is clear that when there are these severe smoke events, NSW Health will take the lead on communicating the health risks to the community but we do that in a way that is coordinated by the RFS to make sure that we are not mixing messages with other important messages that they may have. Does that make sense?

There is a broad emergency management arrangement framework for communication and it is absolutely true that in a bushfire situation the RFS is in charge of that and we make sure that any communication we have is coordinated and is not conflicting with anything that they might be putting out. But I think it is clear to all of us that when we are talking about the details of the health effects of bushfire smoke, NSW Health would be the primary communicator.

**The CHAIR:** We have limited time, as I am sure you appreciate. We will now go to Government members and see if they have any questions and then we will come back to the Opposition. Do any Government members have any questions?

**The Hon. NATASHA MACLAREN-JONES:** Can I follow on from the questions that have been taken on notice in relation to the monitoring stations where you provide information about the types and numbers? Is there information or research that has been done to show the number that are required to per capita or based on area size as well and, if so, whether that is included to take as a question on notice or are you able to update now?

**Mr RILEY:** I thank the member for her question. We can provide that information to you. We are guided in the first instance in the design of our air quality monitoring networks by the National Environment Protection (Ambient Air Quality) Measure [NEPAM]. It sets that population thresholds that inform you of the likely amount of monitoring required within a certain air shed or a certain community. That is the primary source of information that we take. However, it is a guidance document and I do note that New South Wales in most regions far exceeds that guidance. For example, in Sydney we would just take the guidance from the NEPAM. Then we would likely only need 11 monitoring stations where currently we have 18.

What we do is we take a critical assessment of the needs of the community, looking at the sources of air pollution within that community, their likely size and the impacts on the community and that informs the monitoring decisions. Also as part of a review of our air quality monitoring network we undertook an international review of how other jurisdictions set population thresholds or monitoring needs. That is available on the Department of Planning, Industry and Environment [DPIE] website but I will make it available to this Committee. In essence what it found is that the population thresholds set by the Australian National Environment Protection (Ambient Air Quality) Measure were the strictest in the world. We require more monitoring per head of population than basically any other jurisdiction or indeed any of the eight jurisdictions we reviewed as part of that review work. I will provide that report to the Committee on notice.

**The Hon. NATASHA MACLAREN-JONES:** Thank you. That would be great, thank you.

**The CHAIR:** That would be good, thank you.

**The Hon. NATASHA MACLAREN-JONES:** My next question is in relation to fine particles. We heard from a previous witness earlier this morning that there are different types of fine particles that come from people with home heating, bushfires, gas and various other things. I am interested to know about the distribution of masks. I am mindful that our previous witnesses said that more work needs to be done about specific health impacts of the different types of fine particles but I am interested to know about the research and the work that has been done in relation to the distribution of masks that we provided during the bushfire and how effective those types of masks are.

**Dr BROOME:** That is probably one for me. Just in terms of the distribution, I think we distributed approximately 900,000 P2 masks to evacuation centres and local health districts, AMSs, community health facilities and those sorts of things as part of this event. I think you have heard that there is limited evidence to say that masks are effective as a public health intervention in these sorts of events. Certainly we know that a well-fitting P2 mask does filter out the PM2.5 fine particles. The question is in real life how well fitting they may be. For example, if you cannot wear one all day do you lose some of the benefits? I suppose we operate on this principle of a hierarchy of controls so the best thing to do is to not produce the pollution in the first place. The next best thing is to avoid exposure to pollution by, for example, reducing outdoor physical activity or staying indoors. Personal protective equipment [PPE] is really the last or the end of the spectrum. It is for that reason that we really are not sure how well it works. If it is not working, you are not getting any protection at all.

**The Hon. NATASHA MACLAREN-JONES:** My final question before I hand over to my colleagues is in relation to the information campaign. You outlined some of that earlier but I am interested to know what information is provided to schools and to parents for their children during the bushfire period. What are some of the lessons learnt?

**Dr BROOME:** The Department of Education produced guidelines for their schools. I am sorry, I do not have those at my fingertips. We provided some input and that was based largely on the information that was on our website about when to keep children indoors and those sorts of things. The Department of Education developed some resources and provided them to schools. NSW Health—we provided information direct to childcare centres that included things like asthma resources provided by NSW Health and encouraging them to get parents to provide asthma action plans and those sorts of things. That was something that we did during the event.

**The CHAIR:** The Hon. Walt Secord?

**The Hon. TAYLOR MARTIN:** But, Chair—

**The Hon. WALT SECORD:** Thank you, Chair. I would like to direct my next line of questions back to Mr Riley. Mr Riley, what is the status of the clean air strategy?

**Mr RILEY:** I thank the member for his question. The clean air strategy: We are working on implementing actions of the clean air strategy and we are also working on finalising a clean air plan for the public.

**The Hon. WALT SECORD:** What is the timetable for that? I think work began in 2016. Is that correct?

**Mr RILEY:** That is correct. We released a clean air for New South Wales consultation paper in 2016. After the release of the consultation paper we also then moved on and held a Clean Air Summit in 2017. At that summit we invited a number of speakers with experience of air quality management, including the signs of air quality, to speak at that summit: Indeed, Mr Cohen, who gave evidence to this inquiry today. We have consulted with them continually after that summit. Also at that summit I would highlight that the then Minister for the Environment at the time, the Hon. **Gabrielle Upton**, made a number of announcements regarding air quality monitoring and forecasting. She made announcements that we would expand air quality monitoring within the city of Sydney including the three core monitors at three of the main CBD sites, so the three CBD sites. What I say there is that the CBDs are the city of three cities as identified by the Greater Sydney Commission.

Since then we have put a monitoring station at Cook and Phillip Park. We have also commenced communications with the City of Sydney on monitoring at Green Square. We have put a monitoring station in Parramatta and we are actually doing groundworks as we speak for a monitoring station in Penrith. Also the Minister announced additional monitoring in other locations; for example, along busy roadways. We put in place a roadside air quality monitor at Milsons Point. That has been operational now for over a year. We also put in place new air quality monitoring stations across regional New South Wales.

**The Hon. WALT SECORD:** Okay. Can I bring you back to the clean air strategy? Work began in 2016. There was a summit in 2017. What is the status of the strategy now? Is there a draft plan? What is the current state of play as we sit here today?

**Mr RILEY:** It is important to understand that we have been working on implementing components of the strategy. We have invented air pollution as a consideration in three of the Government's primary strategic planning documents, the State Infrastructure Strategy, Future Transport and the Greater Sydney Commission's Sydney Region Plan. We have also released the Net Zero Plan, which sets reducing targets for greenhouse gas emissions while also supporting a vibrant economy. Actions to reduce emissions, whether that is through renewable energy or others, are key components of improving air quality. We have actually put in place many aspects of the strategy and now we are working on the plan.

**The Hon. WALT SECORD:** Is there a draft clean air strategy at this moment? Is there a draft document?

**Mr RILEY:** I would have to take that on notice, regarding the current status of the draft, but draft documents have been prepared.

**The Hon. WALT SECORD:** There is a draft document?

**Mr RILEY:** Documents have been prepared.

**The Hon. WALT SECORD:** What is the timetable for the public release of those documents? What are you telling people who are putting input into that document? When will they expect to see the documents?

**Mr RILEY:** That is a matter for the Government regarding the timing.

**The Hon. WALT SECORD:** The document is done but it is a matter for the Government to release that document?

**Mr RILEY:** No, I specifically mentioned that we have had input into the development of what would be the plan and it is a matter for the Government on the timing of the release of that plan.

**The Hon. WALT SECORD:** You have had input into the plan? "Input into the plan" indicates that you are not the lead agency. Who is the lead agency, then?

**Mr RILEY:** I will direct that to the EPA to provide advice on that.

**The Hon. WALT SECORD:** Who would that be? Is there anyone before the Committee who could give more—no, there is not.

**Mr RILEY:** No.

**The Hon. WALT SECORD:** So your agency is not the lead agency on the clean air strategy?

**Mr RILEY:** Our agency had involvement in the development of the Clean Air for NSW discussion paper and we have worked closely on implementing actions that were put forward in that discussion paper.

**The Hon. WALT SECORD:** When you say that it is a matter for the Government to determine the timetable, is that Minister Kean?

**Mr RILEY:** Yes.

**The Hon. WALT SECORD:** Are you aware of an air quality monitoring station in Katoomba?

**Mr RILEY:** Yes, I am.

**The Hon. WALT SECORD:** I think that was installed in May 2019. Is that correct?

**Mr RILEY:** That sounds correct to me, yes.

**The Hon. WALT SECORD:** What is the current status of that equipment at that air quality monitoring station today?

**Mr RILEY:** That air quality monitoring station at Katoomba was established as part of a program to sample air quality in the Blue Mountains and Lithgow regions. It was a program led by the EPA working closely with the community to help design that program. We provided technical and scientific advice into that program. I will make a couple of comments on that, because I know that other witnesses have given evidence about low-cost sensors. One of the key parts of this program is we put 12 low-cost sensors throughout the Blue Mountains, one, to provide information about how air quality varies across the mountains; two, to test how these would work as a citizen science project and to check the validity of the measurements from those low-cost sensors; and then really to use this as a pilot program to see how we would potentially utilise this technology on a case-by-case, project-by-project basis. We chose the Blue Mountains. To help support that, we put in a gold-standard air quality monitoring station at Katoomba and there was a commitment for that program to run for 12 months. That program will be ceasing on 30 June. That station will be closed then because our lease with Airservices Australia, which hosts the station, expires on that date.

**The Hon. WALT SECORD:** The air monitoring station at Katoomba will cease on 30 June?

**Mr RILEY:** That is correct.

**The Hon. WALT SECORD:** What will happen after 30 June? There will be no air monitoring at Katoomba?

**Mr RILEY:** We will take that air quality monitoring station and it will be redeployed at another monitoring location. I would have to take on notice the information about what will happen within the community, but that project does not cease just when the monitoring ceases. We have got on board Western Sydney University and other researchers to help with detailed assessment of the data that was recorded during that program. That will help inform the design of future monitoring needs and future monitoring programs.

**The CHAIR:** Mr Secord, can I just jump in? Just a question, if I could, to Mr Dunphy and/or Mr Kelly. Would one or both of you please provide to the Committee a description of what were the initiatives and the activities and the examples of responses taken by SafeWork NSW in terms of engaging with employers and providing advice, information or direction about what their responses should be in terms of their occupational health and responsibility to their employees in the context of the bushfire emergency?

**Mr DUNPHY:** Thank you, Chair. I might start answering that question and get Mr Kelly to follow on if he wishes. In terms of our approach to providing information and advice, we have been providing advice throughout the bushfire period to employers and to workers in terms of their obligations under the work health and safety legislation. In terms of specific information, we have been providing advice around bushfire smoke. On our website we have posted information about what the obligations are for employers and also for workers in terms of what they need to be doing. That was published early in 2000, on 8 January. That has had about 6,000 views since that has been posted.

We also followed that up with a number of social media posts. Since December we had been publishing—through the three channels of Facebook, Twitter and LinkedIn—specific messaging around obligations and hazards associated with bushfires. That included information around smoke inhalation, high temperatures, the need for employers or persons conducting a business or undertaking [PCBUs] to review their emergency plans, and also looking at work health and safety during bushfire conditions. That has all been included. We also launched the Speak Up app, which has also been available for workers to be able to very easily send, through their mobile phones, any request for services or complaints or issues that they may have, which means we can respond to those as well.

Over the period of the social media posts and the campaign that we have conducted we had over 51,000 people following that campaign. In addition to that, we have also received a number of requests for services, which requires a response from the agency. During the bushfire season period, going from August to March, we have normally about 6,800 requests for services. Over that period we did get a small number of requests for services relating to bushfire smoke—there were 38 during that period. That primarily related to poor air quality and that resulted in a follow-up action, in terms of working with those workplaces to identify what the safety issues were, to provide advice and, where necessary, to take compliance action too in regard to that.

Throughout the period we have also received many calls, many requests for information through our call centre as well, and we have been providing advice in that way. We have quite a network of contacts with industry groups, with employee groups to also provide messaging and have communicated regularly during that period as well on the actions and also the information that people need to be provided with to ensure their work health and safety during that period. I do not know whether my colleague Mr Kelly would like to add anything in regard to that?

**Mr KELLY:** Thank you, Mr Dunphy. Just briefly, we also upgraded our training and guidance material for our inspectors. We have over 250 field-based inspectors conducting visits every day. That guidance material provided them with resources and information to deal with bushfire smoke, the fitting of P2 masks—where that is appropriate—and the air quality index resources as well.

**The CHAIR:** Thank you. We will move back to the crossbench members now. I am conscious that we are bumping up against the time, but we will continue for at least a short period—

**The Hon. WES FANG:** I do note that the Hon. Taylor Martin was trying to get the call earlier before the Hon. Walt Secord jumped in.

**The CHAIR:** We are doing this in rotation, okay? It is back to the crossbench.

**The Hon. TAYLOR MARTIN:** With all due respect, Chair, you really cut the Government time quite short earlier.

**The CHAIR:** Well I do not believe—I have got a watch in front of me. I do not believe I did.

**The Hon. NATASHA MACLAREN-JONES:** Actually, Chair, it was. We only had about five minutes.

**The Hon. TAYLOR MARTIN:** I think the Hon. Natasha Maclaren-Jones had about two or three quick questions.

**The Hon. WALT SECORD:** I am willing to extend the length of the hearing if other members are agreeable.

**The CHAIR:** We do know that Mr Dunphy has to leave, and that is understood, so I expect that he will be leaving very shortly. It has just gone a quarter to three o'clock. If there is agreement of Committee members to extend for another period of time—say, 15 minutes to three o'clock—I am happy to do that. That is subject, of course, to the availability of the witnesses. I do not know what their positions are.

**The Hon. NATASHA MACLAREN-JONES:** Chair, we had already discussed this at a previous meeting of the Committee and I advised that I had another meeting at 3.00 p.m. and would have to leave. If the Committee is going to hold a deliberative after this meeting it would mean that a member of the Government would not be able to participate in the Committee process.

**The CHAIR:** That is correct. This brings us to the issue that we discussed the other day—I am directing this to the members—about the shortness of time for the questioning of the witnesses. It is quarter to three o'clock, which is now the end of what is the set time. Clearly there is a number of questions still to be asked. The Hon. Taylor Martin, if you want to jump in and ask yours and get that out of the way, at least—

**The Hon. NATASHA MACLAREN-JONES:** Chair, I was just going to say that otherwise members could just put them on notice, which is what we do for all the witnesses as well.

**The Hon. TAYLOR MARTIN:** Yes, I think that is—

**The CHAIR:** Well that—sorry, the Hon. Taylor Martin?

**The Hon. TAYLOR MARTIN:** I am not asking an overly contentious question. I just wanted to add on to an earlier question that was asked. We have discussed—

**The CHAIR:** Please proceed.

**The Hon. TAYLOR MARTIN:** We have discussed before around allocation of time and whatnot and I did not think it is an area of controversy if—

**The CHAIR:** Please jump in. Please continue—ask your question.

**The Hon. TAYLOR MARTIN:** No, I am fine. The Hon. Natasha Maclaren-Jones is right: I think all members should put those questions on notice. We agreed on a 2.45 p.m. end time. I am not going to push that.

**The CHAIR:** I put a final call to you: Would you like to jump in and ask that question—

**The Hon. TAYLOR MARTIN:** No, it is all good now. I think if there are any further questions we should all put them on notice.

**The CHAIR:** That is a separate discussion for another time, about whether it goes on notice or not. On that basis, I thank all the witnesses—including Mr Dunphy, who has had to move to another inquiry hearing. The information you have been able to provide has been very helpful. I think there is a real appetite for additional information—that is what I sense—but our time has now been reached so we will have to leave it there. I thank witnesses on behalf of the Committee for providing the opportunity to provide additional information to what was provided in their submissions, but also to elucidate that through the questioning. Thank you very much.

**(The witnesses withdrew.)**

**The Committee adjourned at 14.47.**