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**HOUSE OF
REPRESENTATIVES**

STANDING COMMITTEE ON INDUSTRY, SCIENCE AND
INNOVATION

Reference: Long-term meteorological forecasting

MONDAY, 13 JULY 2009

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HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON INDUSTRY, SCIENCE AND INNOVATION

Monday, 13 July 2009

Members: Ms Vamvakinou (*Chair*), Fran Bailey (*Deputy Chair*), Mr Bidgood, Mr Champion, Mr Cheeseman, Dr Jensen, Mr Johnson, Mr Ramsey, Ms Rishworth and Mr Symon

Members in attendance: Dr Jensen, Mr Ramsey, Mr Symon and Ms Vamvakinou

Terms of reference for the inquiry:

To inquire into and report on:

Long-term meteorological forecasting with particular reference to:

- The efficacy of current climate modelling methods and techniques and long-term meteorological prediction systems;
- Innovation in long-term meteorological forecasting methods and technology;
- The impact of accurate measurement of inter-seasonal climate variability on decision-making processes for agricultural production and other sectors such as tourism;
- Potential benefits and applications for emergency response to natural disasters, such as bushfire, flood, cyclone, hail, and tsunami, in Australia and in neighbouring countries; and
- Strategies, systems and research overseas that could contribute to Australia's innovation in this area.

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Committee met at 9.22 am**HILL, Mr Alan, Director of Policy, Western Australian Farmers Federation****PARK, Mr Dale, General Executive, Land Management and Climate Change Portfolio Holder, Western Australian Farmers Federation**

CHAIR (Ms Vamvakinou)—Good morning. I declare open this public hearing for the inquiry into long-term meteorological forecasting in Australia being conducted by the House of Representatives Standing Committee on Industry, Science and Innovation. The inquiry arises from requests to this committee by Senator the Hon. Kim Carr, federal Minister for Innovation, Industry, Science and Research. Written submissions were called for and 34 have been received to date. The committee is now conducting a program of public hearings and inspections. This hearing is the seventh of the inquiry.

I now call representatives of the Western Australian Farmers Federation to give evidence. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently, they warrant the same respect as the proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of the parliament. We thank you for your submission, and I invite you to make a brief opening statement before we proceed to questions.

Mr Park—I would like to thank the committee for the opportunity to talk to you about forecasting. What I might do this morning is run you through what WAFarmers would like to see in the future as far as forecasting goes and why it is so important to WA agriculture.

I suppose I should preface all this by saying that I am actually a farmer from Badgingarra, which is halfway between here and Geraldton. I am not a wheat grower; I run stock. So I am very much a pasture person. I will just run you through how agriculture operates in Western Australia, and why and how things happen here. It was not until I started flying to the eastern states that I actually realised that Western Australia grain farmers grow crops on a lot less rainfall than farmers in the eastern states. I started to look at why that was. The reason is that under a Mediterranean climate, which we have here, we have a fairly large degree of surety—or we used to, and we will talk about that in a moment. Under the Mediterranean climate we are pretty sure that we are going to get rain in May—and it used to be towards April, but certainly in May—going through. Once it starts to rain, we are pretty sure that we are going to get rain through to September and we will get a crop off of one sort or another. In the eastern states I was surprised to learn that a lot of my friends over there were in very much pastoral country and yet were getting average rainfall of, say, 16 or 17 inches. In Western Australia places like Merredin in the eastern wheatbelt can run a pretty good operation on 12 inches whereas in the eastern states they were very much restricted to grazing.

That brings us back to forecasting. This is why it will be quite important in the future for WA farmers to be able to see whether they are going to have a season for which it is actually worth putting a crop in. Again, most farmers now have the ability to be able to put in a crop without rain. Back in the old days, in my father's time, we used to have to wait for rain before we would actually be able to get in and plough the country up. So there was lots of dust but it was okay as

long as we got in. Now we have advanced technology as far as seeding implements go. As a friend of mine from the department of agriculture said the other day, with direct drilling we can almost drill into concrete because of the knifepoints on the implements and the horsepower we have at the front of those as well. Therefore what has started to happen in Western Australia is that wheat growers have said, 'Righto, we have got to May. We always get rain. We will just put the crop in whether we have got the rain or not.' That has worked up until now.

What we have seen, probably in the last 10 years, is that in the north-east of this state that has started not to work so well. They just have not had a season, which is most unusual. Therefore what we would like to have in the forecasting area—and this is certainly on the wishlist—is mechanisms where we could be told whether it is actually going to be worth putting a crop in. At the moment it is really only in the north-east of this state that the risks are greater than the benefits. Out there you probably need to have a good season four or five times out of 10 to make things work, as long as you keep it as a low-input type system. Once you start going down into the real parts of the wheat belt of Western Australia, you are looking at higher inputs and therefore the risk of a bad season becomes even more important. Getting farmers to recognise that is going to be a bit tricky, but we also need the mechanisms to get a better forecasting system. I will end my comments there.

Mr Hill—I would just like to support Dale's comments. The intent of not only making a submission but also appearing here today is really to raise the concerns of our members with the committee about the need for recognition of and investment in systems that deliver a greater degree of timeliness and accurate weather forecasting to assist farmers in their management decisions. Subsequent to writing our submission I found a paper from CSIRO in Perth published earlier this year. It said that more than half the variation in the gross margin in wheat cropping in south-west Western Australia can be explained by the seasonal rainfall variability between the May and October period. It is this sort of information that we would like to see to give farmers some confidence with going in early and putting a crop in.

CHAIR—Mr Park, you were talking about the changes and you referred to the north-east in the last 10 years and described a formula that seemed to work. You described that as a Mediterranean climate.

Mr Park—The agricultural sector in Western Australia we usually refer to as the south-west land division. So that goes from north of Geraldton, just north of Northampton and right out to Esperance. So it is really what the rest of Australia calls the south-west corner of Western Australia. We all have a Mediterranean climate. As soon as you start moving out of that area you go into pastoral areas, where rainfall is definitely a lot flukier and a lot less reliable. Of course if you go further north then you get into the tropics. The predictions seem to be that they are going to get wetter. What we are finding in the south-west corner is that we are getting drier and drier. It is not only that but also, and I was discussing this with Mr Ramsay earlier, whereas we used to be assured that once it started raining then it would go all the way through last year we got going—and last year was a classic case in point—admittedly after a few false breaks, and then suddenly in August virtually none of the state got rain for a whole month. We just cannot handle that at all on our lighter soils.

CHAIR—When you refer to the Mediterranean climate, does that describe a consistency? That is what I am trying to get to. I understand that it is a climatic term in southern

Mediterranean countries, and I have heard it used here in Western Australia. I assume you are talking about consistency, which now, in the last 10 years, seems to be changing. That is where I want to go with my question—that inconsistency and the factors behind it.

Mr Park—My understanding of a Mediterranean climate is that we get rain through the winter and it is quite consistent. That seems to be changing.

CHAIR—And that has been changing in the last decade or so?

Mr Park—It seems to be. I mentioned the north-east. As you can imagine, on the extremities of the south-west land division things get more variable, especially out in the north-east where you are right alongside pastoral country. After that you are getting into station country. What happened there was that during the nineties they actually had a spell of quite good years. But during the last 10 years the only way farmers there have got a crop is that they have actually had rain out of season—so in the summer—which has built up some subsoil moisture, which they have relied on, with a little bit of winter rain, to get through. It has almost got to the stage, with the winters we have had over the last 10 years, that they need to have that summer rainfall, which is not a Mediterranean type climate, to actually get themselves a crop.

I can see that actually moving further and further south as time goes on. Hence we need to be able to know when it is worth putting a crop in. If we have a look at the people in that north-eastern section, we see that the people who lost less money during those bad seasons were the people who chose not to put a crop in.

CHAIR—Are you able to tell us at all what sort of efforts are being made to assist farmers capacity to actually understand those changes and plan for the future, because the point of the inquiry is to look at those sorts of areas, which hopefully may lead to recommendations that can be made. Currently are there any substantial efforts being made to understand those changes? Presumably they may be longer term and they go to the heart of whether you are producing or not producing so they are serious issues.

Mr Park—There are two aspects to your question. First of all, and you would be better talking to people from the bureau of meteorology about this, I am aware that the Western Australian agriculture department has got a team looking at trying to predict, once a season starts, how they think it is going to end. They use a system that they call analogue years. That really means that they look at the rainfall up until the present and try to predict what is going to happen. The other way that they are doing it is looking at ocean temperatures in the eastern Indian Ocean and trying to make further predicts. That is what we would like to see. I am just trying to remember the other part of your question.

CHAIR—It is probably a response to what you just said—that you would like to see those sorts of systems developed. Are they being developed satisfactorily? If not, why not?

Mr Park—I think resources have been a real problem. A committees like yours probably hears that all the time these days. Resources seem to be harder and harder to get hold of to do this sort of work. Certainly the mantra we hear around the place is that agriculture should be putting money in to do these sorts of things. The reality is that the profit levels in agriculture are such that we have enough trouble putting investment into research that is going to actually show

returns on the production side. Getting into things like weather forecasting is way beyond our wildest dreams.

CHAIR—Where is it stated that agriculture should be investing? I am assuming that there is an expectation that farmers should make a contributions to research and development. Is that the—

Mr Park—That is usually the story behind comments that are made like that.

CHAIR—Have there been models put forward as to how you would harness individual farmers' contributions? Is there a suggestion for a fund to be set up? Is that what—

Mr Park—I would assume that it would run under the same sort of models that we have for our commodities at the moment. You would be aware that wool, meat and grains put aside statutory levies at the moment. As I say, those statutory levies are such that we battle just to put enough money into production research rather than things like weather research.

CHAIR—So that would not be feasible, would it?

Mr Park—I do not think so. I think we have to expect government to finance roles like that.

CHAIR—Do you want to make comment?

Mr Hill—The comment I would make is that it would be extremely difficult. It would be an added cost to the existing levy structure. Given the constraints of the collection and the cap, it would be difficult to fund this additional research.

CHAIR—It could possibly be seen as a little bit unfair on the farming sector given that weather forecasting applies uniformly to lots of other sectors as well.

Mr Hill—It does. I think it is fair to say that we are probably more exposed, but you could bring in those issues of equity, that is true.

Mr RAMSEY—Just to comment on that idea that farmers should contribute to rolling this out or supporting this kind of science, I think it is pretty fair that farmers should be asked to develop the models that use the science, such as yield profit, which we heard about earlier from GRDC. But to actually collate the raw data in the general public good is probably stretching a bit far. Thanks, Dale, for putting very clearly what I think is one of the very important roles of this committee, and that is to find out what more accurate weather forecasting systems would be worth to farmers and point out why it is so important.

I come from a very similar environment to you, which we touched on earlier. The ability to predict autumn rainfall seems to be the weakest link in the current models. I note also that you mentioned the statistical nature of the current climate forecasting seasonal prediction data. The Bureau of Meteorology tell us that they think that they have pushed that model as far as they can possibly go and that the future is in the dynamic models, which will be the computer-driven stuff. What I would really like for you to tell me—and I know you will not have figures on this—is that if we were to see a 15 per cent decline in growing season rainfall across the Western

Australia rain belt, on any seasonal basis what would you then expect with a very accurate forecast? Would we see large areas of Western Australia left out of crop on a strong prediction and how far are we away from farmers actually having faith in the current models to do that? How much better do they have to be? We may be aiming to something that we can never technically achieve.

Mr Park—There are a couple of very big questions there. To cover the first one, predicting what a 15 per cent rainfall drop would mean is incredibly difficult. I will use last year as an example of that. Last year was quite unusual in that it seemed that the further east we went in the south-west land division the better the season. There was not more production because you have to work on averages but certainly, area for area, the better the season they had the further east we went compared with what they had expected. That came about because of the fact that we had a poor start and bad breaks and then we had a reasonable in between and then we had that very dry part in August. What happens then is that your heavy country—and the further east you go the heavier the country gets—can hold on to water a lot better. We then had an event which was quite unusual. We had quite a wet spring. So all you really had to do was keep things alive during winter. Spring was reasonably unpredictable in that suddenly the temperatures changed a little bit in the Indian Ocean. We suddenly got one of the best springs we have had in probably 10 years for the whole state.

So where is the 15 per cent? If you cut that 15 per cent out of your season at the end of spring we probably would have had less than half the production we actually got last year. But had the 15 per cent come out at the beginning or over the whole year we probably would not have seen much difference. To work this out, first you have to tell me where the 15 per cent comes from. What seems to be happening is that we have more and more variation even within the seasons, so even if we get a good start we are not sure that we are going to get a good middle or a good end.

To give you an example, at the beginning of the season when we were going through the dry patch they were talking about five or six million tonnes of wheat coming out of Western Australia. We ended up with just under 10.

Mr Hill—Just over.

Mr Park—Somewhere around there. That gives you an idea of some of the variability that we have. Trying to make predictions just because you have so much is difficult.

Mr RAMSEY—Can you remember what the climate forecasts were for last season? Around seeding time, what were the bureau telling us we were going to get?

Mr Park—I am just trying to remember. I think at seeding time they were thinking we were going to get a reasonable year. In my own case what actually happened was that we got quite a lot of winter rain. By the time we actually got the break, I was on my fourth germination. We actually got the fourth germination. We got another rain, which kept that germination going. We had another germination. We lost the fifth because there was a dry period. We ended up going through the year on our fourth and six germinations for pasture. At the beginning, from memory, I think they were predicting a reasonable year. As it dried out, they said, 'Look, you blokes are in trouble.' They did not really see it coming at all—

Mr RAMSEY—It is a bit late.

Mr Park—It is a bit late. To come to the next part of your question, how a good does prediction have to be before the rest of the farming community say, 'Right, we are going to take notice of this.' Unfortunately, like everybody else, the nearer in the past these things happened the more notice we take. When we go back to the north-eastern section of the south-west land division those blokes are much more attentive in listening to what is going on because they have just come out of 10 years that have been very iffy. I think they have had three good years in those 10 years. The chances are that they will have bad ones, so they are listening. However, everybody else has squeaked through in some way or another and so they are still sitting saying, 'We will just put it in.' I had not come to the realisation of how much that has changed until I talked to a friend of mine who is 150 kilometres east of me who said, 'Looking over the past 10 years, I am just going to go and put it in. It does not matter whether we have rain or not because in those years where we have just stuck it in and not worried about whether we have had rain or not we have done better because we have had those rains further on.'

If we could know that we were going to get those rains, that is fair enough. But it seems that climate is changing such that we are less likely to get those rains. We would like to know which years we are and are not going to get them in. I do not know whether that is possible, but that is the dream. As I say, the people who did not put crops in in those bad years in the north-east were actually better off than the ones who did.

Mr RAMSEY—I often say in a drought, 'If I had only known, I would have been better off spending the year at the beach.'

Mr Park—Exactly right. That is true. Our problem is trying to get a system where we can predict that. I agree with you and the met bureau if they are saying that, but we are probably better off looking at the models rather than things like analog years. We are trying to understand what is actually driving the systems in Western Australia and it seems to be the sea temperatures in the Indian Ocean. If that is the way we are going to go, see if you can make the predictions a bit further out.

Mr RAMSEY—You have raised concerns about the fact that the ABS no longer does the yearly stat review. I was quite pleased when they stopped doing it every year—I was getting a bit sick of filling them out, I have to tell you. If we are going to look at a dynamic model rather than a statistical model and they think they have gone as far as they can with the statistical model, it probably means that perhaps the yearly survey is not so important. If you are looking at a limited resource and you have to make it go the most distance, I wonder why you think that is so important now.

Mr Park—I suppose we see that as what is actually happening generally—resources are getting cut down almost everywhere we look at it. The ag stats are just one of them that get cut down. Like you, on a personal basis I used to reckon it was a real chore at the end of every year to have to fill all those out. But, as we said in the submission, the problem is that when you do take those out we are getting further and further behind in trying to find out where trends are. I think the next year of real information is going to be 20011-12, and that is not going to be available until 2013. Those trends are important. I think it is the overall picture, where we see resources coming out of agriculture everywhere. I think that is the real worry that we have.

Mr Hill—If I could follow that up, it was the loss of the data points that was our concern. I am certainly not going to appear before any group of farmers and champion the need for more paperwork, because that is always terribly difficult. We were concerned about a loss of the data points and therefore whether that was bringing in any inaccuracy.

Mr SYMON—I would like to continue on with the ABS line of questioning. The ag census was cut, I understand by your submission, back in 1997. Was that an ABS decision or was that directed to them by the government of the day? Was there any input from the Farmers Federation on that?

Mr Park—In answer to the first question, no, there was not any input from the WA Farmers Federation.

Mr Hill—It certainly predates my time. We may have to take that on notice. I could not speak with any authority on the decision-making process back in 1997.

Mr SYMON—We briefly touched on my concern in relation to this before. Moving to a dynamic forecasting model is fine—and let's hope it is better than the statistical model—but without the collection of statistics, how are we going to prove that that dynamic model actually works?

Mr Hill—If we go back a couple of questions, what we have not taken the time to do—and I guess I am unaware of it happening in a broader sense—is to go back and look at the predictions at the end of the season and say, 'How accurate were they and how does that compare to the previous year?' That is the danger if we do move from one model to another—that we go back and validate its accuracy. I am sure that occurs. I do not know that I could speak on how that was actually being processed. One of the notes I have made here is to go back and look at what we were being told last year and how it panned out across the course of the season. I would be happy to provide that to you.

Mr SYMON—Surely if you are only getting accurate and, I suppose, complex information once every five years, it is going to take a whole lot longer to be confident of any new model and its hopefully positive effects on how you operate your farming businesses.

Mr Hill—Yes.

Mr Park—The south-west land division of Western Australia is actually quite a big area. Whenever you go there, people say, 'What's the season like?' and you say, 'It really depends where you are,' because Esperance is a hell of a long way away from Northampton and there are huge variations—not only north-south but east-west as well. It is most unusual that Western Australia everywhere will have a bad season and it is almost unheard of that everywhere will have a brilliant season. Then you get all the variations in between.

Mr SYMON—That is true. I come from a small state, Victoria, and we have variations from one end of the state to the other. It can well be that Gippsland, for instance, has a bad season and it may be better in the west. Obviously in a state the size of WA that is magnified so many times. The question I was leading to was about the interpretation of forecasting advice. When you get a

seasonal forecast from the bureau, how understandable is it, how much sense does it make to the farmer on the land and is it relevant, given what you have just told us?

Mr Park—The level of understanding of a forecast is going to depend on the individual knowledge of that particular farmer and how much he understands of the systems that he is working with. As I was saying earlier, there seems to be a move towards this idea of almost calendar farming, where people say: ‘Rightio. We’ve hit 15 May. Get the tractors out and we’ll get into it.’ That has been working up until now but, if the predictions are right for the overall climate change, it is going to be less and less likely to work.

Trying to generalise on the first part of your question is almost impossible. Traditionally farmers have used long-range forecasters who have not been part of the establishment—people like Lennox Walker come to mind and all those sorts of people—who have used other methods and predict rainfall events. It is amazing how many farmers you will be able to talk to who say: ‘Rightio. I have read such and such. He is predicting rain on 25 May. That’s what we’re looking for.’ There are all these new websites. There are two or three that I have bookmarked. There is one from New Zealand and one from the US Navy. There are a myriad of ones you can go and have a look at to see what is going to happen. They are all models. They work on roughly the same information. I think what you will find is that a lot of farmers look at a lot of that sort of information and it will depend on long-term experience of those particular sites how much notice they will take of the particular site they have seen.

Mr SYMON—I will finish up with one last follow-up question to that. I take it from that that the most important thing that you would be after is a smaller scale seasonal forecast—in other words, a local area rather than a general area forecast as you appear to get now. Talking to the bureau at previous hearings, that seems to be something that can be done if there are enough computing resources put into it. They can actually work down to smaller areas. The problem is that they are still very large areas.

Mr Park—Yes, but it is also how far out into the future you are looking. There is absolutely no doubt at all in my mind that the bureau’s predictions out to 10 days have become better and better. The information we get now compared with what we got 10 years ago is way out there; we are a lot better off. What I am saying, though, is that into the future we need to be looking even further and further out and it would be nice to get a seasonal type forecast. How accurate that is going to be is the real question, and with that accuracy will then come farmers’ confidence in those predictions, so it is going to be a long-term thing. But we are also in a moving feast as well.

Dr JENSEN—When you have a look at the Bureau of Meteorology rainfall charts for south-western Western Australia over the last century, what you notice is that there has been quite a decrease over not just 10 years but over a period of about 40 years. One of the things that you were talking about was the marginalisation of particularly the north-eastern region. Is that an issue where about 10 years ago effectively that threshold of viability was hit rather than we have only seen this change for the last 10 years?

Mr Park—I think you have got a point there, and the other thing that we have mentioned slightly is that our technologies have improved a great deal in growing crops. My first memory of a drought is 1969. I was still at school then. That was the big one. Yet when we have a look

back from now we have probably had 10 or 15 in that time and yet the yields have been much better. In fact, in the last 10 years we have worse than 1969s. Up until 10 years ago when we looked back there were probably four or five 1969s yet the yields had got better and better. So we have got better at using less and less rain. There is no doubt about that at all. What you say about a tipping point or an edge or something is quite right. When you actually have a look at run-off rates, for instance, in Perth you can almost draw straight lines within the curve, and run-offs are a great example because you need to fill the land up first before you then start getting water running out of the country. That is what worries me. The north-east is one at the moment, but I really think that is going to start moving south and probably west. Whereas people in the eastern wheat belt think they can just rip in, put a crop in and they will be right, I am worried that that is going to change over the next 10 or 15 years because you are going to be less and less likely to do that. But then again in my own area in the last 20 years my rainfall has been 600 millimetres. There have been ups and downs but really we have not dropped much at all. Yet you go into the south-west and they have dropped probably 20 per cent.

Dr JENSEN—I guess that leads to another question. How much confidence do you have in the assessments that there is going to be a continued decrease in the south-west and an increase in northern Western Australia, given that you could more or less use a persistence model, in other words go through the trends for the last 30 or 40 years in each case and make the case that, yes, it will continue decreasing in the south-west and increasing in the north-west. That is somewhat different from an actual prediction based on something physical. For instance, something that has only been realised in the last five or so years is the effects of the Indian Ocean Dipole on Australian climate and rainfall. I am not sure how much work has been done, particularly in the Western Australian perspective, with that, but certainly in the east they are now realising that the Indian Ocean Dipole has got a greater effect on rainfall than El Nino-La Nina events. So how much confidence do you have that that trend is going to continue, given that things keep getting discovered that have an impact that were not realised before? The other thing is, how realistic do you think is going to be to get the longer range forecasts that you are looking at to a greater degree than you have got now, given that particularly when you are talking about climate/weather which is in that medium-range period that you are talking about that you still get chaotic effects which can have a major impact further down the line?

Mr Park—You are right. From a farming point of view, the statistical approach is really not going to help us that much. We need to be able to ask: ‘Is it going to be worth putting a crop in this year or not?’ Just to know that things are getting drier is really not much of a help to us. Really, the only thing that should do for us is for us to be able to say to ourselves that we should be looking at something that is going to be predicting drier seasons into the future. It is almost as if we should be using it to say that if something is on the radar, we should be looking at that. That is a problem in itself. I think there are a lot of farmers out there who are saying, ‘No, it is not really getting drier, and, if it is getting drier, our technologies are keeping pace so we can beat that.’

My personal point of view is that I am not confident that is true. I think it is going to get drier and it is probably going to get more unpredictable as well. Going back to last year was a classic case in point. When I talked to people from the department, for instance, who have been using analogue years, they were saying, ‘Halfway through the year we were saying, “This is going to be a shocker”.’ Then suddenly things changed in the Indian Ocean, we got a wet spring and things changed completely. As to whether I think that we can get to a stage where those

predictions can happen, when you have a look at the complexities of the modelling that has changed even in the last 10 years, I cannot see, if we do not get the same sorts of changes again in the complexities of those models, that we can start getting further and further out.

Dr JENSEN—Another thing that I think you were alluding to and which was certainly in another submission that we have had today is the issue of decreasing data collection sites, which is obviously somewhat problematic, given that the data is then fed back into the model to see whether the model is actually generating good model outputs.

Mr Park—I think the problem for Western Australia has been not so much the data collection within Western Australia or on our land mass but all that country out there which is actually sea. The data points out there are very small, and that has been one of our problems. Well, it has not been one of our problems; it has been one of the problems for the met bureau in being able to make those predictions, because there is just nothing west of us except South Africa, which is too far away. If we are talking about those data points, that is right: we have a paucity of data points out there that are going to help.

Dr JENSEN—I guess it is not just in terms of the model projections. There are argot buoys that have been sown around the oceans now which are giving a lot of good data basically for the first time ever. But it is the predictive capacity. For instance, if the weather bureau use all of those data points out in the ocean in their model and they say, just for argument's sake, that they expect in a meridian area that we are going to have this much rainfall et cetera, if you do not have anything measuring the rainfall there, you do not have the feedback mechanism.

Mr Park—Yes. What has actually happened is that there are a lot more automatic weather stations out there. I think in my own area there is one, Badgingarra Research Station. There are still a lot of manual readings of rainfall out there as well. I might be wrong, but from my point of view I do not think that is a problem. I think those things are going to be there. The biggest problem is going to be making sure we do the follow-ups to make sure that what is predicted is actually happening or not happening out there and whether they can improve that.

Dr JENSEN—Given the state of play at the moment—you have said that you are a grazier; you are not a wheat farmer—if you were a wheat farmer and you had the sorts of seasonal forecasts that you have at the moment, what would you be doing with them? How would you be using that information?

Mr Park—Because of the distance that they go out, I would use them for things like nitrogen application and those sorts of things. That is what was happening last year a bit. When people thought that the season was going to go bad they were saying, 'Don't put as much nitrogen on because you'll just burn the crops off.' What ended up happening was that the people who put the nitrogen on really benefited from it. At the moment, with the distance that they go out, that is the sort of prediction: 'Once you've put a crop in, what sorts of inputs do you put on, on a cost-benefit basis? With the predicted rain that's coming up, if we put this sort of nitrogen on they're the sorts of increases but the costs are this, this and this.' Nitrogen is a real classic because, if you put too much on for the amount of rain that you are going to get, you actually decrease your yield rather than increase it. At the moment with where the predictions are, that is about as far out as you can go. I would like to think we could get out further from that but—

Dr JENSEN—The reason I ask is that the Bureau of Met at the moment are in the ballpark 70 per cent of the time with seasonal forecasts. They are saying that there could be a benefit of so many billion dollars to the Australian agricultural industry if farmers followed these forecasts exactly. But say the seasonal forecast is that there is going to be great rainfall—so you sow your crop and put in all of your fertilisers et cetera anticipating that—and you have a drought year it could be enough to send you, the individual farmer, broke. At the moment, is there distinct benefit to these seasonal forecasts, or is it something where the farmers are going about operating in the same way that they have, albeit given newer technology et cetera, and erring on the side of caution from both sides such that the seasonal forecasts are not having a specific impact on their farming practices?

Mr Park—I think that farmers are taking more notice of the predictions going out. If I think back 10, 15 or 20 years ago about what farmers were doing then and what they are doing now, I think farmers give a lot more credence to what the forecasts are, because we just did not have them 10 or 15 years ago.

Dr JENSEN—The question then is: how do they use the seasonal forecasts? Let us assume not another step improvement in modelling performance but a gradual improvement in modelling performance. What other sorts of factors do you think that farmers would use in terms of their operating practices? How are they changing their practices at the moment, given the regional forecasts, and how do you see them further modifying their practices into the future?

Mr Park—It would not matter if we got a step increase at the moment. Because farmers are fairly conservative and because the way they operate their farms is reasonably conservative, until they convince themselves that what they are being told is true then they are not going to change. Even if there was a step change in the predictability there would still only be a very gradual change in farmer behaviour. What we are seeing now in farmer behaviour is that their confidence level in the prediction determines how far they go out. So you have some farmers that are quite confident and look at what is happening further out. The vast majority are back and are probably only using forecasts out to a month or six weeks.

Dr JENSEN—But how are they using that?

Mr Park—How they are using that is, as I said before, in things like nitrogen. As you come through a cropping phase you put your crop in, and that is where your big investment is. You then make other investments as you go further along. To me, that is why frost is the really nasty thing that can happen to you—you have put in all your investment except for harvesting it and then it gets ripped out from underneath you. The putting in of the crop is getting less and less about predictions. They are just saying, ‘Right, we’ll put it in on this day.’ After that, though, they are using those to work out the last bits of the year’s expenses that they will put into those crops.

Dr JENSEN—In other words, they are not likely to use the entire seasonal forecast.

Mr Park—Not at the moment.

Dr JENSEN—They are likely to use, as you say, four to six weeks. Let us assume that you got perfect accuracy with four to six weeks. How useful is that?

Mr Park—That is useful. Using it like that, farmers would never save 100 per cent, but they would probably save 60 per cent to 70 per cent. They are quite confident that that is going to happen. Of course they are using what has actually happened up until then, too. If their country is full of water they know that even with below average rain they can still come through. There is still a lot of looking behind and predicting where they are going.

CHAIR—Listening to you, I get the sense that the whole behaviour of farmers is very much that they operate on their own—the individual farmer makes decisions. You are from the Farmers Federation. I was just thinking about some of my experiences in the southern Peloponnese a few years ago in an orange grove area where they were worried about frost. There was an incredible collective movement towards trying to deal with the frost that might fall and trying to avert the danger of their crop being ruined. There was a very strong sense of collective sharing and working together.

Australia is a large vastly different country. Can you describe the relationship that farmers have with each other in relation to getting this sort of information, using it and advising each other. You said that some do things that see them succeed in their crops, others do not take that same advice and still others take advice from websites in the United States. We have a bureau that provides advice, but it seems to me that there is not a streamlined, coordinated effort where farmers can collectively come together and get advice, not only from a web page, and then rely on their own decisions about whether to accept the forecast or not. I am trying to understand how you operate on the ground, and I want to know what the Farmers Federation's relationship with farmers is in bringing that together for them.

Mr Park—You are right. Farmers in general are very individualistic. Regarding the network amongst farmers, though, I suppose we cannot really discount the importance of things like golf clubs and football clubs, because a lot of interaction happens there.

CHAIR—I meant information sharing in relation to forecasting—serious things. If we are looking at improving our capacity to provide accurate forecasting for the agriculture industry, you would want to think that on the ground that advice was being dealt with in a collective, cohesive way. I can understand there will be variations, but it seems very hit and miss at the moment according to the farmers. I do not know if I am making myself clear. I just do not get the picture of you working together on the ground, that is all.

Mr Park—I am still not quite sure about the picture you are looking for.

CHAIR—Too many people are getting advice from all sorts of places and making decisions about what they are going to do with their crop, and I would have thought that there would have been a capacity, at least now, to be a little bit more predictable and a bit more consistent.

Mr Park—I did not mention the BOM, but that is certainly another site that is used a lot, even the four-day forecasts and the 10-day forecasts, for predicting rain. But I am still battling a bit on the 'collective'.

CHAIR—Do you share information on the ground other than just relying on the bureau or web pages? Do you as a farmers federation provide information? Farmers have an experience of

the land, don't they? They have knowledge that may be very useful to computer modelling. Do you gather that? Do you have that?

Mr Park—Not that I am aware of. You would be looking more at people like the bureau going back to farmers and asking this, that and the other. Is that what you are talking about?

CHAIR—What if some farmers go forward with seeding and others do not, and so the ones who did go forward actually prospered from the climate—

Mr Park—Not always.

CHAIR—I understand that, but they must have some sort of capacity to make a decision that seems to—

Mr Hill—I think if you are trying to find the next an example of the model that you referred to it is going to be very difficult. That is my experience. With European horticultural pursuits, there is a much greater cooperative structure. The advisers are employees of the cooperative and therefore it is part of their role. That does not tend to exist in broadacre Western Australian agriculture. Therefore, there is a much broader sense of information coming in from different sources. You are right in saying that a lot of the decision making is done on an individual basis. There might be some informal sharing of information. Certainly it is not a role that the farmers federation is currently involved in, and I am pretty confident in saying it is probably not one that any of the other state farm organisations is providing either.

Dr JENSEN—Can I expand on this question?

CHAIR—That is fine, because I think it is worth looking at.

Dr JENSEN—An American nuclear submarine called the *Scorpion* was lost in 1968. They heard it getting crushed through its sonar signature. The way they found it was that they got a whole lot of marine experts in the field to predict, based their experience, where it would actually land on the seabed. They got a whole lot of these experts' variety of positions and when they averaged them out it was to within a kilometre of whether the *Scorpion* was found. The point here is that collective information—call that a gut feeling or experience or whatever you like—can be very useful information that can lead to quite useful changes in behaviour. I think that is something that is certainly worth your investigating. You could get farmers together with the Bureau of Meteorology and the different models and so on and get each of them to say how they would behave given certain information and then average it out and see how that actually follows the trend. That would be a very useful thing to do.

Mr Park—I think you are right. It makes sense to me. Resources, again, are always be the problem.

Mr RAMSEY—I think there is a little misunderstanding of what farmers federations do. They are lobby groups. They are a political voice for farmers. What you are talking about largely is what our lot of other farmer groups do, as in research groups that are driven from the ground—like GRDC, for instance. I do not think Western Australian farmers or South Australian farmers would see it as their role to even embark on that area.

CHAIR—They want to lobby government for the resources to make it possible for others—

Mr RAMSEY—For other farmers to do is, yes.

CHAIR—In a sense, they are not totally removed from that capacity building.

Mr RAMSEY—That is right.

Mr Hill—It is probably also more traditionally a state agency type of role. I think that is the point. But, I guess, you are right. Our fundamental reason for being here is to argue the case for better information for growers. There may be a number of ways to deliver that.

CHAIR—We are looking to you for advice too on where your fault lines are.

Mr Park—When I think back to what Rowan said about that, you are right. The GRDCs have sometimes gone down that path. What has been found though is that it has been a very expensive way of collecting information. Certainly, as funds tightened up in those GRDCs they went less and less down that sort of road and concentrated more on how to get the things on the ground and what was going to make the biggest buck. Maybe we are getting to a stage when we are going to have to go back and look at those sorts of things. Previously, we have found as an industry that it has been quite an expensive exercise. As money has got tighter and tighter there is less and less of that happening.

Dr JENSEN—This could be something that is done fairly, simply and cheaply which is to effectively get farmers each to email.

Mr Park—Logging on.

Dr JENSEN—The email would say, ‘This is what I would do given the information that I have had.’ And another farmer would say ‘This is what I would do’ and so on. You average those out, see what the average expectation is and track that. If the farmers in that region had used that rather than the individual models, how would they have gone? I think you might find that might be quite useful.

Mr Park—I agree with you I think it probably could be. I am thinking of ways that could be done. Certainly, I see people like the BOM would be a critical part of an operation like that. It would be fairly complex. We will think about it.

Mr Hill—We will undertake to get back to you on that one.

CHAIR—Thank you very much for your submission and for this morning’s session. It has been very enlightening.

Proceedings suspended from 10.21 am to 10.32 am

CRONSTEDT, Mr Malcolm Graham, Acting Assistant Chief Operations Officer, Country, Fire and Emergency Services Authority of Western Australia

SMITH, Mr Ralph Douglas, Manager, Bushfire and Environmental Protection Branch, Fire and Emergency Services Authority of Western Australia

CHAIR—Welcome. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are proceedings of the parliament and consequently they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Thank you for your submission. I now invite you to make a brief opening statement before we proceed to questions.

Mr Cronstedt—Good morning. Thank you for the opportunity to support our written submission verbally. I represent the service delivery arm of FESA in a regional context, so my staff and the volunteers represent the organisation at the sharp end of the business. It would be worth briefly canvassing the scope of FESA's work to give some context to how what we are talking about fits in. FESA is a unique organisation in that it takes an all-hazards approach across Western Australia—fire, flood, cyclone and a range of natural hazards. Obviously weather is a critical input to managing the risks associated with those natural hazards. Ralph represents a part of FESA which has a keen interest in helping us deliver those services. Ralph's expertise is in bushfire and environmental protection, and provides us with a great deal of support and help in providing services to regional Western Australia across those hazards. His expertise in bushfires is particularly well regarded in that context.

We deliver services across a range of regional offices in Western Australia and are very dependent on volunteers. Volunteers in a rural context are often farmers, landowners and people very much affected by the long-term trend in weather and natural hazards. At the moment bushfire is really in their minds because of recent events in Victoria, and FESA has to concern itself with a whole range of hazards which have and potentially have just as devastating an effect. Getting a handle on the one critical input to those long-term trends can really assist us in managing the risk better. We provide a range of services across the natural hazards I mentioned, including marine, land search, cyclones, severe storms, floods, earthquakes, tsunamis, landslides and all the fire related areas. In rural areas we also have a great deal of partnership and liaison with local government, which is a critical partner in this. Local governments have the people on the ground and we are heavily reliant on them and their volunteers to provide services.

Western Australia is practically a third of the continent, ranging from the Kimberley to the south coast, so the climate is quite diverse regardless of any long-term trend. The risks associated, from bushfire to cyclone and winter storms, are equally diverse. Our issue is getting a really solid handle on what the trends might be on an interseasonal basis but also on a much longer term basis as a better input into how we manage risks, how we model risks and, as a consequence, how and where we devote resources. At the end of the day it is about how we manipulate and configure to best effect all the resources and risk treatments, such as burning, we might apply across the community in partnership with the people I mentioned. Weather is such a critical input into that mix that without its analysis we would be in all sorts of strife. Getting a

really good handle on that long-term impact is what we are here about. Ralph has had significant input into the detail of our submission and I will now defer to him.

Mr Smith—I will just make a couple of comments relating to the Bureau of Meteorology. FESA strongly supports the work of the bureau. We believe that the staff up there are very professional and highly skilled, although we perceive that the staffing levels are at the bare minimum and there is limited opportunity for new or extended projects to be initiated. WA is a very large state and we would like to see an increase in the number of automatic weather stations, other tools and the capability of BOM to meet the needs of WA, including needs not yet identified. We are seeking enhanced climate-modelling techniques applicable to Western Australia and enhanced long-term meteorological prediction systems. We are of the opinion that BOM should be funded to a level that ensures that it is at the cutting edge of research and has the capacity to provide forecast services that ensure that the community receives optimum protection, particularly in regard to the provision of information to fire and emergency services in Western Australia.

Specifically, we would like to see more of the National Climate Centre work undertaken in Western Australia. We acknowledge the great work that they do, but their work is based in Melbourne and we would like to see more of it based in Western Australia. Also, whilst the Centre for Australian Weather and Climate Research strongly supports work in Western Australia at the moment, we would like to see more of its work based in Western Australia, particularly things such as the smoke-modelling project, the development of which is currently being funded by end users.

We are strong advocates and participants in the seasonal bushfire assessment workshops, which are coordinated by BOM and as part of the bushfire cooperative research centre but we are of the view that that should be a core function of BOM supported by local state agencies. We also would like to see more research on issues such as the Haines Index and atmospheric dry cell research or similar that could be researched in WA. I understand that following the Canberra fires some research from Melbourne by Graham Mills indicated some atmospheric dry cell discrepancies. We would like to see more of that work undertaken in Western Australia if possible.

We are also concerned that the rollout of the next generation weather forecast and warning system and the computer application that meteorologists will use when preparing the forecasts, the graphical forecast editor, may take many years before it gets to WA. We are aware that it is being trialled in Victoria but, as I understand it, funding is an issue and it may take up to five years before it gets to WA. We would like to see that brought forward if at all possible. As I said to you previously we are keen to ensure, whilst BOM are very professional and highly skilled, that they are financed to a level that allows us to expand to the next generation of bushfire modelling and prediction tools of which weather forecasting is critical.

CHAIR—Do you have confidence in the Bureau of Meteorology's and CSIRO's capacity for weather forecasting.

Mr Smith—Yes.

CHAIR—That was a very quick ‘yes’. It is a genuine question and I am just wondering whether you could help us to understand whether there are any shortcomings or areas that should be spoken about rather than not spoken about.

Mr Cronstedt—I could perhaps preface the detail by saying that our working relationship with the Bureau of Meteorology is very strong for obvious reasons. Bushfire is one of the stronger elements because of its criticality and the nature of it. Traditionally, it has been very short-term focused but in recent years that has drawn out and, if you are to wisely manage the risk, you have to look further than the here and now. Building on that good working relationship is obviously what we are keen to do. As in every other state, the fire services or in our case FESA, which is much broader, and the bureau have an extremely good working relationship. Ralph no doubt can add some detail about the gaps.

Mr Smith—I guess the most significant gaps are in relation to the more northern portions of the state where there are significant distances between the automatic weather stations. That adds to the complexity of forecasting. It makes fire management in those areas a little more problematic. Whilst the built environment values are not as great, the impact on pastoralists, remote Indigenous communities and other people in those environments can be significant because the response capability in those areas is reduced. We rely very heavily on open edged aerial burning, for instance in the Kimberley, to provide strategic buffers which requires them to self-extinguish. The forecast that we get from the bureau is critical in determining the right day for those burns to be undertaken. I have to say that experience in recent years is that they are very good.

CHAIR—Their advice has been very good. If there are any shortcomings or areas that need to be looked at—why wouldn’t you have a good relationship with the bureau—are they about resources and lack? We have heard evidence as well that we are trying to build a capacity here where we might not even have enough expertise left in this country to actually develop that capacity. What are the areas that might be contributing to shortcomings inadvertently that are actually impacting on not necessarily your relationship with the bureau but rather the work where you rely on the bureau and you need to work as a partnership?

Mr Smith—I think there are issues in wishing to go forward with new initiatives. Where the bureau has run programs for a number of years that we have wanted to enhance or modify, it is difficult sometimes for them to be able to do that in a timely manner, and in some instances we have had to fund those changes because of the resourcing.

CHAIR—Is it because of a lack of will? Do you get a fair hearing? If you have come up with something that you think the bureau should be looking at, are you able to put that forward?

Mr Smith—Yes. We have very good, open and honest communication. There are no worries from my perspective about that. As I understand it, the bureau have suffered a number of budget cuts in recent years. I might be wrong, but I understand that they are now one research officer down. From my perspective, and I do not know the exact workings of the bureau, I believe that impacts on their ability to provide new initiatives. We rely very heavily on the bureau for seasonal projections both for the northern season and for the southern season. We liaise regularly. Whilst the bureau have never not sent staff from Western Australia to those meetings, I understand that budgets are always tight and there are always discussions about priorities and the

opportunity to go to those meetings. They are critical from our perspective in ensuring that there is an ongoing treatment from the bureau to that and the results that they get out of it. I have no absolutely no criticism with the staffing or the staff within the bureau in Western Australia. I find them very good to work with. But I just find that finance is certainly an issue.

Mr SYMON—My first question goes to whether you would support an expansion of the observational network, especially of automatic weather stations in Western Australia. Not being from Western Australia, could you tell me what their spread is at the moment? Are they mostly around the population centres and the rest of the state goes without?

Mr Smith—The northern portion of the state certainly has a deficiency of them. To use the Kimberley as an example, there is one in Broome, one in Wyndham, one in Fitzroy Crossing—and just between Fitzroy Crossing and Broome, I think, there is about 400 kilometres. There is one in Halls Creek, which I think is 297 kilometres away from Fitzroy Crossing. There is one in Kununurra and one at Derby. As I understand it, about a third of the Kimberley is burnt on an annual basis with unplanned fires. It produces about 48 per cent of the greenhouse gas emissions from the agricultural sector in Western Australia. We spend a lot of time and effort trying to reduce the impact of fires in the Kimberley. Having better forecasting tools and weather stations would improve our fire management in those areas.

Mr SYMON—At present, is it right that most of those stations that are in place do not overlap with each other? Do they stand alone and is there a gap between their coverage and the next one?

Mr Smith—As I understand it, yes—in the north of the state.

Mr SYMON—Is that true for the rest of the state? Are there similar gaps in coverage?

Mr Smith—I understand there are gaps in the south as well, but I do not believe the gaps are as large.

Mr SYMON—In your estimation, how many extra automatic weather stations would be needed to cover that?

Mr Smith—I have no idea, to be honest.

Mr SYMON—That is a fair enough answer. Back to your submission, you say that the current reporting of long-term meteorological forecasting prediction information is limited and tends to be broadly focused on the global region and Australia wide rather than the state level and detailed. Even at a state level in an area as big as WA, as we heard from previous witnesses, is problematic. There would obviously be a need for a much smaller scale so that you could use that information in a local area rather than having to rely on a long-term forecast, for instance, for the whole of the northern part of Western Australia.

Mr Smith—You could correct me if I am wrong, but as I understand it the next generation weather forecasting warning system will be on a different scale, which would provide an improved forecasting opportunity across the state.

Dr JENSEN—Smaller grid size.

Mr SYMON—Yes. But that smaller grid size apparently is all due to how much computational resources are available, and we have asked that question previously of the bureau and they have pretty much said, ‘We can take it smaller providing you give us bigger and bigger computers.’ It was a bit of a chicken and egg scenario. What have you got in place at the moment in terms of a long-term forecast for upcoming risks? How is the information that you get from the bureau broken down across the state? Just to fill that in, they obviously must provide your agency with a different forecast, say, for the south than they do for the north. How many areas do they provide that type of information for?

Mr Smith—I am not sure how many forecasting weather districts—

Mr Cronstedt—You mean the fire weather districts on that scale?

Mr SYMON—Yes.

Mr Cronstedt—I cannot put a figure on the number of districts. Twelve would be a stab in the dark. There are quite a few in the south-west, and then it obviously gets larger. At the end of the day, if resolution is increased we are going to benefit. If there are increased improvements in the quality of the data that feeds that—in other words, the automatic weather stations—and then in the quality of the information, through better modelling and so on, it is going to help us manage the risk better. In WA it is such a broad scale. The south-west is a particularly unique circumstance. The south-west corner, which is probably an eighth of the state—the size of Victoria—is that little bit where bushfire tends to predominate because of the high rainfall and the forest fuels and the communities and the population. As you progress up north you get more and more isolated communities, but then the risks come from somewhere else. Ralph has been doing a lot of work, as he mentioned, in mitigating some of the bushfire risks to those communities. Then we have cyclones and flooding and so on. There are the challenges of resolution and the challenges of the network and feeding that resolution—the AWSs. There are some gaps. Answering very broadly, the more the better.

The other aspect of this is that as an agency we deal with a huge range of stakeholders, from local governments to landholders to our own firefighters, with varying skills and capacities to understand what you are putting to them. FESA has to have a bit of an interpretation role and we look to the bureau to assist us with that in interpreting what it all means. Most of our people are dreadfully practical people and like tangible things. That interpretation is really critical, especially when you are starting to look over the horizon.

Mr SYMON—That leads perfectly into my last question. Your submission talks about the problems of navigating the vast amounts of data and information and the difficulty of that due to different terminology, categories, the technical nature of it. Do you have any ideas on how that could be delivered in a way that is more understandable to users and agencies such as yours?

Mr Cronstedt—We will continue to work with the bureau and others, through that professional working relationship, to do the interpretation. At the end of the day, if the resources are not there to assist in delivering a better interpretation, there are shortfalls. I guess it comes back to that resourcing issue.

Mr SYMON—So the bureau would need people in place to interpret their own information so they can deliver it to the end user so that it is in a useable form?

Mr Cronstedt—It would help us—

Mr SYMON—Yes.

Mr Cronstedt—in collaboration to do some of that.

Mr Smith—If I could just add to that, in the 1970s, for instance, the bushfires board in WA used to conduct fire weather courses for fire weather officers, who were primarily volunteers. The bureau actually conducted that training on behalf of the board. I think that was a couple of courses a year, and they were run annually. So that was one of the tools for getting that complex information out to volunteers so that they had a better understanding of what was occurring.

Mr SYMON—But does not occur anymore, obviously.

Mr Smith—No, I do not believe so.

Mr Cronstedt—Having said that though, we still work with the bureau to deliver awareness sessions—but I suspect they are of a shorter timeframe due to resourcing. We do not have the opportunity of having a more decent timeframe so volunteers can get a really good understanding of what it is that makes their job easier.

Dr JENSEN—One of the aspects that you brought up in your report was the issue of cyclone activity. The outlook as far as the Intergovernmental Panel on Climate Change is concerned is that there will be more, and more intense, cyclones. However the trend over the last 40 years certainly has not seen an increase in the integrated intensity of cyclones or indeed the number of cyclones that there have been. What is the danger in potentially misallocating resources due to, I guess, the incorrect assignment of risk? For instance, you were talking about having to have a look at the different elements that FESA deals with and allocating resources appropriately. I guess in specific with the issue of cyclones, with the estimate of increased intensity and number of cyclones, what does that do as far as FESA is concerned in terms of your allocation of resources compared with if it just stays the same?

Mr Cronstedt—I should define what we mean by ‘resources’ first of all. We deliver programs across a range of things from prevention, preparedness and response through to recovery. In other words, starting well before anything occurs we need to devote resources to increase awareness of the risks that people are in, mitigation programs to make communities more resilient to a potential impact and so on. So a whole bunch of resources would be devoted to pre-incident activity and raising people’s capacity to resist what might come and then emerge out the other end unscathed. Then there are response resources—in other words, our volunteers and our infrastructure with the state emergency service units and all the things that go with that infrastructure. That is what that means. Recovery is about what we are going to devote in terms of resources if something happens. It is about returning a community back to the way it was pre impact.

Getting the risk wrong could have a significant impact. One of our biggest concerns is remote Indigenous communities and devoting adequate and appropriate resources to the risk identified to those communities. On the issue of frequency, just one impact can make the difference. So if you have small changes in frequency then I do not think that our risks would change a great deal because the consequence is such that you need to devote resources in any event to the protection of communities and towns. So frequency will tend to make us more aware and allocate response resources more appropriately as the emerging risk evolves. On the pre-impact side we know where the communities are and we know what the risks are in terms of infrastructure. So frequency perhaps just means that we have more to do in a more compressed time period.

It would be nice to know how often these could occur just to get ourselves organised in terms of response. The logic tells you that the more information and the more data you have about that, the better you are going to be ready for things and then emerge unscathed at the other end. Our objective is always that we build communities which are as resilient as is practicably possible so that if an impact, which we know would be inevitable, occurs then they can emerge unscathed. I guess it becomes a circular argument. It goes back to knowing more about it in more resolution and in a more timely fashion so that we can then go to the resource argument. It would equip us much better.

Dr JENSEN—You were also talking about improved smoke modelling. I am assuming that you are talking about burn off there. While we are talking about burn off, over the last 30 to 40 years in the south-west there has been a decrease in rainfall, which I guess leads to somewhat of an increased with bushfires and bushfire intensity. Yet in the same time period there has been a smaller percentage of land burnt off on an annual basis. What is the reason for that and would improved smoke modelling mean that you would actually increase the area that is burnt off every year? I think at the moment that you are burning off something like seven per cent. Would that be correct?

Mr Smith—Could I suggest that you might want to actually pose that question to the Department of Environment and Conservation staff.

Dr JENSEN—I will do that too.

Mr Smith—I think the seven per cent or the eight per cent you are referring to is in relation to the burning of their estate rather than on non-DEC lands. I do not know that there are actually any stats around that would confirm that for non-DEC lands.

Dr JENSEN—Okay, I will certainly ask that. In terms of the smoke modelling what is your specific requirement there? Obviously if you have a bushfire, you have a bushfire.

Mr Smith—The smoke modelling is for prescribed burning—so that the impact of that hazard reduction burning can be planned so that it does not affect key community values. For instance, the way we are trying to develop the process—and we are now partners in that smoke-modelling project—will be so that farmers, pastoralists or those with significant landholdings will be able to have a look at the smoke modelling before they set fire to the bush and work out what impact their burning is going to have on the community.

Dr JENSEN—So this is you providing advice to farmers and so on as far as burning off is concerned?

Mr Smith—Ultimately, yes.

Mr RAMSEY—Is that largely aimed at the urban fringes—the hobby farms and that kind of thing?

Mr Smith—No, it is bigger than that.

Mr RAMSEY—So we are still talking about a localised impact then?

Mr Smith—It will be more than a localised impact. We are talking about substantial burns that are undertaken. We had an example a couple of years ago where there was a lot of burning undertaken in the wheat belt to the north of Perth and the smoke actually came into Perth. We are trying to provide tools to prevent that occurring.

Mr RAMSEY—This actually goes back a bit to what Dennis was talking about with the reallocation of resources. I am just wondering in a practical sense if you have a strong seasonal forecast, what do you do with that now? I can understand what you do with four-, five- or a six-day forecast—like if there is a cyclone coming or if there are bad bushfire conditions coming—where you put out public alerts telling people to chain down their rubbish bins and all that kind of stuff. But if you have a three-month forecast that is telling you that we are likely to have a high-activity cyclone season or bad bushfire risk then what do you actually do with that information at the moment?

Mr Cronstedt—We might very well predeploy people. Once you know that then you pose the question to yourself: what should we do? The answer might be: we need to predeploy incident management teams to a particular regional location. We may need to look at bolstering local resources from the south of the state to the local SES units, for instance—and maybe running exercises.

All those pre-activity preparations would be ramped up or compressed in recognition of the fact that if there were more certainty you could say, ‘Well, with certainty we do need an exercise and we need to pre-deploy resources and people and work with local government and others to ramp up some of the localised prevention activities as well.’ So it would provide a great impetus.

Mr RAMSEY—Do you lease or import water bombers on a seasonal basis?

Mr Smith—We have got helicopters that are here on a seasonal basis, yes.

Mr RAMSEY—So would you order up more helicopters on the basis of a high risk season?

Mr Smith—Can we just go back a step. If the seasonal assessment is done early enough then there is an opportunity to undertake additional prescribed burning from a strategic perspective to start to mitigate some of that potential threat, and we have actually done that in the Kimberley earlier this year. So it depends on the timing of the advice, which is why the seasonal projections are so important to us. If we can mitigate it by burning, fine. If we cannot, we look at a whole

range of other options that are available. For instance, additional resources, such as vehicles, are sent to locations depending on the seasonal assessment.

Mr Cronstedt—Every year it was practised in the past, but in recognition of the resource shortfalls in some remote areas for bushfires, as Ralph has mentioned, in the southern half of the state we do not need the spare resources so we shift them north. We do not duplicate resources, we just shift them around according to need.

Mr RAMSEY—On the Kimberley, I do not know which one of you said it, but you estimate that 30 per cent of the Kimberley is being burned off a year. Is that naturally driven fire caused by lightning and therefore what would have been expected over a hundred-year period, or has there been a big increase, or is it manipulated by the fact that we do not allow them to burn out and build up fuel? I wonder about that management.

Mr Smith—Unplanned, unnatural fire is a significant problem in the Kimberley. Having said that, I think it was 5-12 October last year five million hectares of the Kimberley burned as a result of lightning strikes. Because it is a savannah grassland, it is an annual bushfire fuel, so we opt for strategic fire management on pastoral stations and around remote Indigenous communities and townships to reduce the impact of those fires that occur. We are trying to change the nature of the burning so that there may well still be 30 per cent of the Kimberley burnt on a long-term basis but it will be early dry season burning as opposed to late dry season burning. Early dry season burning does not have the destructive intensities that alter the biodiversity and grazing opportunities that would be lost during a late dry season fire. The late dry season fires are the worst fires; they consume everything and can take out whole pastoral stations. So we try and avoid that and change the structure to more burning in the early dry season.

Mr RAMSEY—On a previous trip I did into the north there was some evidence, at least given anecdotally, that moves to restrict burning in the northern regions of Australia have actually changed the flora in so much that some species that were not thriving before are taking over and choking out those that require the annual burning.

Mr Smith—The seasonality and frequency have certainly changed up there and are having an impact on biodiversity, as well as more basic things, like when you talk to Aboriginal groups they will tell you that there is less opportunity for their traditional hunting and gathering as a result of the fire frequency and seasonality. These late dry season fires are actually destroying those options for them.

Mr RAMSEY—Even though they would have been in the natural course of events, probably.

Mr Smith—Potentially, yes—although there has been an increase in different grass species such as buffel, which—

Mr RAMSEY—is everywhere.

Mr Smith—Yes, and it has different characteristics, depending on whether you are on the east coast of Australia or the west coast. But that starts to fill in some of the gaps that would have occurred—in the Pilbara, for instance, when it was just a spinifex fuel. Following fire now you

are getting a lot more buffel, which fills in that gap. That then becomes an annual grass fuel as opposed to a fuel that may have burnt on a less frequent basis.

Mr RAMSEY—It is coming right down the middle of Australia. It is very resilient.

Mr Smith—There is actually some on the Mitchell Freeway.

Mr RAMSEY—Okay. Most of the other questions I had have already been asked by people who are more eager than I am.

CHAIR—Who got in first, rather. Are there any other questions? There being none, I thank you for your evidence. As I was listening to you, I was wondering how one militates against arsonists, but I guess that is another chapter in itself. You can have all your accurate forecasts and all your plans ready and then get duped by someone else who decides to light a match. I do not know whether there is any comment you might wish to make in relation to that. It does relate to what we are doing but I am not going to invite you to comment on the royal commission in Victoria.

Mr Smith—We are doing some burning on the road verges of the Kimberley. We burnt 400 kilometres of the road verge this year as an early dry-season activity to reduce the potential for late dry-season fires to be lit off the road. We are hoping to make that a three-year project so that we can do the whole 1,200 kilometres from Broome to Kununurra.

Mr RAMSEY—How far out do you go from the verge?

Mr Smith—It depends on the pastoralist—whether he or she has established fire breaks. But, in general, it is just the couple of hundred metres adjacent to the road. In a couple of spots, we have burnt out to a couple of kilometres this year. It is a mosaic where we have burnt and unburnt pockets. Following the dry season this year, we will be analysing that to see how effective or otherwise it was.

Mr RAMSEY—So basically you get someone to run a grader cut along, a couple of hundred metres off the road, and then you light up the verge and follow it along?

Mr Smith—Ideally we get them to grade it beforehand and then we use the helicopter to set alight the road verge.

Mr RAMSEY—The helicopter lights it up? They used to do that in Vietnam!

Mr Smith—By a slightly different technique!

Mr RAMSEY—It is an interesting way of lighting fires.

Mr Smith—It is just a small capsule that is dropped out of the aircraft.

Mr RAMSEY—I had not realised that. That was just for information. Thank you.

CHAIR—Thank you very much.

[11.14 am]

DANS, Mr Peter, Director, Regional Services, Department of Environment and Conservation, Western Australia

LOO, Ms I-Lyn, Technical Specialist, Office of Climate Change, Department of Environment and Conservation, Western Australia

SNEEUWJAGT, Mr Richard, State Manager, Fire Management Services, Department of Environment and Conservation, Western Australia

CHAIR—I welcome witnesses from the Department of Environment and Conservation. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently, they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. We thank you for your submission. You are now welcome to make a brief opening statement before we proceed to questions.

Mr Dans—I will give a brief background into the Department of Environment and Conservation. There are two main streams of business. There is the environmental services stream—which includes environmental regulation, environmental protection and environmental impact assessments—and there is the parks and conservation stream of business—which includes biodiversity conservation or nature conservation, sustainable forest management and parks and visitor services. Spreading across all of that parks and conservation side of business is fire management.

DEC is a very significant land manager in Western Australia. We are directly responsible for the management of about 27 million hectares of our parks and reserves, albeit that 1.5 million of those are marine reserves. We also have management responsibility for about 89 million hectares of unallocated Crown land and unmanaged reserves in Western Australia. Our management responsibilities there relate only to the management of feral animals and weeds and also to fire preparedness—not so much fire suppression, just preparatory fire mitigation type activities.

DEC has about 2,000 employees and about 800 of those are in regional areas of Western Australia. DEC has something in the order of 45 regionally dispersed officers in Western Australia: regional, district and work centre officers. Rick, who is here on my left, will talk from the parks and conservation side of business and on our fire management responsibilities as a land manager. I-Lyn will speak on behalf of the climate change part of our environmental services side of the business.

Mr Sneeuwjagt—Thank you, Peter. I reiterate what Peter has just told you: we are fortunate in that we have a very good Bureau of Meteorology and we have a very close working relationship. I have been involved in the game for 40 years and over that time have been closely involved with the bureau. I have always been very impressed with their expertise. Today's presentation really is about making the point that they are too underresourced to provide the

sorts of services that we require for good land management and good fire management in this state. The bureau provide essential information for fire services and land management agencies involved in bushfire management, as you have just heard. The contributions made at a range of geographic and time scales include climate and seasonal outlooks, bushfire outlooks with real time relevance, daily weather forecasts and spot forecasting to meet specific needs.

We rely heavily on the fire weather forecasting for our prescribed burning program. You might have already heard that our prescribed burning program probably leads the nation, if not the world, in that in the south-west forest, where there is a high density of people and high value at risk, we undertake prescribed burning at around eight per cent of our landscape. We have been doing that for at least 40 years. In the last four years there has been a decline in the level of burning, but it is still targeted at about eight per cent. Despite the very extreme fire weather conditions that we in this state have every year, we have managed to restrict the number of large fires to very small numbers, we have had no loss of life from forest fires and we have had very few house losses as well, even with our very long droughts. That is largely to do with our prescribed burning program, which relies heavily on very accurate forecasts—not just for the short term but also for the long term.

One of the things that we find is that there are now better models available to give more high resolution forecasts. Having that data and that information requires a fair bit of interpretation, and our colleagues at the bureau have indicated to us that they do not currently have the ability to provide that enhanced interpretation. We collectively believe that the best way to do that is to have a bureau expert based with DEC during the bushfire season along similar lines as have been occurring in Victoria. That bureau expert would help not only DEC with its prescribed burning and wildfire work but also the FESA and the local government.

We have been advised that the bureau is having difficulties in maintaining the existing weather-forecasting services that it already provides to DEC. It provides a high-resolution forecasting service already. We have about 10 areas in the south-west, where we get 7.45, 10 o'clock and four o'clock forecasts at high detail. These forecasts are required not only for us to effectively undertake prescribed burning safely but also for the management of the smoke. We have managed to keep prescribed burning going in WA because we have been able to manage smoke from impacting on high-density areas to a reasonably successful level. Occasionally we get it wrong, and the bureau and we sometimes have arguments about that. It is often the case that we have had to make an interpretation of the bureau forecast, and we occasionally get that wrong. I believe that there are models out there now that can improve that even further, and we would be seeking further resourcing for that to occur.

The bureau, as you no doubt know, plays a key role in research through the Centre of Australian Weather and Climate Research and through institutions such as the cooperative research centres. The bureau is a very active and valuable contributor to the bushfire CRC and contributes to a number of projects on fire weather, grass curing and smoke management that are of considerable interest to land managers and fire authorities. We believe that the bureau needs to be adequately resourced to maintain this important research role.

It was mentioned this morning that the bureau currently has limited capacity to provide for and deliver fire weather training programs. That is becoming even more important, given the complexity of some of the outputs that are now coming out. There was in the past a capacity to

do that, but in recent years the bureau has found it difficult to provide that service and we have had to go to external providers to get it. We believe the bureau is actually the best organisation to provide that forecast. I understand that there is also insufficient internal training capacity for the bureau forecasters.

This state is large, diverse, vast and sparsely populated, as you have already heard. The bureau plays a key role in providing and maintaining the existing network of weather observation sites. The current observation network is fundamentally inadequate for existing requirements and leaves a number of communities and large areas of remote Western Australia with no detailed forecasting capacity. We believe that the bureau needs to be adequately funded not only to expand the current AWS network but also to maintain the system. It is the maintenance side of it which I think they find difficult to resource, even for the existing ones.

We have a large number of fires that we have to deal with throughout the state, and many of those are the result of lightning. There is no shared lightning detection network in Western Australia. DEC believes that the bureau should be resourced to provide a lightning detection network and a public map of the data for use by emergency services and land managers, both public and private. We also request that the bureau be funded and resourced to provide more frequent radiosonde balloon flights to improve the frequency of sampling low-level winds and air moisture for bushfire weather forecasting. We need this even in the south-west area. Currently the only radiosondes are in Perth and Albany. We believe that additional facilities should be at Bunbury and Manjimup, or both.

The other area that we believe is needed is for the bureau's radar coverage in WA to be increased and improved to include the Doppler capacity that can monitor wind changes and boundaries. Large sections of the state are not covered at this stage. Lastly, DEC would also support an increase in the number of weather datum buoys to assist in the provision of forecasts for its marine park operations and its coastal areas, as well as for climate change modelling. Thank you very much.

Ms Loo—I would like to make a really short statement on the importance of climate projections for climate change adaptation policies. From our perspective, we are talking about much longer term meteorological forecasting here—forecasting to 2030 or 2070. The first step in this whole process would be the detection and attribution, which links the observed changes in the past and current climates to the changes in the large-scale circulation that drives the climate. More knowledge in the detection and attribution would improve the accuracy and certainty of climate projections, which are generally just outputs of climate models. In improving the accuracy and certainty of the climate projections, you will get a better understanding of the climate change impacts and of the vulnerability of the society, the economy and the environment to the impacts of climate change, which in turn builds better adaptation policies. Improving the climate projections will provide a more compelling case for government investments into subadaptation policies.

Our main interaction with the Bureau of Meteorology and CSIRO is through the Indian Ocean Climate Initiative, IOC. The WA state government has provided \$4 million in investment, which is matched in kind by the Bureau of Meteorology and CSIRO. Basically, it is a core climate science research agreement which focuses on the first two steps that I mentioned previously—the detection and attribution of climate change and providing climate change projections for WA.

CHAIR—We have obviously discussed the bureau today extensively in looking at areas where there are perhaps some shortcomings and so forth. Similarly, you have drawn to our attention some of those areas. You referred to using external providers in the absence of being able to get information from the bureau. Do you mind telling me who those external providers are and how frequently you need to resort to them?

Mr Sneeuwjagt—I was referring to the training program, where we used ex-bureau staff who have now retired or gone private. Obviously, we had to pay for that service—that is understood—because the capacity to do that within the bureau at the time was limited. That is where we have gone, and we believe that we need to look at all opportunities, all sources of information. There are also external weather forecasting systems that farmers use. My understanding is that they use bureau data but they then interpret it themselves.

CHAIR—I do not have a view about that; I just want to explore it. Is it right to say that there is probably a developing industry of private providers who are providing information in relation to the weather that might be running parallel to what the bureau is doing?

Mr Sneeuwjagt—I think that would be the case. I am not really an expert on that. I would think that there is an increasing demand for better information—there always will be as we get more sophisticated in life and we have greater impacts of weather on our way of living. If the bureau is not in a position to be able to provide that more detailed information, you would have to expect that the market will be looking for external providers.

CHAIR—You could say that this whole business of weather forecasting is most unpredictable, and that would be an understatement. If that is happening, do you foresee the possibility of inconsistencies, contradictions and vast differences of opinion from people about weather forecasting, which would then leave people like farmers, and everybody else, to either follow gut feelings or lose confidence? So much is reliant on these weather forecasts. I am looking at a landscape where a market may develop that sells information that could perhaps run contrary to what a government owned body is doing and looking at whether there are any concerns there or whether it indeed complements and extends the quality of the material available.

Mr Sneeuwjagt—I imagine there is always the potential for that sort of conflict where there are interpretation differences. If they use the same base modelling and data, that is less likely to be a significant difference, but I am sure there is some risk. When we get information on, for example, smoke trajectory, it is based on weather models. There are a number of different weather models.

It requires some interpretation by individuals as to which model is the one that is going to give us the best answer. I am sure there are some external people who are very expert at that. I tend to put more faith in the bureau. They are more likely to be up to date with it. We used to have an external provider for our fire weather forecasting many years ago. We have gone back to the bureau and found that their service is superior to the private sector—they were charging us more and that was the other thing. The point is that the bureau does have the most recent and best models. From our point of view, we are relying more on them. It may be that in the future if the bureau cannot provide a certain service, external providers will be able to provide it for us. We will keep our options open.

Dr JENSEN—My first question is in relation to prescribed burning. You said eight per cent of the area has prescribed burning and you talked about the issues in relation to smoke modelling. Is smoke the reason that you have had a decrease in the amount of area that you burn off on an annual basis? I think the science indicates that you really need to be burning off somewhere around 12 per cent per annum to keep the fuel load low.

Mr Sneeuwjagt—Yes, or if you are dealing with a very controversial issue. There are a number of reasons we have reduced prescribed burning over the years. Smoke management is obviously one of them. What has been happening since about 1973—and my colleagues behind me would be able to confirm this—is that we have had a drying trend in the south-west. That has narrowed the window of opportunity for safe and effective burning. We do spring and autumn season burning. Our spring season often gets cut short because of a very dry winter and the logs have not saturated. Fire behaviour in what is normally a mild time of year can be quite erratic and therefore we have had to restrict the number of days burning. That has been probably the major reason we have reduced burning. For example, last year we had a wet spring and that affected our burning in the south-west. Then from about early December through to late May there was not a drop of rain, so, again, we could not start.

We normally do our autumn burning after the first opening autumn rains. In the northern part of the forests, we were not able to burn until late May, early June. That probably has been the most significant impact over the last 30 years. But smoke management is definitely a restriction. What has happened now is that we have opened other opportunities for burning under more risky winds. Our safer winds are the south-easterly winds. We are in the unfortunate situation in that Perth is to the north-west of the forests, so the south-east winds would be the worst ones from a smoke perspective. We have had to go with the winds that occur later in the cycle. When things are a bit drier, it is slightly more risky but at least the smoke burns away. We have had to adapt.

Dr JENSEN—Would increased resources enable you to burn off more areas?

Mr Sneeuwjagt—We have argued for that and successfully been able to get additional resources from government for more seasonal burns. This information for seasonal weather forecasting is extremely important for us. It allows us to know whether we should be hiring people earlier, hanging on to them longer, hiring more people or acquiring more machinery. Two or three years ago we were looking at a very bad fire season. We went to the minister and the minister agreed it looked like a very bad year and he allowed us to increase our resourcing for more equipment and more people.

Dr JENSEN—What sort of accuracy do you require for lightning detection? I am certainly aware of a system for lightning detection throughout Australia. What accuracy in terms of area do you require for lightning detection?

Mr Sneeuwjagt—The use of this information allows us to know where we should be putting our detection system. We have probably one of the most advanced detection systems in Australia. We own nine of our own aircraft for surveillance. We have towers as well. If we know that there is going to be a lightning belt or a lightning blow somewhere then we immediately put our aircraft up to pick up those strikes. We need good information about lightning occurrence and the likelihood of positive lightning strikes. You can get a lot of strikes but it does not necessarily lead to a fire. So we need information about not only the strikes but also the rainfall

associated with it. That is the accuracy that is required to allow us to quickly detect a fire. As you well know, the sooner you can detect it, the more likely you are to put the fire out.

Dr JENSEN—My final question is to Ms Loo. You were talking about climate change projections out to 2030 and 2070. At what stage do you anticipate using in any way, shape or form these climate projections given that certainly in the last 10 years the Intergovernmental Panel on Climate Change's projections have been pretty lousy. They have projected increases in temperature this century; what we have seen is decreases. They have projected increases in ocean temperatures. Certainly since 2003, when the Argo buoy network was deployed, if anything there have been measured decreases in ocean temperature as well. So at what stage do you start trusting those projections and actually using them, and in what way would you be using that data?

Ms Loo—We have to acknowledge that there are definitely uncertainties in the climate projections up to 2030 and 2070. But the climate is changing, so in developing adaptation policies we have to use the best available information that we have. Currently the best available information that we have is through the Indian Ocean Climate Initiative, IOCI. Currently it is at stage three. Stage two has provided what we call downscaled information. It provides higher resolution projections for rainfall and temperature across south-west WA. I understand that has been used in flood plain management, the investigation of climate change impacts on health and water resource management. That is also the reason why the IOCI research program focuses on the detection and attribution of the climate systems rather than just spouting climate projections. We need to first understand what is driving the change in climate. To understand that, we have to provide long-term observation and do more research into the large-scale drivers—for example, El Nino, the subtropical jets or the low-pressure systems that bring the rains to WA. Improving our understanding of those drivers would help improve our climate projections.

Mr SYMON—I would like to go back to the question of training. It came up in the last round of witnesses as well. I take it that once upon a time the Bureau of Meteorology did have sufficient capacity to train outsiders in the interpretation of the data that is provided so that they knew how to do their jobs. From what we have heard this morning, it appears to me that that has slowly been eroded over a period of time. What size are we looking at? How many people would be needed to perform those functions so that your employees are competent in dealing with the information that is presented to them?

Mr Sneeuwjagt—I need to speak beyond just DEC. Obviously DEC has a very high demand. We probably have a need for more refined and detailed information than the average landowner, given our prescribed burning programs and our wild fire suppression responsibility, but of course there are a lot of brigades. We have 122 local governments that have responsibility for fire management. We have FESA. I would be surprised if you could do this with fewer than two people—maybe one full time and another with assistance from existing staff. Those are the sorts of numbers off the top of my head I would be thinking about. They are the sort of numbers that were there 20 years ago, I think. There are aviation weather requirements as well. I do believe that if we can have two dedicated trainers in the bureau that would meet the need. The minimum would be at least one full-time dedicated person with assistance from other staff.

Mr SYMON—What is the current number?

Mr Sneeuwjagt—I am sure there is some training capacity in the bureau but certainly we do not have access to that. That is not meant as a criticism, we have just recognised that and that is why we have gone outside. I would say that the current capacity would be well and truly below one dedicated. I am sure my colleagues would be able to correct that.

Mr SYMON—The bureau has been getting more funding but it would seem to be for specific projects more so than expanding, in many cases, on the work that they have already done. When you talk about one or two people in terms of an agency the size of the bureau, that is not a very big component. It is certainly something we will take on board as a committee.

Mr Sneeuwjagt—I am not talking about the whole bureau, I am talking about WA.

Mr SYMON—Yes, of course. Each state would also need people in that same position but again compared to the size of the bureau's budget what you are talking about is not a big item. They all have to be added up, of course.

Mr Sneeuwjagt—It is not just about numbers; it is about expertise. It is the same argument I have with people saying that we need more fire controllers. It takes 15 years to become a good fire controller, so it is not just getting another graduate to become the trainer. It really has to be one of your experienced people that provides that service. That may be one of the issues where the bureau would be similar to my situation where I have a gap in the middle-level leaders for tomorrow. I am finding it difficult to engage those people and I think a lot of services are suffering the same fate.

Mr SYMON—I think it is a very valid point to raise. There is no point providing more and more information if at the other end, where people are expected to understand and use that information, there is just not sufficient training so that they can. It is all very well to say, 'Yes, we have provided this much.' But if it does not mean that much to the end-user then what have we provided?

Mr Sneeuwjagt—That is a very valid point. We have had to develop our own skills and we have a couple of people who are very good at it but nowhere near what we need. We have had to fill the gap a bit. These are life and death type decisions that we have to make about fire and we are currently going to be facing a coronial because of one of those issues. We are talking about a very serious matter here. It is not just a nice to have. This is totally essential, critical for the safety of the community and for our own firefighters.

Mr SYMON—One more question on a totally different subject and that is the current observation network which we also touched on previously this morning. You mentioned that it is fundamentally inadequate for existing requirements and leaves a number of communities and large areas of remote WA with no detailed forecasting capacity. Do you have any views on how big the expansion would need to be?

Mr Sneeuwjagt—First of all, the south-west is reasonably well served. We have funded a number of our own. The bureau has been very supportive of that. The problem for the bureau is if we keep buying these things they still have to be maintained, calibrated and serviced et cetera and I believe their resourcing for that has decreased over time. The south-west is reasonably good. We still think there are some gaps but the rest of the state is, as we heard earlier, quite

poorly served. We believe that this ought to be a partnership. As a land management agency we have significant responsibility for conservation. Even if there are no communities nearby, we need to know about the. We believe that there ought to be partnership whereby we can provide some of the purchasing and we have been able to get some funding through the Clever Networks program from the Commonwealth government. But again buying that is one thing, establishing and maintaining it, which is not something that we can do, would be the other.

Mr SYMON—So it comes back to being a budget item.

Mr Sneeuwjagt—Exactly.

Mr RAMSEY—I come back to the Indian Ocean Climate Initiative which you seem to be speaking about. You told me what some of the outcomes have been. What is that actually doing? Is it going back and reinterpreting raw data that is coming out of Bureau of Met systems or is there some new science going on there that you people are uncovering? Can you take me through that?

Ms Loo—Do you want to know what the IOCI is doing?

Mr RAMSEY—Are you doing something new or are you just looking at bureau stuff, reinterpreting it and saying, ‘This is what we should do as a result of this information?’ Is this a tertiary product or is this a primary product, I guess is what I am asking?

Ms Loo—I guess there are a few parts to the Indian Ocean Climate Initiative stage 3. The first is the detection and distribution of the weather systems. Part of that is to increase the coverage of our high-quality data sets. This is slightly different from increasing the observation network. From the point of view of climate change, putting in one new weather observing station does not really do much for us at the moment. What we need is long-term observation data that looks back to 1910 or something like that. One part of IOCI is to look at all the data from the current available weather stations and identify those stations with the capacity to be high-quality data stations and go through a quality control process to come up with a high-quality data set that looks back through time to 1910, for example.

Mr RAMSEY—Is the project looking at information we already have and reanalysing it?

Ms Loo—Yes, that is one part of it.

Mr RAMSEY—The bureau believe we have gone as far as we can with a lot of the statistical models and they think the future is in dynamic weather modelling systems, which will be far less historical in that sense. What has really added to our knowledge of the weather sciences or will we just be coming up with a different information package at the end of it?

Ms Loo—Part of the IOCI looks at the dynamic down-scaling of the weather systems for climate projections. There is the detection project, which includes improving the high-quality data sets, and we also have climate projections, which include statistical and dynamic down-scaling of information. We have projects looking into extreme weather information. The fourth theme is to interpret the scientific findings from the IOC to ensure that it is understood by officers who are developing the adaptation policies.

Mr RAMSEY—In regard to the ability to understand the complexity of the information you are getting from the bureau, you are saying that you need people to analyse what the raw data means. In this day and age, I would have thought that someone would have written a computer program that presents the raw data and expresses what it means for, say, Esperance today—for example, the wind shift will be coming at four o'clock in the afternoon and it will be coming from the south, and the relative humidity will be such and such. These are all the things you need in bushfire fighting. I would have thought that information would be generated by a program that takes the raw data from the bureau that you find difficult to understand and turns it into something useful.

Mr Sneeuwjagt—I am sure that that sort of information can be provided, but weather forecasting is all about probability that says if this happens then this is the consequence. We need to have that discussion. We need to have that verbal presentation that will give us confidence as to what is likely to happen. Reading lots of complex maps is not something many fire or land managers are very good at or have the time for. They need something that will bring all the information together without having to go through lots of maps to do it. I am sure that in today's world with our magnificent computer capacities we probably could develop those sorts of things, but I am not sure that that is the product that is going to make a difference.

Mr RAMSEY—It is interesting that you should mention the maps because a witness appearing in Adelaide tomorrow who I have spoken to already says that somebody else has a program that is generating maps using the bureau's raw data which I, as a CFS volunteer, find a lot easier to read than the ones we are currently using. They just look so simple on a piece of paper and you think, 'Yeah, that makes a lot more sense.' So I hope that adds something tomorrow to the sum of our knowledge.

CHAIR—There being no further questions or comments, I thank you very much for your evidence today.

Resolved (on motion by **Mr Symon**, seconded by **Mr Ramsey**):

That this committee authorises publication of the evidence given before it at public hearing this day.

Committee adjourned at 11.50 am