



COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

SENATE

ENVIRONMENT AND COMMUNICATIONS REFERENCES
COMMITTEE

Extreme weather events

THURSDAY, 11 APRIL 2013

CANBERRA

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SENATE

ENVIRONMENT AND COMMUNICATIONS REFERENCES COMMITTEE

Thursday, 11 April 2013

Members in attendance: Senators Birmingham, Cameron, Milne.

Terms of Reference for the Inquiry:

To inquire into and report on:

- (a) recent trends on the frequency of extreme weather events, including but not limited to drought, bushfires, heatwaves, floods and storm surges;
- (b) based on global warming scenarios outlined by the Intergovernmental Panel on Climate Change and the Commonwealth Scientific and Industrial Research Organisation of 1 to 5 degrees by 2070:
 - (i) projections on the frequency of extreme weather events, including but not limited to drought, bushfires, heatwaves, floods and storm surges,
 - (ii) the costs of extreme weather events and impacts on natural ecosystems, social and economic infrastructure and human health, and
 - (iii) the availability and affordability of private insurance, impacts on availability and affordability under different global warming scenarios, and regional social and economic impacts;
- (c) an assessment of the preparedness of key sectors for extreme weather events, including major infrastructure (electricity, water, transport, telecommunications), health, construction and property, and agriculture and forestry;
- (d) an assessment of the preparedness and the adequacy of resources in the emergency services sector to prevent and respond to extreme weather events;
- (e) the current roles and effectiveness of the division of responsibilities between different levels of government (federal, state and local) to manage extreme weather events;
- (f) progress in developing effective national coordination of climate change response and risk management, including legislative and regulatory reform, standards and codes, taxation arrangements and economic instruments;
- (g) any gaps in Australia's Climate Change Adaptation Framework and the steps required for effective national coordination of climate change response and risk management; and
- (h) any related matter.

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BERESFORD-WYLIE, Mr Adrian, Chief Executive, Australian Local Government Association**Committee met at 08:46**

CHAIR (Senator Birmingham): Good morning everyone. I declare open this public hearing of the Senate Environment and Communications References Committee in relation to its inquiry into the recent trends and preparedness for extreme weather events. The committee's proceedings today will follow the program as circulated. These are public proceedings. The committee may also agree to a request to have evidence heard in camera or may determine that certain evidence should be heard in camera.

I remind all witnesses that, in giving evidence to the committee, they are protected by parliamentary privilege. It is unlawful for anyone to threaten or disadvantage a witness on account of evidence given to a committee, and such action may be treated by the Senate as a contempt. It is also a contempt to give false or misleading evidence to the committee. If a witness objects to answering a question, the witness should state the ground upon which the objection is to be taken, and the committee will determine whether it will insist on an answer, having regard to the ground which is claimed. If the committee determines to insist on an answer, a witness may request that the answer be given in camera. Such a request may of course be made at any other time.

Welcome. Thank you very much for taking the time to talk to us today. The committee does not have a submission from the ALGA. If you have any documents you wish to table, feel free to do so. Otherwise, would you care to make a brief opening statement?

Mr Beresford-Wylie: Thank you. I will make a brief opening statement. You are quite correct that we do not have a submission to this inquiry. In fact, I think from memory that this inquiry occurred very early in the year—in January—and we were engaged in an intensive amount of activity around the constitutional recognition of local government, which swallowed up most of our time in the last few weeks of December and first few weeks of January. But I am happy to come along, have a conversation and answer questions this morning on what is an important issue for local government. I see in the submissions that a number of councils have made submissions, as have two state associations. The Australian Local Government Association is a federation of state and territory associations. They are my members. I think you have received submissions at least from the Local Government Association of Queensland and the Western Australian Local Government Association.

I come today to talk about two specific issues, not so much about the recent trends in extreme weather events. I see you have a lot of witnesses appearing today who will talk about climate change science, but this is more about preparing for it and the impact of those extreme weather events. To us this seems to touch upon two separate issues of policy in which the Australian Local Government Association has an interest. The first is climate change and climate change adaptation, and the second is natural disaster risk which we see flowing from those extreme weather events.

On the first issue of climate change adaptation there are a couple of points I want to make, and these relate in part to a dialogue we had with the Productivity Commission on barriers to climate change adaptation over the course of the last year or so. There are issues that have emerged in some of the state and territory council submissions. The first one is a need for data at a local level. One of the things that has emerged in our dialogue with councils on climate change issues over the past few years is their desire for greater data at a local level which enables them to make more informed decisions. In 2010, we ran a workshop for about 140 people from around councils and state associations. They talked about climate change and the issues they wanted to see addressed as part of our policy approach to that. One of the issues they put forward strongly was the need for greater localised data—data on the likely impact from changes in weather but also data on things related to what the impact of those changes might be, and that included, for instance, some coastal mapping. Australia's population lives along the coast.

There are some particular issues in Queensland and a variety of other states, and councils are very keen to see a consistent national approach to coastal mapping. The coastal geomorphology really does impact on how extreme weather events—ocean surges—impact on local communities. There had been coastal mapping done, but often it was done by councils themselves in a relatively ad hoc way, and there was a recognition of a need for greater consistency there. Having said that, there was also an understanding that there were some limitations on the organisations which provided that data. Geoscience Australia and the Bureau of Meteorology were facing a balance between managing to achieve as much information as they could at a local level, the simple cost of trying to gather that information and whether there was a significant difference between two connected local areas or regional information was a more valuable source. But that need for data is something that came out very clearly, and I need to put it on the table here.

The second issue which really concerned councils—climate change adaptation—is a serious issue which we have taken forward in the ministerial Select Council on Climate Change. That relates to local government liability, in particular liability stemming from planning decisions. There has been quite a bit of work done on this. The Australian Local Government Association, in partnership with the Department of Climate Change and Energy Efficiency, commissioned Baker & McKenzie to prepare a report in 2011 called *Local council risk of liability in the face of climate change—resolving uncertainties*. It is a good report. I commend it to the committee. It looked particularly at the need to limit liability of councils and looked at the model that applies in New South Wales, where councils, when they engage in planning activities, providing advice and acting or not acting in good faith based on the available information, have an exemption from legal liability provided for councils. The report recommended that that be looked at as a model for other jurisdictions. The Australian Local Government Association has been pursuing that with the federal government and in that ministerial council, which has just wound up. The other thing that that report indicated was that there were a lot of councils that did not have the capacity to make those decisions themselves in an informed way. They lacked information. So the report suggested that potentially there would be value in looking at some sort of centralised advisory authority which could collect and disseminate information and provide assistance and input to aid councils when they assessed risks, including advice on the appropriateness of particular developments and conditions which might be included in development approvals. I think that is a recognition of the intersection between liability and the need for information and data which is difficult for some councils with small capacities to gather so that they are able to make an informed decision.

Let me now move on briefly to the issue of disasters and disaster impacts. The issue of global warming and climate change is not one that has been around for a short period of time. There was a report prepared in 2002 for the Council of Australian Governments called *Natural disasters in Australia: Reforming mitigation, relief and recovery arrangements* which emphasised the likelihood that there would be a greater severity of natural disasters from more severe weather and climate events and an increasing frequency of those events. The direct consequence of this was that the government decided to place a greater emphasis on disaster mitigation. The Commonwealth government saw that it was in its own interest to do so to really avoid the likely financial exposure under what was then called the Natural Disaster Relief Arrangements and which is now called the Natural Disaster Relief and Recovery Arrangements, where the Commonwealth provides that financial safety net for jurisdictions that are exposed to significant impact from natural disasters. That includes local governments. So the decision was made to try to improve upfront investment in mitigation which would, in part, obviously, ameliorate the impact on communities but which would also be to the financial benefit of the Commonwealth. There was reform at that stage to the disaster mitigation programs that existed.

But, from our perspective, we see that there appears to have been a lessening in a focus on actual mitigation projects at the local level over the last few years—and one of the things we want to emphasise is the important role that disaster mitigation on the ground plays, particularly in the area of flood mitigation. Australia has a type of flood, particularly in Queensland and western New South Wales, which does benefit from the implementation of disaster mitigation measures such as retention ponds or levies—we have slow-moving floods—and studies have shown that there are significant cost-benefit ratios from investment in those disaster mitigation measures. So one of the things that we are calling for a greater focus on is those mitigation measures. And, naturally, as an advocacy body, we have a budget submission and we will be producing an election document which calls for focus on a greater emphasis from the Commonwealth on mitigation.

We would like to see a return to the partnership that existed between the Commonwealth, the states and local government, where every \$2 the Commonwealth put in was matched by \$2 from the states and \$1 from local government. The reforms a decade ago led to a \$1-\$1-\$1 partnership, and our experience in recent years has been that local governments are struggling to meet the amount of money they require for mitigation. We do not want to see a situation where mitigation does not occur in local communities because of a limitation for councils, when clearly there is a significant benefit for local communities—as well as states and the Commonwealth—from such investments.

There are two other points to make about the natural disaster relief arrangements which are emerging and are in some of the documents and submissions you have before you. One is the issue of the use of day labour for recovery by local councils, which is particularly an issue in Queensland. One of the things the Natural Disaster Relief and Recovery Arrangements is aimed at ensuring is that, when there are recovery activities, the expectation is that when businesses and organisations—councils included—engage in those recovery activities, if they have their existing staff in place then those staff will be devoted towards the recovery activity since they are not able to undertake day-to-day activities. We can understand when it is a small business. But that is a difficult challenge for councils in places like western New South Wales and Queensland where, if they suffer significant damage, most

of the council workforce that is available has to be diverted towards restoring those assets. That does not mean to say that the normal work of a council workforce does not and cannot go on, but that that is a priority. The difficulty is the NDRRA does not permit the use of that day labour. It works on the assumption that if there is an additional task then there will be contract labour brought in—and, quite frankly, contract labour really is not available in these remote areas, or it is extremely expensive. The fiscal benefits of using day labour in Queensland in cyclone Yasi were shown to be significant, reducing the cost by about a half over what the cost would have been had contract labour had to be used. So we want to emphasise the importance of allowing a degree of flexibility there, by letting day labour be used to address the recovery stages for local government operations—simply to save money: it makes good sense in value-for-money terms.

The final point I want to make is about the issue of betterment, which is included in the Natural Disaster Relief and Recovery Arrangements. That is the idea that, if a piece of infrastructure is destroyed, the original disaster relief arrangements allowed funding to restore it to its pre-existing state before the disaster struck. The difficulty then is that we have had a lot of experience in recent times of frequent disasters striking and damaging the same piece of infrastructure repeatedly. The relief arrangements do provide for betterment, which is to rebuild that infrastructure to a better standard. Even though there have been changes to the betterment clauses contained in the disaster relief arrangements, it is still difficult to address the challenge facing local government infrastructure—and it is an area we will be focusing on to seek some more flexibility and a better deal to ensure we do not continue to have repeat damaging of infrastructure at the local level.

I have skated across the surface—I apologise for that—and I am sorry we did not have a submission. I am happy to answer any questions that I am able to, although, as I said, I am not hear to comment on climate science, since that is not our area of expertise.

CHAIR: Thank you very much, Mr Beresford-Wylie, and thank you for the thorough opening statement that canvassed a number of key issues there. Senator Milne.

Senator MILNE: Thank you, Chair. My whole issue with local government is that local government has overwhelming responsibility for land-use planning and that local government has been giving planning permission for people to build in areas of vulnerability for a long time. The climate science has been out there for a long time and there is plenty of evidence. I acknowledge that getting it down to detail at the local level has been difficult for local government and has only really started happening in recent times, but nevertheless the issue is there. My concern about this is that, if local government keep on giving planning permission for people to build in vulnerable areas for storm surge, on flood plains and whatever, and then they do not get insurance because the insurance industry is now pricing premiums equivalent to risk and the insurance industry knows full well what the risk is, and people's places get wiped out by fire, flood or whatever else, they will then sue local government—which is why you have raised the issue of liability. But, if we go down the track of a 'get out of jail free card' for local government by giving them limited liability, that means that local government will continue to make very poor planning decisions. So I want you to tell me why we should give local government a get out of jail free card rather than require them to actually take the precautionary principle in land-use planning and seriously change the way they think about giving planning permission.

Mr Beresford-Wylie: It is an important question, and I will do my best to answer it, because it actually raises quite a series of complex issues.

Senator MILNE: Yes, I know—but that is the crux of it.

Mr Beresford-Wylie: That's right: it is not just about the data that is available at a local level; it is also about state planning laws interact with local government laws and the capacity of local government to make decisions. I am thinking, for instance, of the Western Australian situation, where Western Australian law sets out the sorts of things that local government needs to take account of when it makes planning decisions. It sets certain figures in there relating to expected sea level rises. I am aware there has been quite a lot of debate over the last few years about the fact that local councils need to take account of those state laws and the fact that those state laws have been slow to be amended in the face of changing climate data. The reality is that councils will often have to make decisions based on what they are able to take into account, in certain terms—and they are taken to courts, in some cases, for making decisions which are not to proceed with approvals, and there have been instances where decisions not to proceed with approvals have been reversed.

I think councils are very well aware of the instances you are raising, Senator. I would put to you that I am proposing the discussion around what occurs in New South Wales, and applying that to the states, really needs to be taken into account against the context of an interaction between the state and local governments which effectively deals with what local governments are required to take into account when they make planning decisions, giving them the amount of information they need and an expectation that they will reach rational

decisions. I would say there is a change in the way councils approach these issues. I think they are fully aware of the fact that they do not want to unnecessarily expose individuals to risks around the planning decisions that they take. I do not think they are looking for a get out of jail free card; they are looking to make decisions in good faith based on the information that is available to them, to ensure that it is the right planning decision.

Senator MILNE: You have highlighted something important: the interaction between local and state government on planning laws. For example, in Queensland I understand there was a law which restricted development on vulnerable coastal plains and that that was overturned by the state Premier. So that clearly is an issue. And in Western Australia I understand there have been areas exempted from the sea level rise provisions because they are areas of economic development—but, when they are wiped out, who is going to pay? The Commonwealth will be approached. What role has the Commonwealth, if any, in trying to get better consistency between state and local land use planning provisions so that we reduce (a) this level of vulnerability in people's lives and infrastructure and (b) the long-term costs associated with liability?

Mr Beresford-Wylie: The only proposal I would have in that area is a broad proposal but it may not be specifically helpful—that is, one of the unusual and maybe unintended consequences of the changes over the last couple of years to our COAG ministerial structure was actually the elimination of the Local Government and Planning Ministers' Council, which came together to address issues such as the one you have talked about there. In fact, on its last meeting one of the issues it was considering was climate change adaptation and planning matters, but then it ceased to exist. It is actually an issue that has come up in a couple of contexts. It has come up, I am aware, in the context of the lack of this reference body for planning between jurisdictions, between the Commonwealth and local government in these jurisdictions. It has come up on a couple of occasions, not least because it has come up in the context of the emergency management ministers, who have talked about where these issues can go to be resolved. One of the things that we will be putting forward in our election document is a call for the return to that forum which allows a discussion of issues around planning, particularly around things like natural disaster and climate change planning.

Senator MILNE: That is my frustration too. There is no way to resolve this and that is why I was asking. In regard to the National Climate Change Adaptation Research Facility, my understanding is that local government was quite grateful for the work that that facility was doing because it was actually the body capable of localising climate models and giving local government advice as to vulnerability, scenario planning and that sort of thing. As you would be aware, it is about to be defunded. I am after a frank appraisal from the local government perspective on this. Can you give me your perception of the engagement of local government with NCCARF? Now that it is to be defunded, what is the likely consequence of that? Are local governments going to make poor or poorer decisions because of its absence?

Mr Beresford-Wylie: In a sense, I cannot give you that much of a blunt appraisal. One of the benefits I have is that I have a broad policy perspective. I am aware that a lot of individual councils have interaction with NCCARF and so do our state and territory associations. They are probably best placed to make a comment on what will develop or what they perceive will be a gap should NCCARF disappear. It has a very high profile in the area and it certainly produces a lot of information which I would be confident is used by a large number of councils, but I could not give you a blunt assessment about the impact for individual councils or councils as a whole. I have not seen one. I am happy to go back and ask my state associations and see what information I can find out. I am happy to take that on board.

Senator MILNE: That is where I was going, Chair. If that is not going to create too much trouble, it would be very useful because it is my view that we need to continue that research facility.

Mr Beresford-Wylie: I am happy to do that and sound out the sector as far as I am able, and provide you with some written advice.

Senator MILNE: Thank you.

Senator CAMERON: I have been looking at your budget submission that you mentioned and in that you say you have a number of strategic priorities. One of the strategic priorities is strengthening community resilience and a capacity to deal with natural disasters. Do you have a business plan type document that you advise local governments on? If this is one of your strategic issues, what have you done about it?

Mr Beresford-Wylie: There I am talking about our advocacy with the Australian government in taking forward issues that are identified state associations. We put that emphasis there on natural disaster mitigation and also on the provision of information. We do obviously participate in that intergovernment structure which is the Ministerial Council for Police and Emergency Management, which has a focus on trying to strengthen an engagement with local government through the provision of things such as information hubs where individual

councils can go and determine how they might improve their planning for natural disasters. In terms of the advocacy we have there, we put forward broad policy proposals and then have an engagement with the government of the day or the opposition on how they might be fleshed out and developed.

A business plan? No, I can truthfully say we do not have a business plan for a proposition. In terms of the disaster mitigation suggestion there for additional funding, I think the case for disaster mitigation is already proven. I note that the government, in fact, was very responsive when the Prime Minister announced additional mitigation funding about a month ago, I think, for surrounding works on Warragamba Dam and an additional \$50 million for mitigation. I think that that indicates the government is responsive to the need to meet those challenges we are identifying.

Senator CAMERON: We have new staff at Warragamba Dam?

Mr Beresford-Wylie: I cannot exactly say. I have not seen the detail of what exactly is going to be required there, although the **Senator CAMERON:** When you say local people, do you mean the local council?

Mr Beresford-Wylie: Yes. If you talk the Hawkesbury council, they have—

Senator CAMERON: You understand that that has been a very contested position on the local council, don't you?

Mr Beresford-Wylie: Yes. I am cautious to buy into—

Senator CAMERON: Maybe you should not have mentioned Warragamba Dam.

Mr Beresford-Wylie: Indeed. I just had to mention that because of course that was put on the table by the government.

Senator CAMERON: Yes, I know.

Mr Beresford-Wylie: But the other \$50 million for other mitigation measures holds out some hope.

Senator CAMERON: So it is one of your strategic priorities, as you put to the government in your budget submission, but you basically only have broad policy propositions. Is that a weakness in the local government approach to this? Should you not be doing more?

Mr Beresford-Wylie: There is a limit of course to what, and let me be blunt, I can do with a very small organisation, which is lean and mean with only 12 people. So that presents a challenge. In regard to working up a business plan, the reality is that disaster mitigation and addressing disasters really requires a partnership between the three levels of government. One of the issues that often comes up is the debate around roles and responsibilities between the three levels of government, but the reality is it is supposed to be an integrated partnership between the three levels of government. For us to engage in a detailed business case to tell, in a sense, the federal government and the state governments about what they could do in disaster mitigation is a little presumptuous and would not necessarily go anywhere. I appreciate your comment, Senator, about the need to ensure that we provide the detailed information that governments look for. Usually we engage in a dialogue with government when they seek advice from us about propositions.

Senator CAMERON: Within your budget submission, you seek \$70 million—\$50 million over five years for a dedicated program for disaster mitigation and \$20 million over four years to develop the data initiative and boost local governments' capacity. It is not so much a business plan but an emergency response plan. I do not know what you would call it. It does not really matter; it is about having some kind of plan to deal with disasters other than—

Mr Beresford-Wylie: There are a couple of things we could talk about there. First of all on that preparedness issue, one of the important things about the provision of funding to assist communities from the resilience program, in a sense, that exists at the present time is its focus is on disaster mitigation but also on disaster preparedness. There are a series of components obviously that relate to disaster preparedness. Clearly there is the need to assess risk. There is the need to provide a response plan to deal with that risk and we are talking there about ameliorating the risk.

One of the things that I think was flagged in the submission from the Local Government Association of Queensland is the need for individual councils to have that disaster preparedness plan. The reality is that some of them are not as far advanced as they should be in the preparation of those plans. Some of the larger councils have designated officers, not full-time officers but officers who spend a lot of their time developing disaster response plans for their community and for their councils, which of course are sizeable institutions and are always at risk anyway of an impact from a natural disaster. For other councils, the person may be designated with that role but spend very little time on it because they are simply overwhelmed by lots of other things.

Senator CAMERON: And have very little practical, theoretical or professional knowledge.

Mr Beresford-Wylie: Correct, that is right.

Senator CAMERON: So that would maybe account for some of the decision by the Hawkesbury council—a contested decision on the council—to lift the height of Warragamba Dam without having the professional understanding of what it means?

Mr Beresford-Wylie: I do not know about that Hawkesbury issue, Senator.

Senator CAMERON: Who raised it?

Mr Beresford-Wylie: I do not know if a council would make a decision to raise the dam wall.

Senator CAMERON: They are asking federal government to raise the dam.

Mr Beresford-Wylie: That was an observation there, Senator, but I will leave that to them to defend their statement. The issue here is getting the expertise and the capacity at a local level, but importantly recognising that most disasters are not local, they are regional. They have an impact that goes beyond, usually, a number of local governments and so it is the capacity of a council to have its ability to play a role in a regional structure. One of the things that is important is a recognition that often they will work together with their state colleagues on a regional basis to address the impact of a natural disaster, which will go beyond a local government area. But there will be a need for a local government individual to play a role—to be linked into that network and to be able to identify what that individual council will be able to bring to the table in terms of preparedness and response and recovery for that natural disaster, and there is a challenge—

Senator CAMERON: I am going to have to move on. These are very long responses, I am sorry, but we really have to—are you winding me up, Chair? I am going to have put some on notice, thanks.

CHAIR: Thank you, Mr Beresford-Wylie. We appreciate your time and participation today, and if there are further questions on notice the secretariat will forward those to you promptly.

Mr Beresford-Wylie: Thank you for that and thank you for allowing me to appear.

CHAIR: Thank you very much.

DONALD, Dr Alexander David, Private capacity

[09:16]

CHAIR: Welcome, Dr Donald, and thank you very much for taking the time to speak with us today. The committee has received your submission, which is submission No. 161, as well as the addendum to your submission that has been circulated to committee members. Thank you very much for that and I assume, given that, that there are no further amendments or alterations you wish to make to your submission.

Dr Donald: One minor amendment, which I do not think I have put in there which is the emergency management unit, which I referred to as disappeared. I was advised yesterday that part of the staffing and part of the function has been transferred Retrieval Services Queensland.

CHAIR: Thank you for that. Do you wish to make a brief opening statement before we proceed to questioning?

Dr Donald: Yes, I will make a brief opening statement. In terms of outcomes, or what I think is achievable and necessary, there is a desperate need for concise, compartmentalised operational plans, developed at the national level, and presented as templates, so that we are not relying on each local hospital, in some cases with 10 or 12 staff, to develop their own. There needs to be detailed checking of the plans and checking of assumptions, and also making sure that deciding that someone else is responsible actually means that someone else has prepared their own plan. It is critical to identify vulnerable populations. As I have mentioned in the addendum, nursing homes are frequently ignored and have been a major problem in Bundaberg and during Yasi, in that no-one really had a plan to deal with them.

Communication is another critical issue that needs a national input. In particular, with the evacuation of Cairns hospital it is my belief that there was verbal communication relating to structural failure, by which the engineer meant there could be some minor shifting of the building structure. By the time that was fed back to the hospital management, they were told that two of the three hospital buildings could completely fall down. In other words, hearing engineering language and interpreting it without the knowledge is very dangerous. Equally, as I point out in my initial submission, the confusion between highest astronomical tide, Australian height datum, current tides, storm surge level and relating that to, 'What's that mean for my building?' is a critical part of the decision, but a lot of people got confused about it.

In an emergency, outside help is very useful and that was a step forward in Bundaberg where they flew in a couple of people from Cairns who had had experience evacuating Cairns Base Hospital and, I think, someone from Brisbane. The acknowledgment that you need people who have been through it before and who are familiar with the decision making is critical.

The only other thing I would point out is in about a week's time the New Zealand Ministry of Health is holding a national meeting on managing clinical responses to complex emergencies. I think Australia needs to do something similar in the near future, having first worked out what are the critical outcomes we are looking for. Finally, I keep hearing about different things that are being done or that have been done. It is extremely hard at the local level to find out what has already been done and what is available even if you know what question to ask.

CHAIR: In the follow-up to cyclone Yasi and the evacuation of Cairns Base Hospital, what activities have the Queensland government and the Queensland public service undertaken to assess what happened there to develop appropriate learnings for the future as such?

Dr Donald: I believe, and I have not seen the detail, that the retrieval services did their own review of what had happened. There were a lot of problems with coordination in Brisbane. I think that has improved. Almost nothing was assessed or done in Cairns as far as I can tell. There was a debrief, which seemed entirely appropriate, but we only found out later that that was pretty much it. Remember that Brisbane had its floods only a couple of weeks before the cyclone so they were traumatised and undoubtedly concentrating on that. But even after the royal commission into the floods had completed, it was impossible to raise any interest in looking at what had happened and at what could be learned.

CHAIR: You are obviously motivated to address these issues having made a submission to this inquiry and come to appear today. What contact have you had with Queensland health beauracrats to say we need to do the types of things you are talking about: better planning, better communications and having very clear structures in place to deal with these types of emergency situations?

Dr Donald: I would not like to give you a list as it would be very long. I have had private meetings with a lot of people. There have been formal communications. I think we have moved forward in Cairns. We actually have

at least a draft evacuation plan which was exercised in December, and I think that is absolutely critical. In terms of communications with the previous government and with the current Queensland Health, perhaps I could say the communications have been unsatisfactory. Just to find the Parsons Brinckerhoff report, which was a follow-up to cyclone Larry, took me six months. And it turned out that the document Queensland would not release had in fact been tabled in parliament, but you had to know it had been tabled in parliament and how to find it.

CHAIR: I can appreciate those challenges.

Dr Donald: There are a lot of other issues going on but, in terms of time and effort available, it is very difficult to find out that stuff.

CHAIR: Is it just that from your analysis that government was too side-tracked by the recovery phase and the need to focus on those aspects? Do you have any sense as to why it is that the state government in a more systematic manner has not addressed the issues you raise?

Dr Donald: I suspect part of it is a learned response to Cairns. We have been fighting on a range of issues and trying to build funding for far northern health services to something like they are elsewhere. Brisbane, I suppose, has learned to try and ignore what we say as far as possible. There have been improvements over time but they are very difficult to achieve, and we can only fight one or two fights at a time.

CHAIR: You have given us an addendum to your submission which touches on the evacuation of the Bundaberg Base Hospital. On a quick glance, it appears you have flagged there are some pros and consequence compared with what occurred at Cairns. Your opening statement highlighted that the flying in of some external assistance was beneficial in that process. From your perspective, was it better managed and was it better managed because Queensland Health had been through the Cairns experience or were any additional or better managed approaches simply luck?

Dr Donald: The first point I would make is that it occurred two years after the evacuation of Cairns Base Hospital with no evacuation plan. Bundaberg Hospital had no evacuation plan. I find that bewildering. A lot of the information I have is anecdotal or personal comments from people who do not wish to be identified. But it is my clear understanding the management had never considered the possibility of evacuating. So one of the critical issues is a threat assessment that is realistic. My concern is what is the frequency of a big cyclone? If someone says it is once every 3,000 years then no-one will prepare. If it is really one in a hundred years then it is not common but people will think about it.

I think there were a lot of problems with communication locally within the hospital, within the health service. There was almost no input from medical staff. Everyone I spoke to there heard about the evacuation through the media and not through the management so there are some really critical issues. I think the way it was handled from Brisbane did show signs of improvement; it was better coordinated. The fact that they thought to bring in people from Cairns who had done it before, I think, is a significant advance. There were still major problems with the evacuation in terms of who went where. For patients from a nursing home who went to an evacuation centre, there was no possibility of them being properly cared for. My feeling is that to have each area maintain a stock of containers with food and water and a medical kit is a horrible waste of resources. There needs to be a central repository and a mechanism for accessing those specific stores for a major disaster as well as expertise to advise on how to use them and how to set things up.

CHAIR: I would like to follow-up on the handling of other vulnerable people, in particular patients of nursing homes. In both the Cairns and more recently the Bundaberg experience, in the main, nursing home residents were simply taken to evacuation centres.

Dr Donald: In Cairns it was less of an issue. My understanding was there were fewer nursing homes in potential flood zones. In Townsville there was an issue during Yasi. At least one major nursing home had to be evacuated and there really was not a proper plan for it. In Bundaberg I am informed there was argument at some levels about whether Queensland Health had any responsibility. I heard one statement made that that was the duty of the provider. That is the problem when someone says, 'This person is responsible for making that plan.' If the plan is not there then someone else will have to take responsibility in an emergency. Mental health patients, Indigenous people and homeless people make up a significant group in Cairns. The planning is not good, would be my view. I know one residential mental health facility or assisted accommodation facility was not actually informed of the hospital evacuation even though at the time it was under Queensland Health. It is easy to miss groups if the plan is not specific and detailed.

Senator MILNE: Thank you for this. This is exactly what I was hoping to get to with the inquiry: to identify the gaps in planning. I want to come back to the fundamental principle here, which is that you should assess the threat and vulnerability of all your key infrastructure and services. My issue is this: would you say that the

Queensland state government believes that there is a likelihood of increased intensity and frequency of cyclone and flood events, and therefore that permeates through the public service, or is there a climate sceptic view that means that none of this permeates through the public service and it is ad hoc?

Dr Donald: It is difficult to assess. There is an acceptance of some increase. All of the public statements that were made came from that Parsons Brinckerhoff report. My concern is that there was no recognition of the palaeotempestology in that report. That report does allow for an increase in frequency of major cyclones and flood events. There is that acknowledgment, but to what level? The critical problem, as always in any bureaucracy, is that recognition at the top does not always mean that it filters down. If it has, it will be patch.

Senator MILNE: Given what you have said, do you think that the Commonwealth therefore should legislate to require all aged care facilities, all hospitals and all major providers—especially where there is Commonwealth funding involved—to do a vulnerability assessment and then, on a ranking, require a certain level of emergency planning in order for them to be licensed facilities or recipients of Commonwealth money or however you want to structure the agreement? Do you think that that would help to start forcing this issue of getting every key service provider to assess their vulnerability and therefore have some requirement for a certain level of emergency response planning?

Dr Donald: It would be very helpful for that requirement to exist. My concern is that, if you require it of providers whose only expertise is in running a nursing home, they will not know where to start. That is why my ideas is to have nationally provided templates for nursing homes, hospitals and other facilities. That then makes doing the right thing easier than doing the wrong thing. It will also have links to evidence and to information. Clearly, getting a detailed risk assessment on how frequently a particular area is likely to have a flood or a storm surge—remembering that storm surge depends not only on the size of the cyclone but the direction and the local geography, as well as what the highest tides are there—

Senator MILNE: Yes. But you would put that idea that the Commonwealth take responsibility for designing the templates and then requiring responses to those templates—

Dr Donald: And then requiring a mechanism for them to be usefully and practically implemented.

Senator MILNE: I want to ask you about legal liability and the extent to which the litigious nature now society is impacting on the willingness of people who are making decisions in emergency responses to speak out about what went wrong and what could be done better et cetera. I am rather concerned now that the immediate response is to take anyone who makes a decision in an emergency that goes to wrong to court and hold them responsible. That means that we do not get to the heart of matters. Do you have a view about that?

Dr Donald: The threat of litigation is important. The threat of adverse publicity in some ways is more important to a lot of governments. My view is that with Cairns as with everywhere else there should be a form of inquiry. There should be the ability for people to just vent, which means that it should not therefore be published publicly unless it has been carefully considered and vetted. But there is a clear need for people to be able to say what they think went wrong and then for someone to dispassionately look at it rather than have, for instance, the local management assess whether or not they did something culpable.

Senator MILNE: Sure.

Dr Donald: After Yasi, I spoke to a couple of the managers who organised the evacuation. They said that they could not even talk about it for six months. Having a single process immediately will miss the people who are really traumatised by the event. It needs multiple iterations.

Senator MILNE: You mentioned the need for a critical response unit in each state. Were you talking specifically in medical terms or over the whole of the emergency services? The second thing is the clinical response to emergencies, and I wondered if you could respond to that in relation to what collaboration is there with Defence, for example, and emergency services. How can we do this better at a state level? You said how good it was to have people who had been through it once and been able to be brought in to assist. How can we better organise that, and what role would the Commonwealth have? Would you like to elaborate more on that?

Dr Donald: I think having a clearer path to accessing expertise and consumables and stores is critical so that people understand what is available and how it is available. The AusMAT mechanism works quite well for overseas things; it does not appear to be available within Australia. There need to be much clearer and better defined linkages between what is available at each different level so that if someone says, 'We're evacuating; we're setting up a facility; we've got a great building but nothing to put in it,' somebody should have a little checklist and say, 'Right, here's our list; this is what we need to give you; it's on a plane in four hours time.' That would be enormously helpful.

In terms of the Defence Force, I know the feedback from Defence is, 'You can't include us in your plan,' and that is for political and operational reasons. The theory as it was expounded to me—and this is third-hand—was that civilian authorities cannot insist on the Defence Force doing anything; they have to be tasked by the federal government. So it is a question of the extent to which the ADF resources can be written into any plan, and that is something which is not clear to me.

Senator CAMERON: Thanks, Dr Donald, and thanks for your submission. There are a couple of things in your submission that jump out to me. I had never really thought about it, because fortunately I have not been involved in a big emergency, but there is this question of staff being able to leave the workplace that you have here. The proposition now is that staff obviously should be able to protect themselves, their family and their property. This is a huge moral and, I would say, psychological issue for a lot of people, because they would be torn between some patient needing help and their family needing help. How do you ever deal with that?

Dr Donald: The only way to deal with it adequately is to have a detailed plan that everyone is aware of so they have actually rehearsed the decision making. I have a lot of expertise and experience in all sorts of different things. I ran the intensive care during Larry, and I was not involved with Yasi. Part of that was that I was convinced six hours after the cyclone I would lose all contact with my family. Sorry, I still get emotional about some things.

Senator CAMERON: I am sorry to do this, but it is a key issue, I think.

Dr Donald: It is, and there were not nearly enough senior people at the Fretwell emergency centre, because they could not guarantee what would happen to their family. If we are doing things inside the hospital, a lot of people would bring their family. That is a critical part of it. You cannot ask people to stay in the hospital and let their family die. The other critical point is that the management have to take into account that you cannot order people to stay, so they have to have gone through in detail: 'How do we identify people who are prepared to help? Who are the people who can stay because they do not have dependants or their house is safe?' The other critical point is that, for a lot of these people, if you send a flying squad of non-clinical people home with them for an hour so that their whole house is prepared and all the loose bits are inside, locked up and secured, they can come back to work and concentrate on their job.

What actually happened was that there were several senior managers who were uncontactable, and there are some appalling stories of what staff were told to do or ordered to do, which I will not recount here. But after every cyclone we have had, even the minor ones, there is another group of people who say that they will never, ever stay in the hospital again during a cyclone, because they are so scarred from it. That is why the planning in advance is critical. The issue of how we staff both the hospital during a cyclone but especially an evacuation centre is crucial, but there is no plan. The plan in Cairns is still grossly inadequate.

Senator CAMERON: I do not know how practical this is, but for the key personnel—and I suppose that everybody is 'key'; you need people cleaning and doing all sorts of things so it is not just the people in your possession, it is right through the whole establishment because everyone is needed in one aspect or another—if there were another Cyclone Yasi emergency, could there be some kind of flying squad separate from the hospital, and as part of the overall plan they would go to the homes of those key personnel to make sure that people are okay. That never diminishes the fact that some people might say, 'I don't care, I am going back to my family,' but would that be of assistance?

Dr Donald: It would be, but in fact within the hospital staffing historically a lot of people have been told, 'You are nonessential—go,' and frequently they could have been very useful. Certainly with Yasi there were a lot of people sent home who could have been used, and a lot of people ordered to stay who had nothing to do. It is quite complex. I see it as absolutely critical.

And another thing is that a lot of people who had been through two or three cyclones got the message that they were not allowed to leave, and that was it. So they turned off their phones and walked out. It is not a very constructive response but that is a learned response to a system that does not respond. I think that this issue needs to be gone through in a lot of detail and, if you have not been through it, you probably have not considered it.

As I said, in Bundaberg there was an extraordinary lack of communication of any sort. I know a doctor who was rung at 4.30 in the morning and told to be in at six—that was it. When they got in at six they found out that a decision had been made the previous day to evacuate the hospital. Not only did they have no input, they had no ownership. There is also the critical issue of the overwhelming fear when it looks as if your entire community is going to be destroyed. People do not think rationally in those circumstances but, having rehearsed the plans and rehearsed the thinking, you not only get a better outcome, you also get far less damage to the individuals.

Senator MILNE: Just following up from Senator Cameron, you have already mentioned the idea of a clinical flying squad where you would bring in key personnel. You could have a plan to fly them in from somewhere else to relieve the local people so that they could leave the hospital. How do you think we would be best placed to put together a recommendation to say how this should be addressed? It is not clear to any of us at the moment, I think, how you would deal with it. Given all the learning and the people you know and what Senator Cameron has just said, what would you suggest would be the best way for the Commonwealth to be able to facilitate this kind of planning to go ahead?

Dr Donald: Firstly, the flying squad is probably possible within local resources. If you get someone who says, 'I am happy to do it, but I need to tidy my house up,' there may be someone else who says, 'Well, I've got kids at home but my partner is there with them so I can stay for four hours and then go.' Where that was done, that worked quite well.

The critical issue is how we make sure we have got enough clinical staff. What you cannot have are people who just put their hand up and get on a plane. There has to be checking, confirming that they are people who have the right qualifications. As I said, I think the AusMAT model or something similar is very useful. It means that you have got people who have done some training about how to work with limited resources. There are people who have been assessed. Their qualifications and experience are assessed. There were huge problems at Fretwell partly because it was cockroach infested and bat and bird droppings were falling from the roof constantly, but there weren't enough of the right people present because it was put together on the fly under immense pressure.

I just cannot believe that someone has not sat down and said, 'A city the size of Cairns—there is no hospital.' Even the reports on how many babies were born were wrong, and there has been no mention of a transfer that occurred, as I believe, contrary to the police advice and specific direction from the director-general, which probably saved a woman's life. A lot of the critical issues that happened have never come out.

Senator CAMERON: One last question—I have got lots of questions but it is the last one I have time for.

Dr Donald: I am happy to receive any number of questions—

Senator CAMERON: I am not sure about a government template approach for disaster response. I would think—this is just off the top of my head—that each hospital district should be required under a COAG type approach to say, 'You must develop your disaster response.' I do not think a template by a government bureaucracy can actually meet the needs of the specific problems for each hospital. One hospital might be on the bank of a river and will get flooded; another might be up the hill and okay. I think I know where you are coming from: you need a template but surely that template has got to be done at the local level but it is a requirement of government that, in order for you to operate, you must have that disaster relief plan. The government is saying: 'Here are steps 1, 2, 3, 4.'

Dr Donald: I disagree with that, and Cairns is a very good example. We were told repeatedly an evacuation plan was being developed. Ten months after Yasi, which was a month into the next cyclone season, we finally saw the document and it was a good discussion document. It contained some useful information. There was no operational component. It is a very, very complex business.

There needs to be local responsibility, but you have to make it possible, so the expertise required to develop an evacuation plan is extraordinary. They need a basis to start from. They need expert assistance and they need resources. Cairns was promised all sorts of—I do not think Cairns ever got funded for the damage. We were promised all sorts of things we never got and we ended up with one junior admin person who did an extraordinary amount of work with no training. It needs someone who has got experience and very high-level training in disaster management to get it right. It is critical that each local facility has its own plan, but I think having the stem documents working at which bits apply to them. The other critical thing is a plan is absolutely useless if it sits in a drawer and no-one knows about it. It has got to be exercised each year, as we did a total top exercise in Cairns. With a sense of impending doom, people do not think rationally if they have not rehearsed and practised it and thought about where they fit into the plan. Even having a plan will not be very useful.

CHAIR: Thank you very much, Dr Donald, for sharing your experiences and for the effort that you have gone to to make the committee aware of these issues. It really is appreciated.

EBURN, Dr Michael Ernest, Private capacity

GLIKSON, Dr Andrew Yoram, Private capacity

HANNA, Dr Elizabeth Gayle, Private capacity

KIEM, Dr Anthony Stuart, Private capacity

[09:48]

CHAIR: Welcome. Thank you all for taking the time to talk to us today. The committee has received submission no. 2 to the inquiry from Dr Glikson, submission no. 5 from Dr Kiem and submission no. 8 from Dr Eburn. Are there any amendments or alterations to those submissions? In that case, I invite you to make opening statements, noting of course there are four of you appearing and that the committee would like the opportunity to ask questions. Please ensure that your opening statements are appropriately brief and volunteers are sought to go first.

Dr Glikson: I have a few dot points which were distributed to you. I will follow them as quickly as I can. You may be aware of my background in this area. I have more than 40 years experience in earth and palaeoclimatic science, but my evidence is mostly based on the history of the atmosphere and on current events. I am an official reviewer of the IPCC and I am at the ANU and the University of Queensland.

All the evidence I am aware of is pointing to the accelerating series of extreme weather events around the world, which include heatwaves, floods, hurricanes, drought and so on, springing out of the increase in temperature of the oceans and the land. As you get higher degrees of energy, you get stronger evaporation and the water has to go somewhere, and in other areas you have droughts and heatwaves. This is not a gradual trend. There has been the impression that we are looking at a linear development; unfortunately, we are not. When you look at the behaviour of the atmosphere past and present, it reaches tipping points and from a certain degree of energy in the atmosphere you get very rapid events over periods ranging from decades to maybe a century or two. So my main point is that there is no time.

Warming has actually already exceeded two degrees. There is an assumption that the European Union target of two degrees is still to be transcended; it has been transcended—we are at 2.2 degrees. However, sulphur oxide aerosols are mitigating this degree of heating by about 50 per cent. So, in fact, civilisation is already exercising what you could call unintended geoengineering. If sulphur dioxide emissions were to decrease, and they have decreased at other times, the temperature would rise very quickly. What it means is that civilisation is now already dependent on the life-support system of sulphur aerosols, but these aerosols have a very short time of atmospheric residence.

The implications are really what is important. Large-scale agricultural development along river valleys and then in plains, which has allowed the development of cities and civilisation, is now at grave risk because the climate conditions as they are developing now, including heatwaves, floods and so on, and sea-level rise, are endangering the bases on which urban civilisation, cities, are reliant. I certainly wish it was wrong, but this is what the trends are telling us. The implication for civilisation is that it cannot continue business as usual. In fact, as the agricultural food production base is already decreasing and will be decreasing further, small groups of people on farms and in rural areas will have to start growing their own food using a range of techniques. The techniques do exist, but it will be on a smaller scale and it will not provide for the needs of perhaps seven billion people around the globe. The sooner civilisation realises that this is the trend that is going on and starts to take some effective measures, the better it will be for our children and for future generations. I realise I do not have very much time to follow up on this theme.

There are a number of techniques. When our society is developing systems such as the NBN for the fast transfer of information it cannot possibly be looking at the future because what will be needed at the end of the next few decades or century or so are conduit systems to transfer water from where the floods occur in the north to the drying up areas suffering from heat waves. Water will be absolutely essential. It is a water system like the Romans used to develop which needs to be developed for civilisation now, but this has not been realised as yet. I think I better leave it at that point. If you have any questions I welcome them.

CHAIR: Thank you, Dr Glikson. Do any others wish to make a brief opening remark?

Dr Kiem: Yes. I am a researcher and senior lecturer at the University of Newcastle in the faculty of science and IT. I have about 15 years experience in hydrology and climatology working in Australia in both the uni sector and private industry, consulting to federal and state governments and private companies. Plus I also spent three

years in Japan working with the UNESCO funded International Centre for Water Hazard and Risk Management, which was largely focused on flood risk in the Asian monsoon region.

My focus is on the drivers and impacts of climate variability and change, with a particular emphasis on water related extremes—droughts, floods, storm surges and so on—as opposed to temperature and heat waves. I just make that distinction. My submission is not really about temperature related extremes; it is about floods and droughts, basically.

My submission centres around the fact that until recently the hydroclimatic risk has been viewed as a static concept where the risk is constant over time with the same risk from one season to the next or one year to the next. But work in the late 1990s and early 2000s, which I have attached to the submission, has shown that this is not true and that flood, drought and bushfire risks vary over time, and there exist in the historical and particularly the paleo pre-instrumental records epochs of elevated or reduced frequency and magnitude of extremes. This intra-annual to multidecadal variability of risk is related to natural cycles like the El Nino Southern Oscillation or the Interdecadal Pacific Oscillation, which I think have been mentioned a few times.

This finding that risk changes over time is counter to the existing best practice, which assumes the risk is constant. So, therefore, it is not really adequately accounted for in most planning and infrastructure and disaster preparations. Compounding this is the fact that anthropogenic climate change is projected to alter these atmospheric cycles. Therefore, this also has the potential to change the risk of things like floods and droughts.

The problem is that the climate models are very uncertain about the precipitation. They also do not currently realistically simulate things like the El Nino Southern Oscillation or the Interdecadal Pacific Oscillation. So, yes, flood risk, drought risk and bushfire risk will change in the future but we cannot really say at this stage whether or not the change will be an increase or a decrease. If it does increase or decrease, we do not really have a handle on where, by how much or when that will happen.

Some recommendations or final points is that I think there is a big need to better communicate what we know in terms of the science, in particular about these multidecadal cycles, and that we do not really have a proper understanding of the existing risk in a lot of places. It is not just what we do know about the science but what we do not know and the areas where we are very uncertain. We need to get out there what has been in academic literature for 10 or more years—that this hydroclimatic risk does change over time; it is not a constant thing.

The terminology is also problematic, not just in the mainstream media. Climate change is a multidisciplinary thing and across the different disciplines of science different words mean different things. That is problematic when it comes to decision makers trying to understand what we are talking about.

The other point is that funding of research into the area of properly understanding the drivers of flood and drought risk in Australia and properly quantifying the existing risk is urgently needed, especially at the local or catchment scale. Then more funding is needed to get into the climate models to try to get some insight into how that risk might change in the future. Then the next step is that we need to work with the decision makers to use that information to make the decisions. Initiatives such as the South Eastern Australian Climate Initiative, NCCARF and, prior to that, the Indian Ocean Climate Initiative were all making headway in this. Unfortunately, it seems they are being discontinued, which is a shame.

My last point is about the education and training of the next generation of scientists, particularly in the climate and water space. We know what the research questions and the knowledge gaps are, but we have a lot of trouble finding the people to fill the PhDs, postdocs and technical positions that we need to do this research. There are a few reasons for that. One is the funding, but another one is the poor maths, literacy and science generally of the people coming into university. The other one is that over the last five to 10 years, particularly in Newcastle, we have lost a lot of the good students to the mining industry—the people who would have gone on to be a good PhD students have taken the big dollars and gone to mining. Another point is that the career prospects long term in research are very uncertain; it basically depends on getting lucky with ARC grants. Even if you were to do a PhD, you get a PhD and then what? You are on the endless treadmill of applying for funds, short-term contracts and so on, so it is not very attractive for young students when, on the other hand, they are getting offered careers in the mining industry at 100-plus grand a year.

CHAIR: Thank you, Dr Kiem. Dr Eburn, do you have an opening statement?

Dr Eburn: Just very briefly. I am a lawyer by training and my submission relates to the legal relationships between the tiers of government—that was my focus. I note that the Productivity Commission's *Barriers to Effective Climate Change Adaptation* final report has just come out, with a chapter on emergency management which has very similar points of view about the lack of clarity of those relationships. I commend that report to the committee.

My only other comment relates to some questions Senator Milne asked the previous witness about litigation. That was not the subject of my submission, but if there is a chance to do so I might have some comments I could make. Other than that, my submission speaks for itself and I am just happy to answer questions.

CHAIR: Thank you, Dr Eburn. Dr Hanna?

Dr Hanna: Greetings, and thank you for the invitation to appear. I work at ANU in climate change and human health, so that is my focus, I worked with Tony McMichael. I convened the NCCARF network for human health—until the fact, of course, it is no longer funded—and I am President of the Climate and Health Alliance. I have a background in intensive care, so I work with the Australian College of Nursing and we have developed a disaster nursing faculty, which is specifically to try to boost Australia's capacity to be able to cope with. Your previous witness, Dr Donald, highlighted the fact that it really is a shortfall, particularly as we move forward with the increasing events we are having.

I will not talk about the science; I presume you have read all the submissions and have a fair handle now on how they affect health. There are just a few points I would like to make on my assessment of some of the problems we have in our health system in terms of responding. You will probably have noted the very low number and paucity of submissions that came in from the health sector. DoHA itself was particularly tepid and I think that gets to the core of the problem, in the fact that DoHA is so distant. They are not moving sufficiently quickly to why we are failing and what we really need to do about this.

As I said, I think what lies at the core is the way we actually respond to environmental health in Australia. We have a huge department called DoHA and they closed their environmental health section recently—it had four people and an operating budget of \$1 million. This is just laughable; it is a tick-the-box affair. They argue that environmental health matters are the responsibility of the states and territories, and they are the ones that take leadership in terms of responding to the floods, fires and droughts—and then throw in legionnaire's, bird flu and other events that come a long. We would have hoped that, after these major events, they would have had funding boosts. Instead, in some states who seem to have an allergy to the word 'environment' they have actually closed some of those down. We think this really increases Australia's risk. In their abhorrence of the word 'environment' they have actually presumed that this is hugging trees and being a friend of Christine's. When you consider what the rest of the world has in terms of responding to these events and how they have a federal approach to managing them, Australia has dropped the ball. We also have a major problem in trying to get this into the curriculum and there will need to be a central push forward this to actually happen, because the curricula of all the health providers are full just with the expansion of medical knowledge.

Those are the key points but I am happy to talk about all manner of things, particularly the funding for research into how Australia is to adapt and the fact that there was a decision for that to be no longer funded. All I can think of is that the Australian public are really going to hold the government and our bureaucrats to account, because this is a risk that we can foresee, and there has been a decision to not pick up that ball and ride with it. It is very complex but I am happy to go through questions as you wish.

ACTING CHAIR: Thank you Dr Hanna. Thank you all, for those statements.

Senator MILNE: I would like to start where you have just finished and get a comment from you all in relation to the National Climate Change Adaptation Research Facility. All the witnesses we have heard—including Dr Donald, just a moment ago, local government and so on—have said that what it comes down to is being able to assess the local risk and vulnerability of the existing level of warming that is built in, and anticipate, on the basis of the latest science, how much more severe that is going to be, and then localise that information to disaster planning preparedness and so on. My understanding is that what NCCARF was trying to do was to have an interdisciplinary approach which interpreted the climate models in a way that was useable information right down to the local level.

I am personally alarmed that NCCARF is going, because there will be a big vacuum. One of the things that has come out is that we are now going to have an insurance affordability council, which will determine how money is spent on mitigation, which is completely unrelated to the real risk assessment that I am talking about. I am just interested in your perceptions of NCCARF—whether it has been useful. In its absence, what have we got?

Dr Hanna: Certainly it was useful. Most of the heavy lifting was done via the networks. It was literally a network of researchers, and that is where the powerhouse of strength was. They did all of the research. The way it worked for health was a little bit different, because the funding that was supposed to come through NCCARF to fund research projects in health took a totally different model. I think this was a decision that was made in the upper echelons—heavens knows where or how—because NCCARF tell me that they were not part of it. The

NHMRC say, 'We're the ones with the expertise in assessing and reviewing grants so we'll kick in \$3 million and we'll take your \$3 million. We'll take that whole \$6 million and we'll do it.'

After four years of funding they could only get half of that \$6 million out of the door. Again, it is because it is a totally wrong model, because they favour a biomedical model and they wanted to get up on the world stage with patents and such, which is not what we need in Australia. We need adaptation research that would suit Tasmania, which is vastly different to what they need at the Top End. NHMRC could not get over that.

So the health model of funding the research project was wrong from the start. There were some good projects funded. I got to lead one of them, so I am pretty happy but that model did not answer the needs. So we need a different model and I would say that it should not be assessed by the NHMRC, because they do not do policy, they do not do regional stuff and they certainly were not into the adaptation mode.

Has far as the whole NCCARF and network model was concerned I thought that was excellent. Having the overarching NCCARF, with some funding that went along with that—even though I think they probably should have distributed more to the networks to do the research—was very good because, as you would no doubt have picked up, everything is related to everything else. In human health we are totally dependent on the emergency management team and on the primary industries being able to provide us food and water. So we have so many areas of intersect. Having the NCCARF model actually allowed all these networks to work in and do this stuff together. We were too late in addressing this problem and we really did need a kick start. So I think it is an excellent model and it should be continued.

Senator MILNE: Dr Eburn, you made a very clear statement that we are well organised for responding to a major terrorist attack, but we are not well organised when it comes to responding to extreme weather events, which we are already experiencing and we are going to experience more of and in greater intensity. You have put forward a recommendation to clarify the legal responsibilities and who has responsibility to do what. Could you speak to that a little bit? Also, I would welcome your comments about this issue as more and more people are held accountable and the overall lack of planning is not accountable.

Dr Eburn: I will try to address the two questions in turn. The Commonwealth suffers from a lack of having any sort of counter-disaster legislation to define any role of the Commonwealth—also in responding to natural hazards. That is also similar with respect to terrorism. There is an overarching act in that respect, other than the Defence Act, which has various provisions to call out the defence forces to protect the Commonwealth. That is a clear constitutional power of the Commonwealth. I refer you to the latest version of the Productivity Commission's report which says that it is much better to plan in advance what you are going to do rather than leave it. What the Commonwealth may or may not do is not all that clear. Certainly the basis upon which the Commonwealth would purport to do it is not clear.

In my submission I have said that there are two heads of power for the Commonwealth. One is about all the various powers it has to do things: it has to keep providing Commonwealth services, so it has to plan for how Centrelink, Medicare and all those people are going to keep operating in a disaster and how they are going to deliver the disaster services. But that does not give the Commonwealth any particular authority. Whether it has authority is a different question, but it does not explain at all its role as a coordinating agency or what it might do over and above those sorts of things. That is where I argue that we would be assisted by having some sort of overarching Commonwealth disaster legislation.

The Canadian model is probably a very good example of providing for a minister for emergency management. That title was created recently in our government, but it is still not quite clear what the Minister for Emergency Management does. It has gone back to being the Attorney-General and emergency management rather than it being two offices, so in that sense it has just gone back to being the Attorney-General. Of course, the Attorney-General has lots of other things to deal with. Like everybody, this may not be the most pressing thing. These are the sorts of things that will happen one day, but in the meantime they have all the other things to do.

So the Commonwealth would benefit from some legislation that says what the Commonwealth is going to do and what its powers are and defines some key roles and responsibilities—something like a principal federal officer or a federal coordinating officer who is going to be the person who can be the go-to person for the entire Commonwealth. To give an example, when I was writing my PhD on this, I created a fairly fictional example. My example said: 'Assume there were some disaster in Australia and we needed to fly in a supply of medication that had not gone through the therapeutic goods assessment process but needed urgent clearance, and it was going to be flown into Sydney airport outside the curfew hours.' I think there were 11 separate emergency declarations that had to be made by different ministers declaring that this was an emergency, rather than having the ability of the Commonwealth to declare: 'This is an emergency. All these things will come into play.'

I am not sure whether I am answering your question anymore, but I think it is a critical failing that the Commonwealth does not have that sort of overarching structure that says, 'This is what our role is and this is what we're going to do.' Does that address your question?

Senator MILNE: Yes, that does. And there is the liability issue.

Dr Eburn: Thank you for that, because that is not in my submission. That is some of the stuff we did some research on. We think it is horribly overstated. We were funded by the Bushfire CRC, so I will grant you that our research was limited to fires. We traced back as far as we could go—that was to about 1860—and the number of cases where people were sued over these things was pretty low when you think about the number of events we have had. We could see trends that showed that neighbours sued neighbours for a long time. So, when the fire started, you sued your neighbour for not doing something to put it out. Then there was a long period when the principal defendants were the railway authorities, for the obvious reason that steam trains cause fires. Then it became the electrical authorities. Only very recently it has started to become land management and fire agencies. When you think about how many times they turn out, they are hardly ever sued. We are beginning to see that, when we have the catastrophic events—the Canberras, the Black Saturdays—litigation starts. So far, as against the fire agencies, they have not been found liable for their actions for a whole lot of reasons. But what happens when you speak to them and, in particular, speak to firefighters? They are terrified that they are going to be sued and held personally to account.

We had trouble understanding what that fear is. They will not be personally held to account. They are part of a big agency, so the legal actions are always against the states. So far they all have been. It is always against the ACT, against New South Wales, against the Queensland government. It is not against individuals. But what we really discovered is that what they are afraid of is not so much being sued; it is the royal commission process. It is, with respect, a process like this. If you have been a volunteer firefighter and given up three days of your life to go fight fires, then spend the next six years appearing before various inquiries—and after the 2003 Canberra bushfires there were a phenomenal number of inquiries, including one in the House of Representatives. I am reading between the lines now, but it seemed basically at the House of Representatives inquiry that the fire agencies said: 'We're not coming. We've been to so many of these. We've got nothing more to say.' And that led to a very distorted view, because people come in and give evidence that may or may not be legitimate.

In the House of Representatives report they had a whole heading on legal liability that failed to talk about legal liability. What it talked about was bad press, bad feelings and things like that. In our study we got into some records of the New South Wales Rural Fire Service, and one that I found particularly interesting was about an incident that had happened with a bushfire in the Snowy Mountains. There had been a complaint about the conduct of the service. It had been investigated and letters had been written. The firefighters obviously had been interviewed multiple times. At the end of the day, nobody sued anybody. The Rural Fire Service stuck to its guns and said to the complainant, 'We did nothing wrong, we are not liable and we are not paying you any money,' and that is ultimately where the matter ended, but it took five years of investigating and letter writing. When you speak to people, that is what they call litigation. 'We're going to be sued.' As a lawyer I say, 'That's not being sued; that's the process of inquiries, and that's go to happen and that's painful.' But that is actually what they are terrified of. And they are terrified of royal commissions. The firefighters I have spoken to about the Black Saturday royal commission, and then of course the Queensland floods and those engineers who were referred to the Crime and Misconduct Commission—again, no action ultimately taken. It is that process. They label that as litigation.

If you actually look at how often litigation occurs it is incredibly rare and, so far, liability has not been established against these agencies, because the courts recognise they are making tough decisions in tough times in imperfect situations.

Senator MILNE: You are linking that to your first point. If you had a clearly defined set of responsibilities and the flow through of who is responsible for what, that might eliminate a lot of that finger-pointing through the process because there would be clear lines of responsibility.

Dr Eburn: I think that is true. I am not sure how true that is at a Commonwealth level, though I certainly think that is an implication out of the 2009 Black Saturday inquiry. Right down to the chief officers of those agencies, people were unclear on what their responsibility was. That comes down to the state legislation. I think state disaster plans are, despite their best efforts, very unclear about who is in charge of what and, in particular, about where the police sit against everybody else. That leads to a lot of confusion.

Senator MILNE: Thank you. I want to come back to the point of my moving for this inquiry, which was to enable us to identify the gaps. We have heard that one of the gaps is lines of responsibility and drawing up of Commonwealth overall responsibility. We have just heard from Dr Donald about the need for a clinical response team which would be part of that filtering-down process. We have heard from Dr Glikson and from you about the

need for the science. One of the problems we have is that everybody talking about the level of uncertainty as to what you can predict, vulnerability and so on is an excuse for delay. The point is that we are way behind where we need to be in disaster preparedness and anticipation. It is going to happen. It is not if; it is a matter of when.

My concern about the ongoing talk on the need for more PhD students—I do not deny that: we need to be doing the science—is that we actually need the practical adaptation of the science we now know and get things started. Then we can add to that in terms of severity and so on, but at least let's get things started. My concern is: this is an excuse now, and if you read the submission we had yesterday from the insurance industry, they are relying on old reports that say that you cannot link climate change with extreme weather currently. You may be able to do that in the future but you cannot now. Now that is the insurance industry. How on earth are we going to move forward while the insurance industry continues to say that sort of thing? What I am asking you now is: what do you see as the most urgent gaps in preparedness that are inhibiting our ability to save lives, let alone ecosystems, property and anything else? I am interested in you identifying, as you see it, gaps in preparedness for extreme weather events.

Dr Kiem: This comes back to the whole NCCARF issue. I was involved in co-leading a project with NCCARF that we just finished this year which was titled *Decision making under uncertainty*. That project had some really good outcomes, because we collaborated with a whole heap of end users—local councils, water authorities and so on—getting them to understand that 'Yes, there is uncertainty in the climate science, but just because there is uncertainty that does not mean that you sit back and do nothing.'

Senator MILNE: Exactly.

Dr Kiem: There are still things that you can do, even though there is uncertainty there. There is a whole lot of research going on internationally where they are moving away from what they call predict and plan methodology, because almost inevitably what you plan for does not eventuate, because there is so much uncertainty. What they are going towards is—whatever the industry might be: what are the important decisions that you have to make, how does climate feature in those decisions and then what are your options? Optimising those options under a range of plausible scenarios is the sort of road that we have to go down, given that this uncertainty is not going to go away. So it comes back to an education and communication issue, but by the end of that project we had convinced people that it is possible to make decisions under uncertainty—and, in fact, they do it all the time. It is not an excuse. People get married and people do all sorts of things. That is a decision made under uncertainty, but it is really disappointing that that is one reason that NCCARF is not continuing, because that project came up with a series of recommendations which would have been good to follow through, but unfortunately—

Senator MILNE: What sort of recommendations?

Dr Kiem: The recommendations were quantifying what that uncertainty is: actually listing out the range of what is plausible, what is likely, what is less likely and what is more likely. Once you reach those different scenarios, what are the options that various industries have under those options?

Senator MILNE: I think you were here when Dr Donald gave his evidence, so I want to apply this to the template proposition that Dr Donald put up that we discussed a minute ago. How could that research from NCCARF link with the notion of a template? Are you suggesting that NCCARF recommendations could then inform a template, so that the template might say: the first thing is you need to determine the threat and vulnerability, and you need to do that by now going to NCCARF and saying, 'Give me the threatened and vulnerability data for Bundaberg, Cairns or Hobart'? So the requirement on the template would be to get it, but get it from NCCARF or one of the institutions such as that so that you get consistency across the country in terms of the quality of the data that would then apply to whatever that scenario is. You heard that proposition of the template. What is your immediate response to that in light of the recommendations from NCCARF?

Dr Kiem: Yes, that would be something that would be really good—not only consistency in the data but consistency in the terminology and communication—

Senator MILNE: The methodology.

Dr Kiem: And the methodology and transparency and what is being done—a consistency in the communication of what we mean when we say 'uncertainty'—all of these things, and whatever the end use might be, as long as the methodology is robust and consistent on establishing the risk initially. Obviously the decisions that are made depend on what industry you are talking about, but as long as the methodology for establishing those templates initially is robust, transparent and consistent, then we would be in a much better situation. And I do not see how that can be done unless there is some sort of national initiative.

Senator MILNE: Okay, thank you.

Dr Kiem: Also, I meant to jump in before. I also want to second that NCCARF were a good thing. One of the other things that was very good was their support of early career researchers. They did things like PhD top-ups, PhD workshops where the PhDs from all the different universities got together once or twice a year. It gives them a sense that they are actually part of something bigger. Rather than being locked in an office for two or three years doing their PhD, they get to come together and talk to other PhD students, talk to industry leaders and talk to senior researchers. Without something like NCCARF, I agree that there will be a big vacuum.

The other point as well is that the sort of work that is needed, and the sort of work that NCCARF did, is not really the sort of work that you can get funding for from NHMRC or the ARC. The ARC and so on are about big science, not really the sort of participatory industry linkage—

Senator MILNE: Local government.

Dr Kiem: Local government. You do not really get funded for that through the ARC, so if there is nothing like NCCARF there is a big gap there—to do things like producing this template. Where will the money come from if it is not NCCARF?

Senator MILNE: Precisely.

Senator CAMERON: I am not sure, Dr Glikson, whether you had a different view on what Dr Kiem was saying. I noticed you were shaking your head at times. You have a similar position on that last response?

Dr Glikson: I would like to say a word about uncertainty. Ninety-nine point five per cent of the peer-reviewed literature on which science is based agrees about the effect of greenhouse gases. Humanity has emitted 560 gigatonnes, billion tonnes, of carbon into the atmosphere through direct emission and land clearing, which is almost the same as the original amount of carbon in the atmosphere. All the world's climate research organisations—you go from Hadley, Met, to NASA and NOAA's NCDC; to Potsdam; to the CSIRO and the Bureau of Meteorology in Australia—as well as the world's academies of science agree on the role of greenhouse gases, and the evidence is now as robust as that for gravity, I would say, and evolution. This uncertainty notion is a myth.

What we are looking at—if I can bring an analogy from medical science when I am not a doctor—is like this. A gene is identified in a patient which says the patient is in danger of developing a dangerous disease. A few years later, the patient's blood composition is showing signs that the red to white corpuscles have changed. A few years later, the patient starts to develop fever and starts to develop symptoms of shaking and so on. This is a close analogy to what happens with the climate. The principles were established already in the 19th century. The rise in greenhouse gases has been observed from about the middle of last century, and now we come to a stage which has been predicted and is consistent with the basic laws of physics and chemistry of the atmosphere: the increase in temperature is causing extreme weather events, heat waves, increased evaporation in the oceans—and the water has to come down somewhere.

The uncertainty which has been expressed is more political, I have to say, than it is scientific. You will have evidence later on from people from the CSIRO and the Bureau of Meteorology. We insure ourselves against invasion by foreign powers. We insure ourselves in case our house gets burned or our car gets stolen. But here is an instance in which the entire world's climate science community are telling governments that what they already started to foresee and predict 30 or 40 years ago is now actually happening, and there is no time to put up barricades about uncertainties. As far as scientists are concerned, the role of greenhouse gases in the atmosphere—which is now almost doubled, and half of it goes into the ocean and acidifies the ocean—is now certain. Thank you.

Senator CAMERON: So the Climate Commission view that you can allocate some responsibility for some of these extreme weather events to the rising ocean temperature, the increased vapour in the atmosphere, that is a legitimate concern? So climate change is actually contributing to some of the extreme weather events now?

Dr Glikson: The incidence of extreme weather events has tripled over the last 20 years or so. This comes from the Munich Re insurance company and other sources. It is basic physics. You increase the temperature of the oceans and of the land, more water evaporates, more water has to come down somewhere. You increase the temperature of the deserts and other regions and you get heatwaves, and they arrive at the more fertile areas. You increase the temperature of the ocean, which has increased by 0.4 degrees, and that is enough to start the melting of ice in the poles. This is a self-amplifying, runaway effect: as we know a bit of water on top of the ice, over the margin of the ice, the more ice melts, the water absorbs the infrared, the infrared warms the water and the warmer water melts more ice.

Right through the history of the atmosphere, which is my particular field, this is precisely what we are looking at. We are looking at runaway effects, amplifying effects. Whether it is warming or whether it is cooling, they are

not gradual effects. You can look at any chart of development in the atmosphere, especially the ice ages, and you will not see anything gradual; what you will see are jagged curves. Their forcing, which we are now looking at, which is 3.2 watts per square metres, is half the amount of forcing which was brought up to the deglaciation to the end of the last glacier period. This was purely solar, but this resulted in amplifying feedback effects of CO₂ released in the oceans and the ice-albedo flip, which I was talking about.

Climate science and paleoclimate science are now extremely well-established disciplines. I do not do future modelling because every model inherently involves assumptions. I do not work on assumptions; I look at the recent history of the earth at the ice cores, essentially, and before that and I look at the basic laws of physics. I am prepared—I think the world's science communities have now, for many years, presented the evidence which is hard evidence against which no objection can be sustained any longer. Having said that, I would have been the first one who would have been delighted if we were proved wrong because the implications of what we are looking at are serious.

Dr Hanna: I want to respond to Christine's question about what are the gaps. One of the main issues, and others have touched on it, is that mindset—that is, the willingness to approach it and to respond to it. It is almost as if no-one has carriage of responsibility for this, so it all lies in somebody else's department. And it is also the fact that we say Australia has always had extreme events rather than really coming to terms with the fact of the increased number that are happening and the intensity with which they are happening now. In 2009 Australia really was at breaking point. Our systems are designed to respond to an isolated, rare, single event; we send in forces from the other states. But in 2009 we had mayhem up and down the eastern seaboard, and we can only expect this is going to happen again and we have not built our capacity in response to that.

As Dr Donald was suggesting, we need that capacity not just in central locations that can fly in because there is not going to be—they are going to be busy elsewhere. It is like in the floods, people were expecting someone to come to their door; with the fires, when half of Victoria was on fire, people still thought a truck was going to land at their door. It needs drilling all the way down to the community level. We need to have an enormous amount of community education in how to respond to fires so that they can have the good sense to protect themselves and look out for each other. A lot of this transfers, whether it be floods or fires et cetera: it is about having that emergency pack that you need in your house, having the plan to go along with it; teaching the kids in schools as to what they need to do and basic communications so that they can let people know where others are; and up-skilling the ground force, the people who are in these various services, including the health sector, as to what to do and how to mobilise.

I have a previous history of working at the Alfred Hospital where we had emergency plans. We used to do this practice field thing where we would put out fires and have drills, dragging patients down corridors. As Alex was saying, all this is needed and it needs to be at a national level. Somebody needs to take carriage of it. It has to be intersectoral and, for Pete's sake, health has to be involved. You cannot even find climate change on the DoHA website. They say they are doing this but they are not. It is a matter of realising, without being human centric, although we need to be, that it all boils down to keeping people alive and protecting them.

Senator CAMERON: We are really getting lots of evidence and I think Dr Glikson and Dr Kiem have nailed the anthropogenic climate change thing. I want to go to some of the issues raised by Dr Eburn because he has had legislative issues.

Dr Kiem: Can I clarify that I agree totally with what Dr Glikson has said. The uncertainty I am talking about is not whether the temperature is rising or whether humans are responsible for that—and the physics where they say with the warmer world we get increased water vapour and so on, and that is accepted science. I guess I am guilty of my own recommendations about the terminology—there are different types of uncertainty. What I am talking about is that some proportion of those extreme events was anthropogenically influenced but there is uncertainty about how much was natural and how much was anthropogenic. There is also uncertainty about the specifics. In the future in a warmer world how will extreme events change: where will they change, when will they change and what will be the combination? Will we continue to have floods in Queensland at the same time as in Victoria and in south-east Australia? There is uncertainty about that. Will we continue to have drought in south-west Western Australia at the same time as in South-East Australia? That is the uncertainty I am talking about. It is uncertainty about the impacts not the science.

Senator CAMERON: This goes to the issue of weather versus climate. That is the issue, is it not?

Dr Kiem: Yes. I read the submission from Neville Nicholls on that and I think he summed it up pretty well.

Senator CAMERON: I am not a climate change sceptic but I am a Productivity Commission sceptic I must say.

Dr Eburn: Are you talking about the interim report?

Senator CAMERON: Yes.

Dr Eburn: I thought the interim report had some—

Senator CAMERON: The Productivity Commission, in their recommendation to government on the barriers to effective climate change adaptation, say that we should ensure that regulatory and policy frameworks do not impede private risk management. This is the bias of the Productivity Commission towards the private sector—that the government should be minimised, that the government cannot do it properly, that the private sector is the only way to go. This goes directly against the evidence we have had here today from Dr Donald that the private sector—that is, people in the local area—just cannot do it by themselves, that they need the government overview. It comes back to the recommendations you are making in your submission that state governments should expressly set out the role of local government in emergency response and articulate the relationship between state agencies and local governments.

I have put the position to Dr Donald that I think you need local input because locals know what is happening. There is a limitation to what governments can do in terms of a set framework in my view but I do not go to the argument that the Productivity Commission do, that you cannot impede the private sector. The private sector needs leadership, I think, on many occasions. What is your view about taking this forward legislatively? How do we legislate to deal with the issues you put forward in your submissions 1 and 2?

Dr Eburn: I think I have addressed why the Commonwealth should have some power. I do not do think that the states should. If you look at various emergency management legislation and local government acts about the role of local government in emergency management, you see that it is almost non-existent. For a long time local government has been the provider of resources to state agencies. Whatever the combat agency is, whether it is the fire agency or the SES, they would contact the local council and say, 'We need a bulldozer,' and that was pretty much the extent of their involvement. I think the critical thing for local government—and it was a comment I was going to make in response to Senator's Milne's question too—is that you have to make some decisions on a local level about what is the acceptable level of risk. When we have these discussions about how we need to adapt and deal with these future events, the reality is that we have always had bushfires, as Dr Hanna said, and we are still going to have them. We are going to have cyclones. People are still going to live on the coast because it is actually really nice, and they are going to live in the hillsides behind Melbourne because it is really nice, and fires are going to come through there and, I am sorry to say, people are going to die. But I am not sure that that is always a failure. What we have to try to determine is what the acceptable level of risk is, and this is where I think that local government is critically important as to who decides what the acceptable level of risk is.

I am a bit all over the place, I will grant you, but I really think a tragedy out of the 2009 bushfires royal commission—and to come back to something that Dr Hanna just said—was that it quite rightly out of compassion for the community said that it was going to focus the 173 people who died. They completely failed to tell the stories of the people who did not die and what those people did right. So we get a picture that people are not adapting and are not prepared and able to cope without the fire trucks coming. But they know what to do. People do, and they survive, but their stories do not get told. I think the critical issue—to come back to your question—is for local governments and authorities to be the ones to decide what the acceptable level of risk is. Local governments should be able to decide whether they are going to let people live in a really nice place where they will be able to get a ratepayer base because people are going to come in, but equally, they should recognise there is a risk. If you have a residual risk, just because it happens does not mean that anybody failed. I think that is the critical role for local government.

When we come back to the private sector, I agree with what you said about the Productivity Commission. If we do not want to interfere with people's private choices to make their own defensive decisions, then the classic problem arises. I am not a water scientist, obviously, but my understanding is that if you let people build their own coastal protections or whatever, you are just shifting problems. You are just allowing them to pass the problem to someone else. Somewhere someone has to be the decision-maker about what is an acceptable level of risk. It seems to me that that is critically a local government issue.

That is also consistent with the National Strategy for Disaster Resilience. We want resilient communities. Let communities make these sorts of decisions. That is the balance, I think, because then that enables a decision to be made that says to the private sector or, more importantly, the private individual, 'You just cannot do that. You cannot just build your seawall to protect your property because all you are doing is damaging someone else's,' or 'You cannot decide that in this beautiful bush block that we are all living in, you are going to concrete yours because it will be fireproof,' but it actually destroys our amenity. Equally, to other people you can say, 'You cannot let your bush block become an overgrown natural wilderness because, yes, it is really nice, but actually

you are putting everyone at risk.' Someone needs to be taking that line: how do we manage this risk and what is the acceptable level of risk? I think that local government is the critical group to do that.

That will lead to inconsistencies, but surely that is what communities are for. Do they have to be consistent? That is why we have states. The basic principle is that they are not the same and they are allowed to make different decisions and experiment, and you can then learn from that—this one did it this way and that one did it that way so which is the better way? I am not sure that that is an answer to your question, but I think that local governments are key players here but they are given very little authority. In the legislation they are given very little authority. The economists, I think, will tell you that they are also given very few resources.

Senator CAMERON: One of the submissions we had just prior to your coming in was local government and they argued that they are suffering because of lack of resources. The risk is being pushed back to local government from state government without appropriate resources. Has anyone got any views on that?

Dr Eburn: That is certainly what you hear. It is not a field of my research so I cannot comment on it, but certainly that is what they say. Legislatively, I can say that they have virtually no power in any of the local government acts or emergency management acts to do anything particularly—

Senator CAMERON: What role should COAG play in bringing about appropriate legislative change at all levels of government to bring about what you are proposing?

Dr Eburn: COAG can really only ever play a guiding overall policy principle role. I think that COAG has written the National Strategy for Disaster Resilience which is a good high-level document. It has limited translation. But that really is the role of COAG, I would have thought: to set that high level policy and to then encourage and work with the states, who then have to encourage and work with their local governments to give it effect and teeth. But it has to also be different, because local communities are different across the country—which would go against that template model, because they are different.

CHAIR: Can I thank each of you very much for the time you have taken where submissions have been presented and the time you have taken in addressing the committee today. It is genuinely appreciated by all of us, and we thank you for your participation in the inquiry.

The committee will now take a brief suspension.

Proceedings suspended from 10:45 to 11:04

DOBSON, Ms Corinne, Senior Policy Officer, Australian Medical Association

HAMBLETON, Dr Steve, President, Australian Medical Association

CHAIR: I welcome representatives from the Australian Medical Association. Dr Hambleton and Ms Dobson, thank you very much for joining us today and thank you for the submission from the AMA, which was received as submission No. 104 to this inquiry. Do you wish to make any amendments or alterations to your submission?

Dr Hambleton: No, thank you.

CHAIR: Would you care to make a brief opening statement before we proceed to questions?

Dr Hambleton: Yes, thank you very much, and thank you for the invitation to give you verbal evidence as well as our submission. The fact is we have lived and breathed, I guess, the problems we see with extreme weather events. There is no doubt that there has been a change in the frequency and severity of extreme weather. We have seen that in Queensland—and I am a Queenslander—but we have also seen in southern states. We have seen droughts, we have seen bushfires, we have seen floods and we have seen once-in-a-hundred-year events happening as frequently as every two years. There is no doubt that it is harming people. We have seen the immediate impact of floods and fires. We are seeing the impact of displacements. We are actually seeing the impacts of extreme heat, and we know that the death rate climbs as soon as the temperature gets above 37 degrees—and that has happened in all of our capital cities.

We also see the shifting patterns of infectious diseases, things like mosquito borne diseases that are moving further south. We are seeing illnesses occurring much further south than we ever saw before. We are also seeing delayed issues, the mental health issues that occur after disasters have happened—three months later, that impacts on our community. There is no doubt that we need to do better planning. Extreme weather events pose a significant challenge to human health, and as the peak medical organisation we believe that preparing communities, service providers and governments for these health impacts is a public health priority.

As I said, the frequency and intensity of these events is increasing, they are leading to increased mortality and morbidity, and they are damaging health infrastructure. I suppose that is the other part. We have seen infrastructure damaged and hospital evacuations. When there are fires, there is nothing left behind. At least with a flood it is just covered and can be uncovered.

Chronic disease is where the impact is felt. Those heatwaves actually cause increased death rates because of chronic diseases. People with renal disease, cardiovascular disease or respiratory disease, our elderly and the very young are the ones who feel the impact. We do need to minimise and manage the health impacts of these more frequent, intensive weather events and we are concerned that the current policy response nationally is inadequate. We want to try to drive some improvements and support proper preparation and planning at the local level but really nationally coordinated. We need to provide some leadership, as I say, at that national level.

We certainly acknowledge the importance of some jurisdictions already where some good things have happened. Much of it has been reactive rather than proactive, though. The National Strategy for Disaster Resilience has improved coordination, but there are some fundamental gaps. The AMA highlight a range of areas where policies need to be strengthened. We need to overcome things like infrastructure and capacity. But we also need knowledge, awareness, communication and coordination, and long-term planning to anticipate future health risks and target populations—because we know where the floods are going to happen, we know where the bushfires may be going to occur and we know that a heatwave is going to have a greater impact on low-socioeconomic demographics. These are things that we should have strategies in place to do something about.

We need to understand and overcome these various challenges because we know that these events are likely to be more severe as the climate changes. We are really calling on the Australian government to develop a comprehensive and coordinated national strategy for climate change and health. We need policy leadership at this level to drive action and co-operation across all tiers of government—state governments, local governments and local sectors, with local groups being engaged.

We need to make sure our general practice workforce is available to contribute as well. They are often forgotten in disaster planning and, in fact, even in the pandemic planning. Our GP groups at the AMA are very keen to be involved, and there are certainly lots of skills in our GP workforce and in the large medical centres that could contribute. Thank you very much.

CHAIR: Thank you, Dr Hambleton, and thank you very much for the detailed submission that you have provided as well. Senator Cameron.

Senator CAMERON: Thanks, Dr Hambleton. I want to go to the issue that you raised on page 2 of your submission—that there has to be a nationally coordinated approach to 'extreme weather events and climate

change'. One of the issues we have heard this week from the Insurance Council and from the insurance industry is that you cannot allocate consequential issues from climate change to the extreme weather events. Every scientist who comes here says that is nonsense; it is the actual physics that determine what happens. Does the AMA have a view on this?

Dr Hambleton: If I understand the question properly, you are asking: are we seeing impacts on health based on those climate change events?

Senator CAMERON: And the extreme weather.

Dr Hambleton: The very clear answer is yes, we are. Where it is reported that we have multiple days with temperatures over 37 degrees, which is the threshold temperature, we can measure increasing death rates in our senior citizens once we get above that level. The higher the temperature goes and the longer it stays high the clearer that data becomes. It is not from heat exhaustion or heat stress; it is actually from exacerbations of chronic disease. Over Christmas this year we saw that right around the country. The AMA was instrumental in trying to put out some really clear advice—that the body's air-conditioning system relies on fluid intake and evaporation. Air-conditioning is very important to keep people at the right temperature, but a lot of areas in the community do not have access to that. So we need to have plans about how we manage that. Moving air is so important, so a fan, fluids, the right clothing and the right way of setting up houses is so important. We asked neighbours to go next door to help.

In some areas there are transport systems to take people to air-conditioned environments, like shopping centres. That would be a very good thing. Of course, with NC, there are the secondary effects on infrastructure. If everyone turns on their air-conditioner we can have power outages. We saw power outages in hospitals as well, and we need to have contingency plans for that. Certainly there is the direct impact of floods and loss of life, and the direct impact of bushfires with loss of life, and there are the secondary impacts that I mentioned earlier about the mental illnesses that occur because of the extreme trauma that people face. Sometimes that is the forgotten thing. It does not occur until a couple of months later. So I think there is ample evidence that these extreme weather events are impacting on health. It is pretty clear.

Senator CAMERON: We had a panel just before your submission. Dr Michael Eburn, who has experience in legislative and legal issues, spoke about the need to develop a national response to this. In your submission you say, similarly, that policy fragmentation is compounded by the complexity of jurisdictional arrangements. The problem we have is that the Productivity Commission is basically telling the government, 'Hands off.' The Productivity Commission is saying that we have to ensure that regulatory and policy frameworks do not impede private risk management. As I have said before, I am not a climate change sceptic but I am a Productivity Commission sceptic. I think there is the attitude that government cannot do anything if it impedes on the private sector. It is absolute nonsense. We had submissions from Dr Alexander Donald this morning about his experience. He is crying out for a national approach to this. How do we as politicians deal with the advice we get from the economists which is all about the economic implications of this? How do we deal with that and deal with your issues? What should get primacy?

Dr Hambleton: It is very interesting. Perhaps they are right about making sure individuals look after their private risks, but we are not talking about that in the main; we are talking about community risk; we are talking about population risk. That is the role of a central organisation. It is certainly a role for leadership—for the central organisation to cause those things to be planned for and changed.

We did see a federal government response—and I am thinking of the 2011 floods in Brisbane. The Chief Medical Officer called together a roundtable which was put together for the pandemic to start a communication plan between the colleges and the primary care providers to see what we can do to centrally coordinate. You have to remember that Medicare and primary care in our country are actually federal. It is a federal responsibility, so it has to be centrally coordinated.

There were very good decisions made. A GP whose surgery was flooded could actually move down the road and continue to see patients, whereas the Medicare rules say you cannot do that without a provider number. But, if you have no infrastructure and you have no way of getting provider numbers, you shut down primary care.

In Brisbane the AMA in Queensland, to its credit, coordinated doctors locally to volunteer. Why wasn't that a plan that was ready to go? Large medical centres like my own let it be known that anybody who was affected by a flood could come in and get bulk-billed, so there was no financial barrier for those people who maybe had no resources. Why isn't there a registry somewhere, or why isn't the government causing a registry to be built, so they know who is ready to volunteer?

We saw a train crash in Victoria. Maybe it was because of bent rails because of heat, but there was a train crash. There was GP down the road with emergency medicine training who did not even know it had occurred but who could have been part of that response process.

So there are large medical centres. There are individual GPs. There is a framework of things that we call on in a reactive way, but it is too late. Recently we had a major flood that flooded Bundaberg Hospital. How do you evacuate an entire hospital if you do not have a plan? If there are no plans in place, if there is no accreditation system that says you have to have a disaster plan, how are you going to engage with your community? How are you going to continue to provide services? These are the sorts of roles that are centralised and can be facilitated by government.

In many cases it is a response at a local level. I know that GPs who volunteered, for example, in Brisbane went along to work with St John Ambulance. It took a while before they figured out how St John Ambulance operates. We need to know how that happens. We need to know where volunteers can go. We need to know where the list of doctors who have the competencies and the skills is. We cannot rely on local governments and even state governments to get it right. There needs to be some leadership at a federal level.

Senator CAMERON: I suppose the debate on climate change has really focused very narrowly and simplistically on the implications for companies to pack up and move away because of cost imposts. This is the argument that has dominated. I think it is a nonsense argument in a whole range of areas. However, you are saying that one of the big arguments that have to be out there is the health implications. Would you like to expand on that?

Dr Hambleton: That is certainly the case. There are health implications, and we have had, if you like, a live-firing example of that in the last two years. We have seen the impact of fires and floods. We have seen the impact of hot weather. We know that extreme weather events are going to occur more often. Two floods in Brisbane two years apart when they say they are once-in-100-year floods is unprecedented. I remember back in 1974 saying, 'It will never happen again,' and I live in Brisbane. Now we have had three once-in-100-year floods in 37 years. So these are happening more. They are having health impacts.

We see tropical diseases moving further south. We see the mosquitoes being able to survive. We see waterborne diseases and arboviruses moving south—Ross River virus and things like Barmah Forest virus turning up in places you do not expect. Dengue fever is marching south. Ground borne diseases are also turning up where you would not expect because the river flows and heat can bring them down.

So we are saying that there are going to be health impacts. We need to plan for the health impacts. We are planning for the ageing of the population, and we know there is going to be an impact, but it will be accelerated in pockets where these natural disasters occur, whether it be cyclones, whether it be floods, whether it be fire or whether it be just heat.

Senator CAMERON: But I suppose, if some politicians went out and ran the same argument that you have put now, they would be accused of scaring the public and running their own political agenda. How do we get over that? Do you have any idea? I am not asking you how I do my job, but it is a wider societal problem that people do not understand the issues you have just raised, and to some extent we, partly because of political issues, are failing to get this message out.

Dr Hambleton: The whole country has lived through the last couple of years and recognises that we have seen more extreme events in that time than most of us can remember over our lifetimes. It is a great opportunity to say that the federal government has seized this opportunity to do some planning so that, rather than reacting when things occur, we can push a button and have teams in place, lists of names available, agencies which have already communicated with each other and know how each other operates and we are ready.

Every doctor works in a major hospital as they do their training and all of them have plans for surges of patients in emergencies. They have yellow alerts, red alerts and green alerts. So we are used to doing some planning for contingencies like that. We can broaden that to the community in saying, 'We do have plans in place. We do have communication lines we can open up. We know agencies know how to work with each other because they have practised.' I think that is just prudent, and I think people will accept that.

Ms Dobson: I think also in making that case for why it is important to address this issue and also picking up on that productivity framework which is focusing on the economic implications one of the issues is that the kind of health impacts that Steve is talking about have economic implications as well. What we would really like to see is that some of those health costs are systematically assessed and taken into account when we are looking at the planning and in making the case for why we need to take those steps that we are recommending. These have health impacts. These health impacts also have economic consequences. They have productivity consequences.

When you are seeing the cumulative impacts on certain communities where they are more prone to having extreme weather that can erode the health of those communities. It erodes the infrastructure there. It has mental health consequences and so on. These have ongoing health and economic implications, which is why we need to take those kind of planning and preparatory measures. I also emphasise that there are certainly, as Steve has mentioned, some significant health risks and consequences that are concerning. But there are measures that can be undertaken to try to minimise those risks. That is part of what we are advocating.

Senator CAMERON: Are you aware of either what government or AMA is doing to advise medical centres and doctors about this march south of dengue fever and Ross River fever? Have you got a plan to advise doctors about how to deal with it who have never, ever seen it before? This is a longer term issue. This is not an emergency issue; this is an emerging issue that is going to be there for some time. What are you guys doing about that?

Dr Hambleton: When you look at that, it is a reactive process. When we had those floods in Queensland and the majority of Queensland was under water for a short time, the information was available then. We know that is going to happen. If you work in Cairns and you get someone with a high temperature you are going to do the dengue fever serology. We know that if you have had dengue fever once and you get it a second time you are at risk of dengue haemorrhagic fever. But if you work in Brisbane that is not the first test you are going to reach for. So we do need to remind people that there is this march south. There are diseases that occur in Darwin that we do not see in Brisbane but that you will see further south. There are no plans that I know of, other than that all of us are comprehensively trained. You do tend to focus on the things that are common in your area. But there is no plan that I know of to continually update people.

The office of the Chief Health Officer obviously has a very strong role in some of these areas to make sure that information is disseminated. I have said to the Chief Health Officer, 'Don't underestimate the impact of one of your letters.' But if we overuse it that impact will be minimised. So we cannot be reacting; we have to have a plan for informing people and making sure they are aware that these diseases are on the march.

AMA Queensland, for example, ran a program for mental health to watch out for your neighbours—'Here are the symptoms and signs of a mental illness you might see in one of your neighbours.' That was trying to engage the community in saying, 'After the floods, if people do not seem to be recovering, if they are not sleeping well, if they are pretty low, it could be a mental illness coming on. Get them to see their family doctor.' So engaging the community and informing the community is really important as well.

CHAIR: Just before I go to Senator Milne, I need the committee's approval to allow a photographer to take some photos. That motion has been moved by Senator Milne, and is carried. Senator Milne?

Senator MILNE: I just wanted to follow up on, obviously, the Commonwealth's role, but you mentioned before that hospitals are accustomed to anticipating various levels of emergency and so you have green or orange or whatever. But what we heard from Dr Donald this morning was that there is really no planning, when a full-scale emergency is anticipated, for when the emergency also affects all the staff at the hospital, including the medical practitioners, right through to the people working on the front desk. So what has the AMA done, if anything, to look at this issue of what you do to manage an emergency when all of your staff are also likely to be vulnerable to the same emergency at a personal level—so they are in the hospital and the cyclone is coming, or they are in there and the flood is happening, or whatever.

Dr Hambleton: That is a really important point, because hospitals prepare for surges of patients but when you are affecting the staff it is a whole different ball game. The best example of that was when we had the scare about the pandemic. Medical practitioners and their staff and all of the people working in the health system were at equal risk, and when the pandemic first started, with 20 per cent death rates, the people who were going to be affected first were going to be hospital staff. So part of the pandemic plan was that we would get antivirals and stockpile them and make them available for hospital staff as a priority, and when the vaccines became available the medical staff would get those as a priority because they were working at the front line and at the greatest risk.

With disaster planning, we have not done that. We have not actually said: 'When we are unable to staff the department because they are looking after their families, what do we do?' That is where local jurisdictions will be overwhelmed, and we will need a broader plan saying: 'If Bundaberg staff cannot help, we need some staff from somewhere else, so where is the list of people prepared to go there? And what impact does that have on the surrounding areas? And what are the meaningful networks of workers that we can actually plug in at that time?' So I do not think too much planning has been done. Pandemic planning was done, and the model for that is a good model.

Senator MILNE: That is the point that I think was being made today: that there is no planning to look at this, and we know that these events are going to be more common and likely to be more intense, so this kind of planning needs to happen.

Dr Hambleton: Correct.

Senator MILNE: I guess I am asking you to reflect—and you may want to give us some feedback—on how the AMA can drive this.

In terms of your engagement with the federal bureaucracy, how focused would you say the federal health department is on taking a leadership role nationally in helping the health system plan for emergencies of the kind that are going to be generated by extreme weather events?

Dr Hambleton: There are three questions. If we go back to what the AMA is doing, the AMA Council of General Practice has put together a couple of papers to indicate that there are lots of resources in primary health care that are not being utilised appropriately. Our GPs have basically said that they are available—they want to be part of the planning process—and I guess we have made that known.

In terms of where I see the health department doing some national planning, the main area where I see that occurring is the office of the chief health officer. When something occurs, it is the chief health officer who coordinates leadership meetings amongst various people. As to the department of health, I do not see them doing that long-term planning outside of that area; they are focused mainly on health-care delivery. But the chief health officer, to give to that office its due, has been an early responder and an active planner—not so much for climate change related health issues but for national issues of importance. The planning, for example, for the pandemic, well before we had that, was done there.

Senator MILNE: But the point that I am making is: yes, there are plans for terrorism, there are plans for pandemics, but there are not plans for what we are actually experiencing right now and are likely to experience.

Dr Hambleton: I would agree with that.

Senator MILNE: The probability is a much higher probability than for a terrorist attack or a pandemic; nevertheless, we are preparing for those. I want to come back to the role of GPs and the community, and this goes to Senator Cameron's point about the community being aware of the health impacts of climate change. How many GPs talk to people with a chronic illness about how the drugs they are taking may be compromised or have some side effect if there are three days over 27 or 35 or whatever the situation might be? I am not aware of it—and this is purely anecdotal; it is not scientific in any shape or form. I have asked my friends and family and so on: has anyone said to you, 'If you have got high blood pressure and you are on this particular drug and it is really hot then you ought to get yourself into air conditioning or you should have a fan or be aware that you are going to be impacted more than the next-door neighbour?'

Senator CAMERON: You are in Tasmania, Senator Milne.

Senator MILNE: Actually, it affects us more because we do not have air conditioning. We are unaccustomed to it. When we do have a really hot day we are more unaccustomed to it than someone, say, in Sydney.

Dr Hambleton: It is a very reasonable question. Again, it is impossible to measure that sort of conversation. Certainly when there are hot days that advice would be given by GPs about exactly what I said earlier—adequate hydration, adequate ventilation, even if it is not air conditioning. The body's air conditioning system is perspiration and evaporation, and to maximise evaporation you need air flow. We cannot measure that conversation, but it would be a very important conversation because the older you are and the more complex your medication list, the more those medications will affect your ability to perspire and to regulate your own temperature.

Senator MILNE: So the point I am making to the AMA is that, if the AMA is encouraging professional development through the system, it is too late once the hot weather is on and the patient presents already suffering impacts. Surely, when you prescribe a medication, part of that now has to be telling people that if it is very hot or if this occurs then they would need to take other action. So my suggestion to the AMA is awareness raising. The other one is that there is never any data. I have been trying to find out, for example, the health impacts of the heatwave in Adelaide that was occurring at the same time as the Victorian fires. How many people actually died? Was it true that they had to set up a temporary morgue there because so many people lost their lives? And where is the analysis of the health impacts of that or, indeed, of this last summer when we have had heatwaves in various parts of the country? Where are those? If people read about their own local jurisdiction and what has actually happened, they are going to be much more focused on this than if they just hear on the news that heatwaves cause health problems. It is not the same as 'so many people died in Adelaide that they had to get a temporary morgue'.

Dr Hambleton: Thank you for that question. I can take that on notice and give you a paper that was written by a prominent individual about the impact of heat on death rates. I am not sure if it has been analysed for the recent past, but the work has been done and the methodologies are quite well known. As you say, it is an indirect measure because you are not actually measuring heatstroke, heat stress. That is not what you look for. You have to correlate temperature with death rates. When you do that, it correlates with the increasing temperature. A report was written—

Ms Dobson: There has been analysis undertaken looking at the 2009 heatwaves in Adelaide and Melbourne and at that kind of data that Steve is talking about. As he mentioned, it is difficult to directly attribute mortality to heat. Often you get a harvesting effect. So, with people who might already be predisposed or quite ill, it will hasten the deterioration of their symptoms. But when you look at the data on mortality and hospital admissions for the particular conditions that are made worse by heat, clear patterns emerge; but a lot of that data analysis is done quite some time later.

But it is not easy to get the hospital data when we have these events; it is not easy to track that. I think there is definitely a gap in data collection and the way that that health surveillance data is linked into data around weather and climate, and that is one of the issues that need to be addressed. If we are going to make targeted planning we need to have that kind of information and data as a first point, and that is where there are gaps—and, I think, a role for the Commonwealth in addressing those gaps.

Senator MILNE: Okay, so the issues are data collection and fragmentation of policy between jurisdictions—and you see a strong role for the Commonwealth in terms of leadership, clarification of roles and responsibilities, and actually putting into the federal health bureaucracy a directive to get planning for health impacts. The other point Dr Donald made this morning was: how you plan health services for the community when the people providing those health services are as impacted as everybody else by the fire, the flood, the cyclone or whatever.

CHAIR: Thank you, Senator Milne. Can I pick up, in a sense, on the preventative and educational aspects of your submission and what we have talked about today—and, obviously, in the heat-stress phase, or the consequences and outcomes of heat, the best thing that can be done is to make sure that at-risk individuals as well as the community more generally are better educated about the personal steps they should take to prevent the consequences that could befall them if they expose themselves too much to heat.

Firstly, what better role do you think primary healthcare providers can undertake in getting that better understood by those who are most at risk? In particular, of course, we are talking about the elderly or the frail in that regard.

Dr Hambleton: I think there is a very good role—we see the elderly eight or nine times a year, on average, in our surgeries; and there is an opportunity for primary-care providers, as part of their preventive health impacts with their patients, to actually explain to people about ventilation, perspiration, evaporation and when it is appropriate to switch on that air conditioner. I have personally visited a lady at one o'clock in the morning when it was 28 degrees and she was all ruffled up. I was sweating, wearing this suit, and she had an air conditioner that was not switched on. People don't turn them on for financial reasons but, on those hot days, when an air conditioner is available, they are very helpful to maintain body temperature. As I said, there are the simple messages that we can deliver about adequate hydration and air flow—a simple, cheap fan that is very cheap to run, to increase that air flow—and appropriate clothing. How many times have we seen our elderly relatives dressed up for winter in the middle of summer? How many times have I gone on a house call and every single window in the house is shut, because of security issues? It is all very disturbing, because that minimises air flow and maximises humidity, which makes it doubly bad. So we do have a role, and we do want to take on that role and make sure we prepare our elderly.

The other time of life we have to be really careful of is infancy. It is up to us to dress infants appropriately—the dangers of swaddling infants and keeping them overly hot, and how you tell whether a baby is hot or cold, are the sorts of things we need to teach parents. Again, air conditioning makes that easier but, when an infant is all wrapped up, are they over-heating or not? Is their face sweating? Are their fingers or toes hot and cold? New parents do not know some of these clues, and it is up to us to tell them.

CHAIR: One of the witnesses yesterday gave evidence in relation to the impact of heat events. They put to the committee that research indicated essentially that it was a prolonged period of failure to cool overnight below the high-20s type degrees that perhaps had a greater effect than a prolonged period of high-temperature days.

Is that your understanding of where the risk is heightened? If it is, do you believe that is a clear area of failure of community understanding: that 28 and 30 degree nightly minimums cause the problems more than 42 degree daily maximums?

Dr Hambleton: It is a complex area and I will have to defer to the experts in this area. As I said, there were papers written on this. Senator Milne, I will try and get that paper to you.

Senator MILNE: To the committee.

Dr Hambleton: To the committee. I will have to defer to the experts. It is a complex calculation that involves the humidity, because that decreases the evaporation, airflow and breezes. With night-time temperatures, from a first principles perspective, if you are dehydrated and you are continually dehydrated, you are increasingly at risk. The paper that I am talking about looked at daytime temperatures over 37 degrees, and the death rate started climbing. I will have to defer to the experts in that area. But globally the solutions are similar: hydration, perspiration and evaporation.

CHAIR: Thanks, Dr Hambleton. Thank you both very much for your time today, for the detailed submission that the AMA has made and for the thoughtful evidence that you have given to the inquiry.

COSIER, Mr Peter, Member and Convenor, Wentworth Group of Concerned Scientists

DAVIS, Dr Richard, Member, Wentworth Group of Concerned Scientists

HARDING, Dr Ronnie, Member, Wentworth Group of Concerned Scientists

HUGHES, Professor Lesley, Member, Wentworth Group of Concerned Scientists

KAROLY, Professor David, Member, Wentworth Group of Concerned Scientists

STUBBS, Mr Tim, Environmental Engineer, Wentworth Group of Concerned Scientists

THOM, Professor Bruce, Member, Wentworth Group of Concerned Scientists

WILLIAMS, Dr John, Member, Wentworth Group of Concerned Scientists

[11:41]

CHAIR: I welcome the Wentworth Group of Concerned Scientists, who are here in number, with a couple on the phone as well. The committee has received your submission, submission 24. Do you have any amendments or alternations to that submission?

Mr Cosier: No, thank you.

CHAIR: In that case, I invite one or some of you—I will not necessarily invite all—to make a brief opening statement.

Mr Cosier: That is very wise. Firstly, thank you for the opportunity to appear. We consider this to be a very important inquiry by the Australian parliament, because the recent reports on the impact of extreme events on Australia highlight not only just how urgent reducing emissions is to our future wellbeing but also the need for Australia to begin a long, complicated and expensive process of adapting to climate change because the world has been too slow to respond.

I am therefore pleased that a number of the members of the Wentworth Group of Concerned Scientists have been able to attend today's hearing and bring their individual expertise to assist senators in this inquiry. The expertise of the members of the Wentworth Group is broad ranging in this matter. We have with us today Professor Karoly, who is an expert on climate science; Dr John Williams, an expert on agricultural science; and Dr Richard Davis, an expert on water management. On the telephone, we have Professor Lesley Hughes, an expert on biodiversity adaptation. We have here Professor Bruce Thom, an expert on coastal management; Dr Ronnie Harding, an expert on risk management; and me, an expert on environmental accounting and natural resource management. I will do my best to direct your questions appropriately, depending on what they are.

In summary, we would like to make five brief points. The faster that the world reduces its emissions, the less damage climate change will cause to the Australian economy and our environment. Therefore, Australia needs to push the world to adopting deeper emissions targets, which means we have to do the same.

Our second point is that climate science modelling says that Australia should expect more frequent and more intense extreme events. This will have significant economic and environmental consequences. The most important response is for the Commonwealth government to support no regrets actions to restore the health of our soils, vegetation and waterways so that these assets are best placed to adapt to these impacts.

The third point is that we cannot manage what we do not measure. We must first understand the condition of our environmental assets at a scale that can inform economic and policy decisions. To this end, the Australian government needs to install across Australia a regionally based system of environmental accounts that monitor the condition of our environmental assets—our soils, vegetation and waterways—and whether their condition is stable, declining or improving and what impact climate change is likely to have on the condition of these assets in the future.

Our fourth point is that extreme weather events impose significant hardship on people living in coastal areas and those who live in and near major urban settlements. These impact on people and the costs they impose impact on the Australian economy. We should harness the high-quality science that this country has invested in over many years to improve our emergency response capabilities to manage extreme weather by improving our capability to predict and monitor the movement and intensity of these weather systems in real time, whether it be droughts, cyclones, bushfires, floods or storm surges.

Our fifth point is a very simple point: we need to put these actions in place now. We would be very pleased to take questions.

CHAIR: Thank you very much. I will start quickly on the area of actions to restore our soils and waterways. What specific actions do the Wentworth Group believe need to be undertaken in that regard?

Dr Williams: The first thing we would say is that a system that is under stress is a system that is difficult to respond to extreme events. Many of our river systems and our agriculture systems have been damaged by our current practices and therefore to restore the resilience of those systems is one very important way of helping to be able to accommodate the sorts of changes that we are seeing and we foreshadow into the future. So it is a matter of preparing our landscapes and our river systems to be as sustainably managed as possible. That gives us the best chance of them responding to the impacts of climate change and shift and variability.

CHAIR: And the types of actions necessary to restore systems as you identified?

Dr Williams: The two things that are very strong in the case of catchments are first and foremost to maintain our native vegetation in place. There is a clear importance to keep our vegetation in place to control the hydrological response of the river system. The second thing is to minimise the extraction of water from our river system so that our ecosystems are in a good place to respond to the extremes of drought and flooding circumstances. They are two very important things, and I therefore think we should encourage the natural resource management strategies that are available in Landcare movements and groups of catchment planning processes, particularly catchment action planning, to make sure we have our catchments in good health. Those are the two things: the extraction from them and the maintenance of vegetation cover and the maintenance of agricultural land in a sustainable place.

CHAIR: I will go to the measurements issue and I particularly want to get your views on local understanding of effects in local areas that could assist local authorities and governments more generally to better handle planning issues, the insurance industry to better address the risk, those types of areas of measurement. What does the Wentworth Group believe we are doing right at present in that regard? Where are the opportunities to do better?

Prof. Thom: On the issue of planning, what we are faced with in Australia today is that historically we have got a legacy of actions that take us right back to the days of Governor Macquarie essentially when he started thinking about the planning issues of putting people and structures at risk in floodplains. We have continued to do that. We have continued the economic drivers of the day, the political drivers of the day, and allowed subdivisions and allowed infrastructure to go to places which are in harm's way to natural forces, whether they are floods, whether they are coastal inundations, coastal storms. We have allowed this to happen. So extreme event phenomena have impacted adversely on our society ever since the Governor Macquarie days. What we do not have is a clear articulation as to what is at risk now and what could be at risk in the future with growing population. In the work that I have been involved in in coastal assessments now going back to the 1970s, we have attempted to try to convince governments to understand the nature of that risk.

I was involved in the Academy of Science report of 1979 following the work that we did at a symposium in 1976 that looked at the impacts of the fires of '67, Cyclone Tracy and the big floods of '74. We put proposals together from that for more coordinated federal government action. Subsequent inquiries that I have been involved in on coastal matters for the federal parliament repeatedly asked the federal government for leadership in this area. It has not come forward—and there are good reasons why it has not come forward, because of the nature of the relationship between the states and the federal government. This has allowed states and local government to put people's lives, property and public infrastructure at risk, and continues to do so.

We had 30,000 properties below the 1974 flood level in Brisbane that were impacted, even though there was a strong attempt to stop flooding impacting adversely after '74. The belief that Wivenhoe Dam was going to stop the flooding was obviously a myth. This is the sort of thing that is continuing. New South Wales has allowed a lot of flooding to occur in particular areas where people are at risk. The only place where we really attempted to remove people from floodplains was the Hunter after the 1955 floods. So we have this awful legacy, and we have now got to address that legacy because the cost to the Commonwealth that we saw from the 2011 floods in Brisbane and other parts of Queensland, involving a flood levy, was \$5 billion to \$6 billion of taxpayers' money. How do we stop that from occurring into the future? We have ideas that should be implemented involving better institutional changes in the relationship between the Commonwealth, the states and local government.

CHAIR: A lot of witnesses through this inquiry have told us that they think there is a lack of understanding off where risk lies in certain geographical locations. From what you have told us, we have a pretty good understanding for a lot of the country as to where the risk lies already.

Prof. Thom: Yes, we do. That is under the current circumstances. The work that I have been involved in with the department of climate change looks at future risk in coastal areas associated with sea-level rise that

exacerbates that particular issue. But right now, as you have seen with the recent flood events in Queensland and along the New South Wales coast and with the impact of fires in areas where we have people living in fire zones, we know enough now about the nature of the physical risk and we know enough now about how that is likely to impact on present populations as well as growing populations.

Particularly concerning to me is the continuing growth of populations along the coast in vulnerable areas, and it is that that we feel we must look at nationally. We cannot just allow the states to go and do their own thing because they will be driven by state interests. By definition, they have been historically much more short term in nature than what we believe to be the Commonwealth's interests, which should be much more longer term in nature.

CHAIR: What are the opportunities and the challenges for mitigating risk in the areas that are already well-developed and well-populated?

Prof. Thom: One of the first things is to have an acceptable national level of mapping of the risks. One of the difficulties we have had in the past, which was pointed out in the IAG report—I am looking at this on page 12—is where there have been inconsistent, outdated approaches to determining flood risk, the refusal or inability of a large range of councils to release mapping and a lack of consideration given to the effects of climate change or current flooding issues. We have had this history. We had a premier in New South Wales many years ago who asked the authority responsible for flood mapping to destroy the flood maps because the citizens of Western Sydney at the time objected strongly to being identified as citizens at risk of flooding. That premier ordered his departments to destroy those maps.

With current technologies and information we have gone beyond that, but we actually need to have a national methodology that is consistent so that we do not have state-by-state variation or local council by local council variation and so that the local councils or whatever regional authorities are involved can go to that national body and seek the appropriate information that we know from the historical records on what the risks are. It is not rocket science. There has been a lot of work done by different entities, consulting engineers and others that has defined those risks but it has not being brought together.

The Wentworth Group idea here is that, at the national level, we should look at disaster management not as a matter of the Attorney-General's Department—it is a reactive process through Attorney-General's—but bringing it forward in a proactive way with an entity; let us call it local government, regional development and disaster management. It is the link between local government, regional development and disaster management where the cutting edge is. That is where the forces are going to be of greatest impact on those local communities. By bringing disaster management much more proactively, in terms of mapping and information available, into that particular entity, you will get a more coordinated response.

CHAIR: In terms of taking the understanding of risk and ensuring that it is actually understood by individuals, by households, by people who can and should be taking some element of responsibility for their own risk and who should be making their own assessments as to how much risk they are willing to take, is there any good work that you have seen already done? Or do you have ideas for opportunities to be able to translate those types of risk assessments into information so that, when people are making decisions about where they buy their house or where they live and how they live and what mitigation steps they may take individually, they are informed of the risks and can then take personal responsibility for whether or not they act on those risks?

Prof. Thom: The complex issue of notification of risk and understanding of risk at the local level is extremely politically contentious. We saw that during the course of the last New South Wales state election and the follow-up actions of the coalition government in New South Wales, which was responding largely to the fear of many in the community, who were shown—more through the New South Wales EP&A Act; there were section 149 certificates—what risks they were facing now and into the future. This led to a change of government policy with respect to that, which means that local communities are now far less understanding of the nature of the risks than they were. They of course depended to some extent on insurance or noninsurance, as the case may be. That has again become a particular issue on the coast, because no insurance company insures for coastal erosion or flooding by the sea. The question of flooding by land and sea, which occurred in Newcastle in 2007, is a contentious issue again for people. So the matter of notification of risk is particularly a difficult one. Again, it is about having an independent source of information about that and not relying just on the local councils and the local council politics.

Look what has happened in the last few months at Wyong. Wyong council has a very different view about the future of risk than its adjoining councils—Gosford and Lake Macquarie. Why? Because of the nature of the political structure in Wyong compared to Gosford and Lake Macquarie. We have this inconsistency, so residents

of Wyong will have one view of risk and residents of Lake Macquarie will have another, depending on the view from that council.

CHAIR: You mentioned the role of insurance there. How much of a driver of understanding is the insurance industry at present and how much of a driver could it be in future?

Prof. Thom: I think the insurance industry is well informed. I have had a fair bit to do with discussions with the insurance industry over the last few years.

Senator CAMERON: You probably did not speak to the people we spoke to yesterday then!

Prof. Thom: But the area that I feel we do not have much contact with is the finance sector, the banking sector—those that give the mortgages. The relationship between insurance and mortgages is a complex issue. I have just come back from spending two weeks in Washington. In the United States that is partly solved by the existence of the Federal Emergency Management Agency, FEMA, which was set up in the 1970s because of the failure of the insurance industry to cover the risks faced by people in floodplains and along the coast. But FEMA is having its own set of problems in terms of being able to support the costs involved in big events such as Hurricane Sandy. So there is this issue of how the insurance industry and the reinsurance industry cope in terms of their premiums and so on. But with coastal areas there is no doubt that many people are prepared to still live in vulnerable areas and not have insurance; but still they get loans to have houses there. This really bothers me.

CHAIR: Is there a chance that the insurance industry will be more effective at treading where politicians perhaps dare not tread—that they perhaps already are?

Prof. Thom: I think they are already doing that.

CHAIR: That they will be blunt in telling people, 'We can't insure you,' or 'Here's the cost of insuring you and these are the risks'?

Prof. Thom: In some cases they have already done that, particularly in the coastal erosion, coastal inundation areas. They have made that clear, and I have read some of the submissions. In the area of flood risk, we have seen cases where the insurance industry is pulling out—there is the example from Suncorp in Queensland—but we are also seeing a massive increase in premiums, and they are measuring that against their risk.

Mr Cosier: I will just make an addition to the professor's comments. This goes to the role of the Commonwealth. The point Professor Thom is making is that, with adverse levels in the political system, there are adverse instincts of politicians to make information available, at either the local government level or the state government level. There is an opportunity here for the Commonwealth at the national level, given the sophistication of our scientific monitoring systems, the internet and other access, to show some leadership and get this information out into the community where states or local government, for political reasons, choose not to. We have excellent science capacity in this country. We have institutions like the Bureau of Meteorology, for example, who could provide that facilitation role. So, where the states refuse to get the information out that the professor is talking about, perhaps the Commonwealth could do it for them.

Senator MILNE: And undermine coastal real estate prices.

Mr Cosier: Senator, you would be surprised to hear that in a democracy we believe that people have a right to information.

Senator MILNE: I absolutely do myself. That is the reason this information is not made available. Absolutely, it is a matter of the most expensive property being on the coast.

Mr Cosier: That is correct.

CHAIR: We might try to keep to questions.

Senator CAMERON: I was a bit perplexed by the insurance industry's analysis of climate change yesterday. We had a group called Risk Frontiers, who are funded predominantly by the insurance industry. I will take a minute to go through some of the issues so I do not keep coming back to them. Their submission says:

A wealth of peer-reviewed research has shown that the economic cost of weather-related natural disasters is rising in concert with growing concentrations of population and wealth in disaster-prone regions.

I do not think that is an argument. I think that is a statement of fact. They go on to say:

No role can yet be attributed to anthropogenic climate change.

Then they say:

... we may be centuries away from being able to detect an anthropogenic climate change signal in US tropical cyclone loss data.

They go on to say:

Importantly, the time series of losses exhibits no significant trend over time but there is some general correspondence with El Niño-Southern Oscillation phases.

They continue:

Conflating disaster losses with anthropogenic climate change is to look in the wrong direction and ask the wrong questions ...

Professor Thom said that that engagement is taking place with the insurance industry—probably not with that part of the insurance industry! Risk Frontiers, remember, are advising the insurance industry about these issues. They go on to say:

It should also be borne in mind that given the relatively short recorded history we have probably not seen the worst that the current climate has to throw at us.

I would like somebody to explain what the current climate is. I thought climate was changing. These are the scientists, apparently, who are advising the industry.

The Insurance Council says:

This does not suggest that there is no increase in the intensity and frequency of the hazard due to anthropogenic climate change ...

So there is a bit of a nuanced position here. They go on to say:

... simply that there is currently no observable signal in extreme weather loss data to support the focus given to it. Losses are changing predominantly due to increasing exposure and vulnerability.

That is what the Insurance Council says. The IAG are running a similar argument—that the issue is not climate change, you cannot measure this, and there is nothing to tell you there is a problem. Yet every scientist who comes before us says this is a matter of basic physics. If the insurance industry, with the massive wealth that they are involved in, cannot get the basic physics right, what hope is there for us? Why would they be running these arguments?

Mr Cosier: Some might be centuries away from identifying climate signals, but other scientists are not. I might pass to Professor Karoly, who is a climate scientist, to try and answer your question for you.

Prof. Karoly: Senator Cameron, thank you for your question. You have obviously clearly enunciated some of the points made in that submission by Risk Frontiers. They quite correctly state, as does the Insurance Council, that the increase in the value of exposed property is the dominant factor in the increase in insurance claims. There is no question of that. As you said, that is a fact. They have then tried to remove that valuation aspect. Having removed that, which is highly uncertain, without also removing the adaptive responses of building structures and other factors in protection, they end up with a negligible change in, if you like, the exposure to climate related extreme events.

There is significant scientific—how would I say?—debate about whether the approaches that they have used can in fact identify the observed change in frequency of extreme events like heatwaves, increased exposure to wildfire or bushfire intensity and risk in Australia, or even the increase in frequency of heavy rain events. What Risk Frontiers neglected to point out is that there is considerable uncertainty in the way that they have removed this change in exposure to try to identify the residual effect, which is the climate change related impact.

In fact, what has happened in Australia over time is changes—very sensible changes—in adaptation to past extreme events, such as Cyclone Tracy leading to changes in building codes in northern Australia, or changes in protection against wildfires, and the massive improvements that we have had in the technology and infrastructure that is now available, such as the helicopters and the aircraft, for fighting bushfires. There have been massive adaptive responses. They are not sufficient. We can see by looking at the observational data that there are clear trends to increasing exposure associated with extreme temperatures, increases in heavy rainfall and increases in wildfire.

Senator CAMERON: I have found the IAG quote. I think it deserves to be put on the record and get your comment. They say:

Natural variability of climate is a significant source of uncertainty in understanding the true frequency of extreme events. Additionally the climate science is still developing and how climate change manifest itself is not yet known.

For people who have to legislate, for people who have to go out and run the political arguments, to have the insurance industry, with all of their power and influence, running these arguments is part of the problem of the broader debate, I think. Science is always developing, as I understand it. I am not a scientist, but I understand that it is always developing, and how things manifest themselves is always going to be unclear, but there are some basic principles established. I would have thought that the insurance industry would be accepting some of the basic scientific principles that have been established. I would like your comment on that specific position that the

IAG are stating. It is still developing, and because it is still developing you cannot put any weight on it. They are not saying that, but that is what it seems to me. Because it is always going to develop, you cannot put any weight on what is there. How do you deal with this sort of issue?

Prof. Karoly: I think what that submission says, that the science is still developing, would apply to all areas of science in all disciplines. So there have been a number of assessments in Australia and around the world. The most recent one was the special report on extremes by the Intergovernmental Panel on Climate Change which concluded that increases in hot extremes, increases in wildfire events and increases in heavy rain events are occurring around the world already and are linked to anthropogenic climate change. In Australia, the Bureau of Meteorology and other groups—you will be hearing from them later on today—have already identified and reported on these increases in extreme events.

Other insurance companies, particularly reinsurance companies globally, such as Munich reinsurance and Swiss reinsurance, have their own assessors of increased exposure to extreme weather and climate events, and they have clearly concluded, in a number of reports, that there is increased exposure to extreme weather events and insurance related risk happening around the world already. So there are differences in opinions amongst different insurance companies.

Senator CAMERON: Could you point us to those reports?

Prof. Karoly: Absolutely; I can provide that information to the secretary to the committee.

Prof. Thom: One added point: I spent time in Washington with the US Army Corps of Engineers. They have been advised by the national oceanic administration about having to plan their expenditure—and they spend billions of dollars a year—for increased size of hurricanes and increased frequency of, effectively, our east-coast lows as climate change induced phenomena. So government policy, in working its way through the Army Corps of Engineers, is accepting that as something they have to plan for.

Senator MILNE: Professor Thom, before I go to my questions I would like to follow up on a comment you made: that governments are tearing up risk maps. Can you give me a specific example?

Prof. Thom: In the years when Neville Wran was Premier of New South Wales—I cannot remember what year it was—there was a demonstration of homeowners of Western Sydney in Macquarie Street, and following that there was a directive.

Senator MILNE: A directive to tear up the risk map?

Prof. Thom: To get rid of the risk map, yes. I think 'burn' may have been the term that was used, but I stand to be corrected on that.

Senator CAMERON: Knowing Nifty, there would probably have been a few adjectives used as well!

Senator MILNE: My main line of questioning goes to the fact that, when people talk about extreme weather events, it rapidly shifts to adaptation rather than mitigation in terms of reducing the severity and frequency—in other words, making it less worse than it otherwise would be; that is probably the best way of putting it. So that is the first point I would make; that is a question.

The second part of that question relates to the impacts on the natural environment's ability to mitigate through its own integrity. The more you can build resilience into it, the fewer impacts there will be through the system. Yet that is rarely discussed or talked about. An example in this context is Queensland, and the concern I have is about the impacts on the reef and the fact that extreme weather events are leading to coal mines flooding, leading to that polluted water then being released into river systems, which then contaminates the river systems and further destroys the reef, and around and around we go.

So, in terms of mitigation and where the latest science is, is it true that we are on a trajectory for at least four degrees? You have said, as a first point, that we need to reduce emissions faster, and that that ultimately will reduce the costs, so if you want to be cheaper you have to go faster. I would like you to give a comment on that.

Secondly, my question is on the importance of resilience in natural systems and, therefore, planning about the destruction of those systems—and I am thinking in particular of coal-seam gas and what the impacts are on water, land et cetera.

Prof. Karoly: Senator Milne, thank you for your question. As Mr Cosier said, I can really only answer as an expert the first part. In terms of the first question, yes, based on current projections of emissions and even the commitments already made under the UN framework convention at Cancun and Copenhagen, the world is heading to increases in global average temperatures. The best estimate is about four degrees above preindustrial levels by 2100. But, in fact, higher temperature increases are possible, substantially higher, because there is great uncertainty and the uncertainties are such that there are greater chances of higher temperatures than lower ones. It

is also important to bear in mind that those are global average temperatures. Most people live on land and the land average temperatures are 25 per cent higher than the global average. The area average land temperature increase is 25 per cent higher than the global average because oceans do not warm up as quickly as land. When we are talking about temperature increases, we really should be talking about land average temperatures not the global average.

Secondly, I think your point was about the rate of emission reductions. It is critically important, due to the long lifetime of carbon dioxide and other greenhouse gases, to reduce emissions quickly. As a number of reports have said, this decade, the 2010s decade, is critically important—the critical decade for reducing greenhouse gas emissions globally and in Australia—because that will then set a path for emission reductions over the future period. If we do not start to peak our emissions in Australia and globally this decade, we cannot reach the internationally agreed objective of limiting warming to only two degrees above preindustrial level. But already that is twice as much as we have already experienced and will be associated with further increases in extreme weather events and that is why adaptation is also necessary.

In terms of the resilience of natural ecosystems and biodiversity, I am going to pass on to someone else—

Senator MILNE: Just before you do, if I could follow up on that. What you are saying is faster emissions reductions will help to reduce what otherwise would be more intense and more extreme weather events along that trajectory.

Prof. Karoly: Yes.

Senator MILNE: So is a five per cent reduction in greenhouse gas emissions on 1990 levels enough?

Prof. Karoly: It is a good starting point, but it is not enough to meet the international objectives of stabilising greenhouse gas emissions by two degrees. International assessments suggest that by 2020 the emission reductions for developed countries should be between 25 and 40 per cent below 1990 levels for all developed countries—substantially higher than the current federal government and opposition commitments of only five per cent emission reductions below 1990 levels by 2020.

Mr Cosier: I would like to pass to Professor Hughes, who I believe is the phone, to answer. Given the science that Professor Karoly has just told us about as to what we might expect in the future, the message we would like to give today is that the single most effective thing to do in terms of securing the health of the landscape in the face of significant change is to get your ecosystems into a healthy condition. It is a no-regrets action. We should be doing it anyway. I would like to pass to Professor Hughes, who can explain some of the science that is behind that.

Prof. Hughes: Thank you. I totally endorse what Peter just said. Our ecosystems are potentially in dire need of assistance with climate change simply adding to the existing stresses that we have already put upon them. Most species have evolved fairly slowly over time and have adapted to past climate variability. The problem is that the rate of current climate change is probably at least an order of magnitude or several orders of magnitude greater than the rate at which those species have adapted to in the past. So it is simply not the case that most species will be able to adapt in an evolutionary sense to keep up with the changes that we are currently seeing.

We are already seeing species reacting to climate change by shifting their distributions, by having alterations in their life cycles and by increased mortality during heatwaves and other extreme events. We are seeing the extreme sensitivity to climate change of species and the flow-on effects to ecosystems, and we have been seeing that for the last couple of decades. So, as Peter said, the main way that we can deal with this and help our ecosystems and our species be in the best shape for the future is to reduce all of the other threats, particularly habitat loss but also pollution and over harvesting, to improve the health of our landscapes. Mainly what we need to do is turn the clock back on habitat loss and vegetation clearing.

Senator MILNE: I want to follow up on the issue of coal seam gas, agricultural land and groundwater systems in terms of protecting systems.

Dr Williams: I will ask Richard to speak, and then I will speak to it quickly. Certainly, Richard, you are in charge.

Mr Cosier: Dr Richard Davis is a groundwater expert. Richard, perhaps if you could assist the senator with the issue of climate change impacts on groundwater resources and the management thereof.

Dr Davis: Can you hear me okay?

Senator MILNE: Yes, very well thank you.

Dr Davis: And John Williams may wish to contribute to this after I make a couple of points. The first point I would make is that the groundwater resources of Australia are still not very well understood, and it worries me

that we are moving so rapidly into exploiting coal seam gas because there is obviously an immediate economic benefit to do so at a time when we do not know the long-term effects it will have on many of our groundwater systems which may well turn out to be quite important for current and future generations. So the first point I would make is: do not rush at exploiting coal seam gas until we really understand what effect it is likely to have on our groundwater.

Let me say a couple of things about groundwater and surface water. Firstly, it is not always well understood or appreciated that surface water and groundwater are closely connected in many systems, particularly, for example, in the Murray-Darling Basin. The rivers recharge groundwater at some times of the year and at other times of the year the groundwater is a vital source of water for the flowing of rivers. During the dry periods, many of the rivers simply would not flow if it were not for groundwater seeping into them. When we talk groundwater, we have got to keep in mind always that we are also talking about effects on surface water systems.

The services that the natural environment and the natural river systems provide to all of us—and John Williams alluded to those benefits from the river systems at the beginning of this submission—are at the end of the day partly dependent upon maintaining our groundwater systems. So I would simply make the point that it is important that we think this through before we start to exploit the coal seam gas that underlies parts of eastern Australia and understand the likely long-term impacts on the groundwater systems and consequently some of the surface water systems before we regret some of the decisions and end up in the sort of situation that we are now trying to extract ourselves from in the Murray-Darling Basin. I will leave it at that point, but it is possible that John may wish to add to it.

Dr Williams: The only thing I would add is that it is a matter of general principle, senators, that the more stress on the system, whether it is the groundwater or the river, because of our choices, the more difficult it will be for those rivers and groundwater systems to cope with the extreme changes we anticipate under climate change and the current systems we have. So, if we actually take our arid zone groundwater systems that are most likely to be the source of water for shale gas and coal seam gas, they are going to be systems, particularly ecosystem dependent groundwater systems, which will therefore have stresses on them that will make them less adaptable to the extremes of climate change and the extremes under the very nature of the Australian climate. That is a very important principle.

Senator MILNE: As a last question: you may be aware that the National Climate Change Adaptation Research Facility is going to be defunded as of this year. It is of great concern to me because it seems to be the only interdisciplinary national organisational mechanism to bring together a whole lot of things to give local government particularly—I come back to your point about local government—the interpretation of the science models which allows them to make local decisions in an informed way. You represent a whole lot of research institutions between you. I wonder if any of you or all of you might want to make a comment about the importance of NCCARF and/or the vacuum that will be left if we do not have such a National Climate Change Adaptation Research Facility.

Prof. Thom: I might speak to that. I was very much involved in the development of the settlements and infrastructure plan for the NCCARF program, and that was the largest of the NCCARF programs. It is with great regret that I see this program is not going to continue. Something of this nature has to occur, because if we are not doing the sorts of things that we have been talking about today then we are going to leave lots of decision making, both in the private sector and in the public sector, in the lurch. The CSIRO have their adaptation flagship, so there is an entity there, but that does not do the same sort of thing that NCCARF did, which was coming out of those types of projects that were very much linked to a lot of local government concerns. When you have these sorts of programs and you start them up for four years, you are really only just getting going. Some of the PhD students who were funded in this program will, I think, be having some difficulties in continuing their work. I do not know that for sure, but when you have these sorts of things only lasting for four years you really cannot evaluate their impact. You really need a minimum of 10 years for these sorts of programs so that you can measure their effectiveness. Four years is just not enough. So we need something. I do not know what the structure should be—we can talk about various other models—but we certainly need something that will take that place.

Prof. Hughes: I would like to endorse what Bruce Thom just said. I have been involved in NCCARF since the beginning, and I convened one of the networks and am on the management committee of it. NCCARF has done some terrific work. As Bruce said, it is very difficult to get a lot done in just four or five years; it got off to a bit of a slow start. I think it is really hitting its straps now, and it is a terrific shame that the formal funding of the national facility is ending. I think there is a crying need for something to continue, whether it be that model or a more distributed model. Clearly the need for adaptation research is only going to get greater, not less, in the future.

Prof. Karoly: I have a specific comment relevant to this committee: the NCCARF had a disaster management and emergency response network in addition, and that will also disappear as a network. That was one of the few that were really coordinated across Australia in terms of research on changes in natural disasters in response to climate change.

CHAIR: Thank you all very much for taking the time to attend or participate by phone today. It is greatly appreciated by the committee. We have gone a little bit over time with the Wentworth group, but I am sure it has been valuable for all senators. So thank you.

CONNOR, Mr John, Chief Executive Officer, The Climate Institute

KEMBER, Ms Olivia, National Policy and Research Manager, The Climate Institute

[12:28]

CHAIR: I now welcome representatives from the Climate Institute. Thank you very much for talking to us today, Mr Connor and Ms Kember. The committee has received the Climate Institute's submission as submission No. 105 to the inquiry. Do you wish to make any amendments or alterations to that submission?

Mr Connor: No. I will make some extra comments if I may, and we are going to table some extra work which we just concluded as well, which I will do in the process if that is okay.

CHAIR: You may, and you may do all of that right now.

Mr Connor: Thank you very much. I would like to make some opening comments and, in particular, just to stress the importance of looking at this issue as one of risk and to highlight the poor focus on interdependencies and the consequences that flow across our sectors when we deal with this. It is now clear that, with the 40 per cent extra greenhouse gases that have gone into the atmosphere since industrial times began, the doorway back to more stable, predictable climate and weather conditions is now shut. Australia's already moody weather is being put on steroids and becoming more hostile. Our challenge is to manage the unavoidable impacts while we do everything we can to help avoid the unmanageable conditions that will arise if we and the world continue to dither or take half-steps.

Since our founding in 2006, the Climate Institute has worked hard to bring in a flexible system of carbon prices and limits that start to make some businesses take responsibility for their emissions of what are now clearly dangerous carbon pollutants and provide them with incentives to reduce that pollution. We have worked hard to telescope Australia's action to see that it helps, not hinders, global action necessary to avoid the worst impacts of climate change. It is important in that context, if I can correct a comment made by the previous panel, that the actual targets that both the ALP and the coalition have is not just five per cent but from five to 25 per cent dependent on global action. That is important because we are far from a world of just five per cent action on those conditions which both parties share.

However, since 2007, we have worked hard to minimise the impact of the climate change that is already underway. In 2007 with the CSIRO and the CRC for bush fires, we commissioned research into the likelihood of changing bushfire weather conditions which led to the development of what are now the code red and catastrophic extra warning conditions—extra segments of the pie that are now integrated into emergency response and disaster relief. I think it has been a valuable and illustrative example of some steps that can be taken to improve response and we saw quite magnificent efforts over the last summer in that regard.

It is important to understand the impacts of extreme weather events stretch far deeper than the first response phase. They cascade, they connect in chaotic and confusing ways that often leave lasting legacies with profound social, economic and environmental consequences. In our 2010 *A Climate of Suffering* report, which we gave to the committee, we included data that showed that higher rates of violence, family dissolution, drug and alcohol abuse, and suicide are likely to follow these events. This is not to say that climate change causes those events but it increases the risk that the mental health and social welfare toll will grow. ACOSS did some excellent research on this, and I understand they will be addressing you this afternoon. But it is important that this is not about recreating or creating welfare dependency. That has been a perverse and unintended consequence of some of our current disaster response. It is about creating resilient and interconnected communities that are able to respond and regrow.

Our latest research program looked at the economic consequences of inaction. Late last year we published research which we also shared with you which was conducted with Mirvac, Westpac and others into Australian infrastructures readiness for extreme weather events. We conducted literature reviews and, importantly, engaged with practitioners and industry participants looking at the transport, energy, finance, property and water sectors. In that report we compiled Australia's first-ever sectoral resilience and readiness indicators for these sectors. We were surprised, given Australia's history of extremes, that the readiness was patchy. It was poorly coordinated and reliant on historic data. Our infrastructure managers are walking backwards with blinkers on into an uncertain and high-risk future.

We were quite surprised at some of the Productivity Commission's conclusions in this area, especially given the depth of the engagement we had with industry participants. We tried to share even our preliminary research with the commission at the time in which we were concluding ours but unfortunately they had concluded their final report at that stage, which was then shortly thereafter submitted to government. So it is important to bear that

in mind when you consider the Productivity Commission's recommendations. It is important because we think they made some of the same mistakes that were made more broadly. It was very much a bottom-up sectoral approach which left this in the silos. While there are some quite good recommendations and some which are being followed up by the government in the building codes and other areas, the issues of interdependencies and in particular issues of disclosure from infrastructure managers, we thought, were very surprising and deficient. It appeared to us that they accepted submissions given to them as evidence for broad industry activity, and of course they got the best examples that were provided to them rather than looking deeper there.

I think it is quite relevant to note that worldwide there is significant action in this area, beginning to address precisely these issues in ways which contrast to those recommended by the Productivity Commission. We saw the UK economics of resilience committee, which has just recently released a report. Its first recommendation is to look more deeply into interdependency issues. We have seen the US Government Accountability Office put climate risks into its top high-risk categories for the fiscal exposure of the government and the need there again to look at broader and interconnected issues. These approaches seem to have missed some of our local insurance representatives, which senators were talking about with the prior group.

That work has forced us to do some further work because really we have seen almost a radically deficient understanding of interdependencies and the interplay between our key infrastructure sectors. To further investigate this, we have teamed up with KPMG and Manidis Roberts to examine new approaches to dealing with these and to examine for the first time the cost to Australian businesses of disruption to those interdependent systems. I will ask my colleague Olivia Kember, our national policy manager, to briefly explain this work and its key findings in a moment. It is important to highlight that, in examining the impacts of heatwave conditions on a manufacturing firm in Melbourne, the labour and lost production costs alone—we were not looking at the supply chain disruptions and new insurance premium impacts that may flow—for this firm measured some millions of dollars, costs that are at least as significant as the carbon price impacts that comparable businesses are facing. We have had discussions with our industry colleagues in this regard. If I may, I will table the report and ask Olivia, while that is being shared with you, just to talk briefly on some of the highlights of that report.

Ms Kember: This is a report we have just completed called *Infrastructure interdependencies and business-level impacts*. What we wanted to do with this was explore two main areas: first of all, to map the way direct climate impacts affect an infrastructure sector and then the resulting impacts of that, then the third-order impacts of that and, again, the consequences as they flow on and to do that for a range of infrastructure systems so that we could map the chain of consequences and identify nodes of interdependency within that where systems were exposed not just to the direct impacts of, say, extreme heat but also to other sectors' ability or inability to withstand extreme heat. Secondly, we wanted to then consider what that would mean for a business trying to operate in that situation.

We used a scenario of a heatwave in Melbourne. We looked at the projected increase in extreme heat in Melbourne to 2030 in which days over 35 degrees increase by 28 per cent. As our infrastructure mapping showed, the transport and electricity sectors were particularly vulnerable to the impacts of extreme heat, not just directly, in the case of the transport network, but indirectly through its exposure to the electricity network. We found a huge range of trigger points and thresholds within those systems. For example, in transport, you would have the direct impact of heat on train tracks buckling the tracks. That then forces the line to be closed. That then affects the ability of the train network to function. That then affects the ability of people to get to where they need to go. That then affects the ability of, for example, business to have the employees in place to do the work that they need to do that day. With the transport sector as well you have the fact that many of its components are reliant on electricity. When the electricity system goes down, it gets those indirect impacts from the heatwave as well.

Having done that, we modelled a hypothetical business. This was a moderately large manufacturer and distributor in Melbourne. We looked at what in a situation where extreme heat was affecting this range of infrastructure, on a single input, what this would mean for labour for that company. We did three scenarios for that, where 20 per cent up to 100 per cent of the company's employees were unable to do their job. The cost from that single input from a single climate impact was, as John pointed out, between 0.2 and 1.1 per cent of revenue, or \$1 million to \$5 million, for our hypothetical business. That does not include anything that would factor in the likely simultaneous effects that you would get on supply chain disruption. It also does not include any long-term price impacts that you would get. That is the report you have in front of you.

Mr Connor: Just to conclude: we have talked in our submission about better disclosure and about a national resilience report card. There is some progress happening, with a climate futures document the government is working on, but we do think there should be better focus on two- and four-degree scenarios for risk management and risk planning across government, and that governments are doing. We do think there are key tests that

agencies with oversight of standards, such as the building commission, need to be publishing their readiness for two-and four-degree scenarios. We need to have private sector proponents for Commonwealth approval of funding disclosing how their projects will deal with two-and four-degree risk scenarios. Infrastructure Australia is an example which at the moment has no guidelines on these things but billions of taxpayers dollars potentially going into those kitties. Finally, the Commonwealth should be a leader in capitalising that and following on from some of the lead in the UK and looking at getting agencies themselves to look at and disclose those risks to build a better risk management culture that is focused on the very real and already identifiable risks that we are facing at two and four degrees.

Senator MILNE: Thank you for this new report. It will take a bit to absorb it all. Basically, the fundamental issue that you raise is the one that is coming up constantly: that you need a collaborative effort across community and across government, and intergovernment as well, and that is what we are not getting, which is why we get siloed reports. You said that the thing that surprised you in looking at this, given that Australia is a continent that suffers extreme weather events over time, is the patchiness of the preparedness. I would like you to go into a couple of critical areas where you think that it is patchy at best and even worse than that actually to give the committee a practical example of where this planning is so patchy into the future and of the consequences.

Mr Connor: The better stories are in some of the water supply areas, where there is discussion and coordination across the sectors and with other influences. Waste water disposal is another issue. In the property sector we saw some quite good examples at the level of individual companies, but they are not so much sectoral discussion across areas. Transport and electricity were where there were some issues where we found very poor preparation, very much reliance on historical data. In the energy sector—this has obviously been a controversial area with networks and claims of gold plating and the like—we actually did have issues where regulators were not prepared to recognise when some of the network companies were actually starting to talk about resilience: this will actually cost, so how does that get built into the profiles?

Ms Kember: What we found when we looked at the different sectors was that, obviously because the infrastructure is very different in each one and is regulated in a different way, there will be different degrees of government control or different fragmentation of ownership, which helps explain why you get some of the patchiness that you do. When you are talking about a sector that has a huge range of actors in it, you are seeing a lot more activity. At the same time, it is much more fragmented and you are getting a lot more conflict, where, say, various local councils are trying to change their planning regulations. States are doing their own different things at the planning level. The insurers are pulling out of some areas and are not providing signals, as do others perhaps. It is a real mishmash.

Whereas, if you look at the electricity network sector, it is highly regulated. There is the experience of the Victorian distributors when they went to the AER and said, 'We think we need this extra money to climate-proof our system over the next five years,' and the regulator basically said, 'I'm not convinced by what you've shown me.' So far, that has been the end of it. So you have less flexibility and fewer solutions, but at the same time you have potentially a more simple way of dealing with that.

Senator MILNE: Just to come back to the issue of the regulator saying, 'I'm not persuaded that we have to build resilience into the system,' presumably what was in the evidence presented was the climate science and the projections of intensity, frequency et cetera?

Ms Kember: It starts to get very complicated because what was presented was an analysis by AECOM of climate projections and then, on top of that, there was an assessment by the companies of what that would mean for their own operations. My understanding is that it was the second part that the regulators were not convinced about.

Senator MILNE: They were not persuaded that that was an appropriate, over-the-top or whatever response?

Ms Kember: In their determination they noted that they believe that climate change will be gradual, so, within the next five-year period, they do not see that the risks would outweigh the natural buffer allowed for in terms of maintenance and upgrades that were already going to happen. That is a really interesting point, where the regulator has an idea about what climate change is or is not going to do.

Senator MILNE: That is a very interesting area for us to follow up on with the regulator, to get an assessment of that. I want to go to the other example that you use. I think it is a really good example of the flow-on effects and impacts, and that is about extreme heat and the consequences of cancellation of so many trains as a result of problems through the networks. What has been the response to that? You start getting the heat, the buckling and so on, and now we have seen what happens: massive disruption; big costs all round—and you have documented

those. What has happened since the heatwaves that led to this, in terms of railway planning in Victoria? Do you know?

Ms Kember: My understanding is that, at a very high level, they are taking this very seriously and they are putting in place plans to improve that. They have extended their risk assessment to cover climate change. At the same time—and this is probably touching on our disclosure points—as to the degree to which that is actually happening, whether there is some kind of time frame and what is going on in practice, I do not know.

Mr Connor: I will add a few things to that. One is that the City of Melbourne has established a task force. They are getting going on that. We are saying that is a good example of some of the public-private partnerships we will need to see more of. Again on the disclosure point, this is what should be standard risk management procedure. There should be standard disclosures to the marketplace and to broader communities about these things. The culture has been to shy away from that and put it into the too-hard basket.

Senator MILNE: But the point of this inquiry is to identify the gaps. You have clearly identified one: the failure to identify the cross-sectoral interdependence and what it means, and so on. The issue is then: what can the Commonwealth do? What leadership role can the Commonwealth take in terms of the management of essential services, for a start? It might be: water, electricity, transport—a few. Should it be the Commonwealth that takes on a national coordination role that then flows down? One of the submissions earlier today was that there needs to be, at the Commonwealth level, legislation which sets in place the roles and responsibilities down through the chain of who is going to do what into the future, in terms of managing national disasters, if you like—not just climate related, but overwhelmingly it is going to be climate related. What is your proposition? You say that there needs to be score cards, greater cross-sectoral analysis and so on. What do you see as the role for the Commonwealth?

Mr Connor: It is obviously a difficult question in a federal relationship but it is one which we deal with in other areas. I am not sure if legislating the framework would do much, because we actually have had—the national adaptation framework of 2007 did all of that but then just sat on a shelf. Unless you have clear actions and, I think, a culture of disclosure and risk management built more rigorously into the system, we will miss this.

From a Commonwealth point of view, what we are suggesting is disclosure through a national report card. We do think the Commonwealth can have a much greater role now, in terms of—and this is what we are adding today I guess—requiring their agencies to put forward how they are looking at two- and four-degree scenarios. That should be built into the contracts of the senior executive levels as key performance indicators. We should have that as requirements for private agencies seeking any Commonwealth approval or funding—they should do that as well—as well as getting our house in order.

There are boundaries to this in terms of what we can do. We do have state governments delivering many of these services. One example we have become aware of is the disaster relief money, where we actually institutionalise very bad planning. We had a presentation from the KPMG actuary which looked at the disaster relief money that is being spent and the way in which we helped rebuild infrastructure. You may have had this already—but essentially the government says they will repay about 70 per cent of those costs. But, if they actually improve that infrastructure, they cannot get the money. There is no 'betterment'—I think is the term there. They are incentivised to rebuild exactly the same infrastructure and in exactly the same spot.

In fact, some might argue that that would be an extra incentive. This actuary has some clear tables, given as part of a separate process, which we can submit. The history for the last five or so years was about \$5 billion spent, but that is going to quadruple also in the next few years, just with the way that is built.

Senator MILNE: Would you be able to table that?

Mr Connor: Yes, we can find that data and provide that. I think it is very important example of how—

Senator MILNE: Presumably the Commonwealth wrote those conditions.

Mr Connor: Yes, but there has been a process there. We will forward that information.

Senator MILNE: Thank you.

CHAIR: Senator Cameron?

Senator CAMERON: Thank you. Mr Connor, you have raised the issue of the Productivity Commission report. I have been having a look at some of the recommendations and the government's response to the recommendations. One of the issues that I have raised already in these hearings is the proposal from the Productivity Commission to ensure that regulatory and policy frameworks do not impede private risk management. We have had evidence here this morning about the need for more government engagement to try and coordinate risk management after extreme weather events. I have not heard anything that runs to—I have

heard no arguments about this public-private dichotomy that the Productivity Commission are absolutely besotted with. What is your view on that recommendation? Do you have any idea why that recommendation is in there?

Mr Connor: I think, as we found, it is that the private sector is actually very poorly prepared for this as well. For reasons of the politics and of culture, this has been put in the too-hard basket. In many ways, this should be a—there are some fairly standard risk management procedures that would be being followed. But I think they are getting poor information from governments. They can do more internally, and I think they really should be encouraged to do so, because that is building-in further obsolescence and higher risk for citizens and taxpayers in what they are doing.

We make recommendations ourselves. Some of the work we are doing and that we have just done is precisely focused at that—getting businesses to start to look at this. There are very profound implications here. We have built a whole system around just-in-time supply chains. The reality might be that they are just out of date. With the disruptions we may see more of, we have to reorder our whole supply chain systems. Companies in the private sector need to look at that for broader economic wellbeing. It will ultimately be the taxpayer having to bail out companies or communities exposed by those decisions.

Senator CAMERON: The Fukushima disaster had international implications in global supply chains.

Mr Connor: Indeed.

Ms Kember: An example might be where a government might be preventing private risk management, as was brought up earlier in the discussion, to protect the property values of coastal mansions. For some of these issues, there are going to be groups that stand to lose value by the disclosure of the true risks that they are facing. So there is always a risk that there will be political pressure for those findings not to be disclosed, which I think comes back to why we think disclosure early and often is really important.

Senator CAMERON: The recommendation 6.1 of the Productivity Commission's report says:

Australian governments should implement policies that help the community deal with the current climate by improving the flexibility of the economy.

It would seem to me that, given the lessening of flexibility in the economy, the more concentration on the mining sector, both coal and minerals, this is a somewhat bizarre recommendation from the Productivity Commission. I would have thought flexibility in the economy would be arguing that in the medium- to longer-term we have a broad based economy that is not solely reliant so much on coal and iron ore. Did you have any discussions about this recommendation or have you thought that issue through? We are talking about flexibility and we are becoming less flexible in the economic base of the country.

Mr Connor: We have just released a report into the carbon competitiveness of G20 countries, which looks at the preparedness for those countries to prosper in a carbon constrained world. Before that, you do need flexibility like prompter business approval times, you need investment in education and you need investment in infrastructure. All of those are key indicators along with the emissions content of our exports and the growth of emissions generally.

The reality is we are moving to a carbon constrained future. If we are looking for flexibility, we need to look to that broader sectoral composition and preparation of our broader economy. In those economies clean tech and education services are very important. I can only agree with the spirit of your question.

CHAIR: I thank you both very much for your time and participation today and for the additional research information the Climate Institute provided. It looks like a valuable document for the committee's deliberations.

Proceedings suspended from 12:59 to 13:48

GOULD, Mr David Colin, Private capacity

CHAIR: I welcome Mr David Gould. Mr Gould, thanks very much for your time and for your very comprehensive submission, which was received by the committee as submission No. 4. Do you wish to make any amendments or alterations to your submission?

Mr Gould: There is an embarrassing mistake in that I misspelled Bill McKibben's name, but not apart from that.

CHAIR: Thank you. Would you care to make a brief opening statement before we proceed to questions?

Mr Gould: Thank you. My thesis is that the only real adaption strategy is to avoid 4 degrees warming. Thinking that we can prepare to cope with the extreme weather events that would occur should such a temperature rise eventuate is, as Clive Hamilton says, a trap. The scale of what Australia must do as part of its fair share in the global effort to avoid such warming must be laid out to the Australian public and debated.

I mention in my submission that a global recession spanning decades will be necessary. This is because cheap energy in the form of coal, oil and gas has powered the globe over 150 years. But that chapter in world history must now close. To close it, consumption of goods and services must decrease dramatically—probably by around 50 per cent in the West, which means recession. Renewable energy alone cannot fill the gap fast enough and, even if it could, switching to renewable energy is going to involve the production of massive amounts of steel, silicon, aluminium, concrete and glass, which will require the expenditure of terawatts of energy—energy that will initially have to be provided by the energy system we have now.

To give some idea of scale of the task facing us, I will lay out a version of what Australia would need to build over the next 25 years to do its fair share in the global effort to limit warming to around three degrees. The figures are derived from global numbers calculated by Saul Griffith, an entrepreneur and MacArthur 'genius' award winner, and presented by him in a series of talks in 2008 and 2009 called 'Climate change recalculated'. For the next 25 years Australia will need to build 1.5 square metres of photovoltaics per second, 0.75 square metres of solar thermal per second, four three-megawatt wind turbines every day, one three-gigawatt nuclear plant every 18 months, 15 100-megawatt geothermal steam turbines a year and 20 square metres of biofuel pools every second. Note that if nuclear is removed from the list and replaced with wind, for example, we must produce an additional six three-megawatt wind turbines a day. We must shut down our gas industry over the same 25-year period, we must close our coal industry within 10 years and we must reduce meat and dairy production, consumption and export by 80 per cent.

This will be a Herculean task. It is a task that has not been articulated to the Australian people by its leaders. As elected representatives of the people, you need to start doing so. I believe that, given leadership, we will rise to meet this immense challenge. We will make the impossible possible. We must.

CHAIR: Thank you, Mr Gould. We have only a short period of time for questions.

Senator MILNE: Thank you, Mr Gould. As you would be aware, I share exactly your concerns that we are on a trajectory and that we have gone beyond two degrees. In my view, we are beyond even imagining we can restrain global warming in that context. You have done a lot of statistical analysis and stuff in this submission. We have been out there as an environment movement globally articulating the case. Bill McKibben has been out there with his 350.org. There has been a whole movement to address climate change and equal and opposite, in fact greater, movement in denial, if you like. The issue I would put you is, why do you think presenting people with the scientific facts of global warming is going to make them change their behaviour? That is what we assumed would occur and it has not. I am interested in your analysis of why it is that when the facts are out there—and they have been put out there—people refuse to accept them.

Mr Gould: People make decisions not necessarily on complete rationality. Humans are emotional creatures. One of the problems that I see in the communication of the problem of global warming is that there is an inconsistency between what many people are saying and what they are actually doing. As an example, how many politicians have publicly stepped away from eating meat or publicly stepped away from eating dairy? Not many. How many have given up travelling in their cars, how many travel by public transport? Not many. How many have decided that they are not, for example, in a committee like this going to travel by air across the country but instead make the whole inquiry by teleconference? It has not happened. People are looking at your actions as well as your words and they see a big disconnect between the two. That is one of the main reasons why they are resisting the message. Al Gore, for example, is seen as a millionaire who has made money out of the global warming issue. That is seen as an inconsistency, but in some ways it should not be. I am a believer in a capitalist society with a socialist base, that is my idea of a society, and so I see no problem with people making money in

trying to solve the problems that face us. In fact, I think that is going to be a necessity; we are going to need to have that happen. But there is that perceived inconsistency between people's actions and people's words.

Senator MILNE: Do you think that is all it is? There is a massive amount of money that goes into the Murdoch press in particular, but not exclusively, that runs a massive climate denial argument every day of the week. There are massive amounts of money from coal exports.

Mr Gould: Certainly there is a huge denial industry that is funded by vested interests. I have been talking about shutting down the coal industry. The coal industry is worth billions of dollars. In fact, my government funded superannuation will depend on government revenues that in part are coming from the coal industry; the same with your government funded pensions. We are inextricably tied up in this huge amount of money, but we need to move past that. The simple truth is that if you do not articulate the truth about the scale of the task facing us and the sacrifices that are necessary, and start making those sacrifices yourselves, then I do not think we are going to move much further. However, I have confidence you, and we, are going to do that.

Senator MILNE: Before I hand on to somebody else I will just say that we are not on government pensions in the way that you might suggest. We are in the same boat. Collectively at this table we are not on the old pension scheme and we are choosing our own superannuation. I can tell you in my own case I have chosen a fund that does not invest in fossil fuels, amongst other things. There are many of us doing all that sort of thing, but I think just change of behaviour from those who articulate what is going on is not going to be enough.

Mr Gould: No, Senator, but it is necessary because it is one of the big things that the denier movement often point to.

Senator MILNE: Yes, I know.

Senator CAMERON: Thank you, Mr Gould, for your warnings and the work that you have done, but I think we are coming up against not only a problem for an individual but a global political problem. China has its desire to increase the living standards of its society, as does India. These are all big problems that we have.

Mr Gould: That is right, I agree.

Senator CAMERON: The use of fossil fuels I think is projected to continue to grow for many years.

Mr Gould: As I outlined in my submission.

Senator CAMERON: From what I have seen, the argument is that we need to cut fossil fuel emissions by about 15 per cent by using carbon capture and storage, and that is a big problem as well. I do not see too many politicians giving up their cars, I do not see too many politicians not flying when they need to fly, so there are some issues that are just not going to be achievable in the short term. The proposal that you have put would create huge social dislocation.

Mr Gould: Of course.

Senator CAMERON: I am not saying that is something that can be avoided, but I am just asking how you then give that message. You have seen how hard the message has been to get a very small step on pricing carbon. How do you tell people to stop eating meat, to stop eating dairy products, to take a bike to work? It is just a huge step-change that I do not think is there at the moment.

Mr Gould: But one thing that needs to be done is for people like you to start saying, 'Let's do it,' and for people like you to set the example by no longer eating meat, eating less dairy, travelling less by car, travelling less by plane.

Senator CAMERON: I don't know!

Mr Gould: Basically, if you are not willing to do it, there is no way you can expect the public to. It is as simple as that. If you are not willing to show leadership, and I am not just speaking to you specifically, Senator Cameron, I am speaking in the broad—if the leaders of the country, our elected representatives, are not prepared to make the sacrifices then of course there is no way that they can articulate an argument to the public as to why they should. So the first step, the absolute first step, has to be us choosing to make sacrifices. I gave up my car. I gave up eating meat. I use public transport all the time. I am moving into an occupation where my income is going to be reduced. Part of the reason for that is that, by necessity, will reduce my consumption. These are all things that, as an individual, I have chosen to do. If you are truly concerned about global warming then these are steps that you as individuals should choose to do.

Senator CAMERON: It is about consumerism. That is one of the issues you have raised.

Mr Gould: That is certainly one of the issues, yes.

Senator CAMERON: So the advertising industry and the media—it is not just individuals making changes; it is a societal change in terms of what is important.

Mr Gould: Yes, that is true. Again, to make the society change, individuals have to change. The fastest way for society to start changing is if leaders make the change first. If the leaders of the country, the elected representatives, are not prepared to make those sacrifices then people look at your statements about the seriousness of global warming and say, 'It cannot be that bad' or 'Even if it is, why should I do anything if they are not?' That is very simple and that is an argument that is made a lot in the denial community. They are saying that people want other people to make sacrifices. The elites are telling other people to make sacrifices that they themselves are not prepared to make. That argument may be in some way flawed because I know many people in the so-called elite who are making those sacrifices. But the fact is there are a lot of people who are articulating, 'Yes, global warming is a problem,' but are flying around the world on jets and living a very luxurious lifestyle. It seems incongruous.

CHAIR: Mr Gould, I am, generally speaking, optimistic about human nature; I am not terribly optimistic about the likelihood of the changes that you are advocating being embraced or adopted across the community. Like Senator Cameron highlighted, even if we could start seeing people embracing some of those changes, the simple reality of emissions and the continued growth in global emissions elsewhere mean that the outcome you are trying to stop is unlikely to be stopped by virtue of what Australians are doing. Rather than scaring the horses and creating great division by talking about giving up meat and dairy et cetera, would it not be better to focus the debate on technological change and the things that might actually provide a way through the climate change challenge that we face and provide an opportunity for countries like China and India to continue to lift their populace out of poverty and enjoy the things that they are seeking to aspire to enjoy, but hopefully do so in ways that do not create the same problems that have been created?

Mr Gould: Certainly and that is why I strongly push for the deployment of Australia's uranium reserves. The issue is Australia has about 10 per cent of the global coal. We are selling that to the Chinese and Indians to boost their development. Again, this is seen as incongruous. Governments across Australia are arguing to varying degrees that climate change is a problem. Yet all of them, Labor or Liberal, it does not matter, are encouraging a massive expansion in coal and gas production and export. Instead, if we focused on helping China and India move more into nuclear, we would not only continue to have at least some export income but also be providing for the twin goals of helping their development and reducing their emissions.

As long as we sell coal, anything we say on global warming is completely hypocritical. I do not know how we can even make the argument to the global community when it is obvious from state and federal government policies that our intention is to dig up every last skerrick of coal and export it to the rest of the world. We will also say: look, we have cut our own emissions by whatever percentage that we end up cutting them by. But wherever coal is burned, it still goes into the global atmosphere. So it is still Australia's responsibility. We could choose, if we wanted to, to stop that coal being exported and 10 per cent of global coal would not be burned.

Bill McKibben says we have to leave 80 per cent in the ground. The International Energy Agency is suggesting that we have to leave two-thirds in the ground—or something like that. If we took Australia's 10 per cent off that, we would hugely help the world in achieving its goal and we would signal to the world that we are actually serious about the problem. But at the moment it looks as though we are intending to heat up the atmosphere as much as we can and pocket as much cash as we can in doing so—and, oh well, who cares about what happens? That is what our actions are telling the world.

CHAIR: Thanks, Mr Gould, for your thoughtful and detailed submission and passionate presentation today.

EARNSHAW, Ms Yve, Director, Dunalley Community Neighbourhood Centre Inc.

GOLDIE, Dr Cassandra, Chief Executive Officer, Australian Council of Social Service

HAMILTON, Ms Emily, Senior Research and Policy Officer, Australian Council of Social Service

MALLON, Dr Karl, Director, Science and Systems, Climate Risk Pty Ltd

[14:06]

CHAIR: I welcome representatives now from the Australian Council of Social Service. Thank you for taking the time to talk to us today and for your submission to the inquiry, which has been received as submission No. 142. Do you have any alterations or amendments to make to that submission?

Dr Goldie: Yes, we do, thank you. First I want to thank the senators for giving us the opportunity to appear before you this afternoon and to congratulate you on forming this really important inquiry. It is particularly timely for us because ACOSS is the peak body for community services in Australia and we are the national voice of people who experience poverty and inequality.

We all know the people who are the poorest in a country and the people who are the most vulnerable are the ones that are hit first and worst and longest when it comes to extreme weather events. Your inquiry coincides today with the release of a really important world-first piece of research that we have commissioned and done in partnership with Dr Karl Mallon, who is with us today from Climate Risk. Also one of the authors of the report, Emily Hamilton, is with us, and so is Yve who comes from Tasmania to share a very direct experience of what we are about to discuss.

Our study which we are releasing today is informed by the contributions of over 500 community organisations from around the country, which, in survey terms is a really significant body of evidence. We estimate there are right around the country a network of community organisations in the order of tens of thousands and we have hundreds of thousands of staff and volunteers who are working within this really important network of people on the ground in local communities. They will be the first to tell you that the short- and long-term human and social impacts of disasters are often understood and are typically very, very long term. So when the spotlight goes off the event, the human cost of that is long term and in many cases people never recover without the support they will need. It is very clear that community organisations are typically playing a major role in supporting local communities in the emergency response and, importantly, in the long term, supporting disaster recovery. Our study has brought before you clear examples of human determination and the human spirit which comes to the fore in these kinds of events, and demonstrates the innovation but also the significant risk from the fact that we are not well prepared particularly with this sector when it comes to the response and resilience and adaptation that is required.

It may surprise some of you to know that community organisations are not embedded within the national, state, territory and local mechanisms for disaster planning, management and recovery mapping requirements. So it is not systemic at any level to have community organisations involved in this really important work. Our study has shown that, typically, if a community organisation goes through an extreme event, after a week less than half of them will be up and running again and, disturbingly, a quarter of them are likely to never recover and to never get back to doing the really important work that they do. I want to highlight to you that we are talking about vital community services that are working in aged care, with older people in home and in community settings, with people with disability, who are particularly vulnerable, with young people and with other vulnerable people who are likely to be at significant risk and whose lives are at stake but also who, in terms of their vulnerable existence, are likely to be—and in some cases are already—deeply affected by these circumstances.

We have some clear recommendations, and we obviously would urge the committee to take clear notice of what they are. At the heart of them, the first part, is that we think really important planning must be done around collaboration and coordination. I am struck by the number of times when I have listened to government leaders talk about these events they talk about the role of the SES and the police—all the important emergency services—and the impact on businesses and farming communities, but it is rare for them to talk in any shape or form about this really important third sector of community organisations. Our expertise is in collaboration and coordination and human relationships. In the end, that is what is going to make the difference in terms of whether we recover quickly and well and we are stronger after that or we are going to be worse off and for a long time. So participation of our sector is absolutely vital. Clearly, we see our role as a peak organisation as having a major part to play in that, and it is one of the reasons why this research has been so important to us.

Obviously, there is an issue about resourcing. It may surprise some of you to know that, for example, in the Queensland floods, initially the package of assistance for small businesses did not include community

organisations. That was rectified but it was an afterthought rather than it being an obvious opportunity for there to be an understanding that these are vital entities that should equally have the support that is needed. We have heard stories—and you will hear stories in a moment—about where, for example, these organisations have government funding contracts and they are on the phone trying to get agreements that will allow them to down tools from what they are funded to do in order to be where they really need to be and to make sure that they are not going to be breached on their contract. There are some really obvious systemic changes that we can make. What can we do about insurance arrangements? Clearly, there are big issues within the sector about affordability of insurance. What are the arrangements that we could enter into with the insurance industry to make sure that those kinds of insurance mechanisms are there?

Obviously, there is resilience building. We think there is a real place for a program of action right across the community sector which would enable those organisations to benchmark whether they are well placed at the moment and, if not, what are the gaps and what are the tools that they need to put in place in order to ensure that they are well placed to respond and to recover. I want to highlight again that this is a world's first piece of research and one that is very timely. I also want to highlight that I think across the Australian setting we have a choice here. We have a choice on the one hand of being a world leader in terms of addressing extreme weather events, in responding to them and in recovering as well as can possibly be the case or we can ignore this evidence at our deep peril.

I would like to introduce you to Yve Earnshaw, who is from the Dunalley Community Neighbourhood Centre, who will share with you some of the direct experiences arising out of the recent tragic events in Tasmania. Thank you.

Ms Earnshaw: Good afternoon. It is a bit of a complex picture to try and unravel, but I will put it in some sort of context. The organisation that I manage is a community based organisation. Its core funding comes from the state government, but then we also have some funding through federal and local government and anywhere else we can scratch around to get some funding to run different projects and programs. We are a broad-based community organisation. We are in what is classed as a rural or remote region, so large-scale organisations such as Anglicare or the Salvation Army do not have any real presence, as in a physical presence, in the community. We have an office that is based in Dunalley and another one that is based in Nubeena, which is further down on the Tasman Peninsula.

We offer broad-based community programs, which are health and wellbeing, literacy education or simply recreational or artistic programs. We have strong relationships and links with the two different schools that operate in that region. We are also a real conduit for other specialist services, such as Relationships Australia, Centacare and Anglicare, who utilise our facilities or our networks to be able to access people in the community and deliver services.

In terms of extreme weather events, such as the fire that came through, we actually have no disaster-planning mechanisms in place. We have absolutely no relationship at all on any level with state or local government in terms of disaster planning and management, how we are meant to respond or what role we play when that sort of event occurs. So how we responded during that crisis was purely, totally, up to us. We have to use our own initiative as to whether we play any role in such circumstances.

I actually live in the Tasman region, so for me it was: 'We just need to go into Nubeena, open up the house and see what comes up, basically, and try not to be an impediment to any emergency services that are operating in the region.' Of course, it is blindingly obvious that emergency services do play the biggest role in those sorts of circumstances and they should always be deferred to for direction or coordination, as their primary role is to ensure the safety of the community and of the region. There is no question about that. But it is about what happens once people are placed in a safe area; what happens to them then? I think, in terms of our sector, that is what we are all about.

There had been an evacuation centre set up in Nubeena, which was officially run. But it was a very large scale situation. There were thousands of people trapped in the region and there was no power. We went and opened up the community house with a generator—it is my and my husband's own generator. Basically, we plugged it in and set up some computers, and we got an old telephone to plug into the wall because, of course, with no power, only old landlines would work. We wondered what was going to happen. Then, over the next few days, literally hundreds of people came through the house to use the internet and to charge their mobile phones—we had piled power board on power board so people could charge up their phones—because, in this modern age, when people cannot communicate they start to stress and panic very quickly. There were no communications available in the region, virtually, except for emergency personnel. So the role that we played there enabled the thousands of tourists that were trapped to arrange flights, accommodation and hire-car companies; for all of the local people

who had been steadily evacuated all the way down from Forcett to that region, it allowed them to contact family members and also—unfortunately, for a lot of them—to discover that they had no property to go back to. So, within those few days, we played that role.

Some staff stayed there and then we got permission to be able to go into Dunalley, which had suffered extreme fire damage. The whole region was in complete lockdown. The roads were not open. It was something like nine or 10 days before there was any real freedom of movement, and it was weeks before electricity was restored. So we were given permission to go through on the Tuesday to open up the house in Dunalley, because it had been checked and secured by emergency services. Once we were there, we once again got a generator set up, hard-wired into the hot-water cylinder. We then opened up communications channels there. Fortunately, we were also able to offer hot showers and laundry facilities. So we were just inundated—50 to 70 people a day were coming in just for something as simple as having a shower.

We had counsellors available through Relationships Australia; they had counsellors who came in and used the facility, due to that relationship we already had with them. The local GP from Sorell organised, once again under her own steam, herself and her nurse and a pharmacist from the local region to come down two times a week to support the community when it was in lockdown. They came in in the convoys. So they used our facilities a couple of days a week to be able to offer that service to the community.

There was a large tent that was set up which was absolutely paramount. It was more government run and structured. It was a monstrous, big tent. There was no privacy. It was perfect for people to be able to come in and access food and those larger-scale government organisations and structures. But we did also play a fairly small but fairly important role in terms of offering a smaller, more appropriate and private space for people to be able to access counselling and also medical facilities.

In the spirit of that, it was a really highly cooperative relationship with the emergency response team that was in that region. But then, of course, as time has progressed, the emergency response is moving away and we are moving more to a recovery mode. Unfortunately, once you go into recovery mode, you then have a bureaucratic layer that comes through. Through that bureaucratic layer, organisations such as ours, who are very small, have great difficulty in being able to be at the table to have conversations around strategic planning.

It is also extremely difficult for us then to access funds, because we are completely locked into our funding agreements. As to our capacity to get extra funds to cover the costs of the extra utilities and the staffing costs through emergency response—and then, as we are now, running quite extensive recovery programs—it is very difficult for the bureaucracy to release funds. There is not necessarily an unwillingness from government departments or funding bodies to do that, but the bureaucratic layer is really quite complex.

So here we are, three months down the track, and we have had quite an amount of money promised for us to be able to cover our costs, but not one red cent has actually come into our bank account. As an extremely small community organisation, we are fortunate to have had a period of very good financial management, and we do have some small reserves that we can actually lean on. But it puts us in an extremely tenuous situation where we are basically putting ourselves in the red, hoping, with fingers crossed, that the promised funds will actually materialise.

I have talked to the Association of Community Houses in Tasmania. There are 34 organisations that operate. At a recent meeting, none of the organisations said they have any involvement at all in planning for emergency response or recovery programs, and a large proportion of those said that there was absolutely no way possible that they could sustain for three months the sorts of financial costs that we are carrying at the moment. That means that those organisations—without prior structures embedded into their funding agreements that there is an emergency capacity for fast funding release—would not be able to deliver any extra services for the communities in need.

So I think that, on a couple of different levels, there needs to be a review, looking at mapping the facilities and capacities within different regions. That is not necessarily to be done by me, because mine is far too small an organisation. But my peak bodies could be involved in mapping their organisations: what facilities we have, what capacity we have, and what our existing relationships are with different specialist services. That could then be fed into that much higher level of state and local government planning so that it is then much easier to access those facilities, and then they can also be embedded into our funding agreements so that once again there are clear criteria and structures in place so that then those responses can be much more effective and efficient through on-the-ground services. I could talk a lot longer about that, but I will give you a rest!

CHAIR: Thank you. We will progress straight to questions. Senator Milne.

Senator MILNE: Congratulations on this work; I think it is really important. The clear learning out of it is that the focus has been on physical infrastructure rather than on the services network, which is absolutely fundamental. You have talked about disaster and recovery, but in this inquiry I am particularly interested in preparedness so that we maximise what we have got and know what we are going to do, because we know the events are coming, rather than pretending that it is a one in 100 years event and, oh dear, it is happening again. In terms of the priorities for the federal government, given what Ms Earnshaw has said the obvious place to start for somewhere like Dunalley would have been for the local government to have a disaster plan and services and so on mapped to feed into the state and into an overview of the federal level. But, realistically, what do you think, Dr Goldie, should be the fundamental first thing that the Commonwealth should do in relation to this? We have had quite a lot of evidence to say that we need to start at the top with new legislation that sets out the responsibilities and chain of command from the Commonwealth, to the states and down through local government. Is that where you think we should start?

Dr Goldie: It is quite clear that a lot of the planning and the view has been from a very top-down approach, when in fact one of our big themes here is that the strength in terms of preparedness as well as recovery is far better targeted where it needs to be if you have a bottom-up approach. And we are not starting from scratch here. We know that we have been through some very major events in recent times. Just this morning I was with the Salvation Army. We had people from all over the country—their financial counsellors. I told them I was coming here today—by plane, unfortunately, not by high-speed rail. I was approached by George Nathan, who runs the Moneycare scheme in the Lockyer Valley. He said, 'Before the 2011 floods there was nothing; we never talked about it.' Eventually they were fortunate enough to get a release of money to set up a financial counselling service after the floods. And then the state government set up a human and social advisory committee which they then picked up as a local mapping exercise in their region of who is who, who has the capacity to deliver what and what are the ways in which they can coordinate better through drawing on the lessons that have been learnt and the human spirit that comes to the fore with no planning to then be able to plan at the local level and feed upwards into the disaster management arrangements. I do not know whether Karl or Emily would like to comment further on that.

Ms Hamilton: A similar example was given to the bushfires royal commission in Victoria in 2009. The example that VCOSS gave in their submission, which I think is included in here, was the Whittlesea Community Futures and talking in terms of preparedness and the impacts on long-term recovery and resilience. Whittlesea Community Futures was a network of 40 human service local government organisations in a region that had pre-existing relationships between service providers and government. Their recovery from the bushfires was much quicker than in other regions, and also in regions that had seen the model they had used, picked it up and tried to just superimpose it—'Okay, here are all your relationships'—but it did not generally work for them because it was not a genuine partnership like the Whittlesea Community Futures partnership had been. In those situations where it had been superimposed it did not support recovery and resilience; it was those pre-existing relationships between a whole range of different service providers that contributed to the resilience and the quick recovery of that community.

Senator MILNE: What you are telling me about is the terrific, innovative local examples that people have learnt from something, or they had someone innovative, and they did it in their local area and that was good. But the reality is that the whole country is going to be impacted by extreme weather events of some kind or another, right now and into the future. On that basis, somebody has to mandate that local government must have a plan; or, if there is a state or Commonwealth funded service of some kind, as part of qualifying for the money there are arrangements about what the finance arrangement would be in the event of an emergency; or, as part of it, you need to be part of a bigger plan or something. Somebody has to mandate system-wide. Where do you think this initiative should come from and who should draw up the parameters of what that should look like? For example, a doctor this morning said we need a template that every hospital ought to have in terms of identifying the risk and vulnerability of that particular facility and then the evacuation plan and servicing and so on that would all come. But you have to get someone to say every hospital has to do it and now it is over to you to do it. Is it a role for the Commonwealth to identify the value and then start putting some directives in place that will then lead to this flowing out?

Dr Goldie: We certainly see a key leadership role there for the Commonwealth government. We have developed a more detailed project plan around how to insert the community organisations into the planning process and the frameworks. We think there is a need for a deliberate process at that level to draw up what has worked, to work out what is scalable and what does need to be mandated, and what on the alternative needs to be enabling. I think the big risk is that if we just mandate specific roles and responsibilities from the top down, when you get to the environment such as Eva has described, it will get lost in who is who in that community. So we

propose a process at that level. But also I think we do need to be ensuring there is a way to get through to local organisations. We also see local government having a key role here in providing the frameworks for the ongoing coordination of local action. This is a theme across a number of really important national priorities. Whether you are talking about addressing homelessness or working in Aboriginal communities for example, this is a major theme for the country: place based initiatives around unemployment. What can we do to build on those local relationships so that an important part of the discussion is: 'If this happens to us are we ready as a local community?' Karl, do you want to add to that?

Dr Mallon: Yes. It is actually a very pointed question, Senator Milne; it goes to the heart of the issue and what we have tried to pull out in this research. We have seen this previously. With Hurricane Sandy in New York we saw people in tenements two weeks after the event who had been rationing their medication and going without food and could not leave—in one of the leading cities of the developed countries. We have seen it in Paris with aged people dying. What we identified in this research is that that was not an accident, it was not an oversight; it was a systemic problem—and we have got it here. The problem is that our society's way of working to look to the needs of these people is through community service organisations. What we have identified is that, when these things come along, they actually cripple the organisations that look to their needs. And as the statistics are coming out, if something like what happened in the US had hit Sydney or Melbourne or Brisbane, after a week 50 per cent of those organisations who provide food, medicine, disabled access and so on would not be operating. And that is not a credible situation in a modern, wealthy country like ours. Addressing the problem provides the basis for the solution, and that is one of the very positive things that has come out of the research.

With a lot of the organisations which we look at losing in those events and which provide those specialist assets, on the one hand, yes, we want to make sure they are in good shape and well prepared but, interestingly, when we have organisations which are well prepared and are operational in the way he talked about, they become part of the solution. Indeed, they take some of the load off our traditional services. If they are well-functioning, that is less work that the SES needs to do and less work that the police need to do. Indeed, in some ways they can do that work much better than those organisations because they know who in the local area is disabled, they know who is isolated, they know where services need to be placed. In a way it is a little bit like preventative health; it is incredibly good value for money.

Getting to the key solution—and I think the recommendations in the report go to this in a straightforward manner—essentially we need to build a bridge between what is happening at the top level and what is happening very much at a grassroots level. These organisations are hard to reach. They are a bit like SMEs—there are thousands of them and some are just one- or two-people operations. We know the big ones like the Salvation Army and Uniting Care but a lot of these may be very small locally based organisations. We need a bridge to communicate with them and bring them into some sort of system. I sit outside of ACOSS obviously but one of the things which has been incredibly important in the process is that ACOSS, as a peak body, has stepped forward and said, 'We are going to embrace these findings and we are willing to act as a coordinating body, to act as a bridge between what has to happen at Commonwealth government or state government level through to a grassroots base of organisations.' There are well known ways of doing that. It might be training or some form of benchmarking. It might be creating registers or audits of the kinds of skills, assets, people or buildings which are in a place, but that essentially seems to be the genesis of a solution. We work at both the top level, as we are doing today, bringing that all the way down to the community level. As everyone talks about community-led recovery, we have to do that in a coordinated phase. We cannot do it after the fact; it has to be done before. If we take the approach of preventative health, in a sense that is what we need to do now—we have to lay the foundations of that.

To close with a fairly pointed remark, previously this evidence base has not existed. We have identified in our research that there have been big gaps in the research which have failed to identify that if we want to look at vulnerable people who are experiencing poverty and vulnerability previously we focused on those people, but in fact we need to look at the vulnerability of those who service them. That is our solution. It is very simply. Previously we missed that. We now know it but it is on our watch and I think it would be negligent if, now that this issue has been identified and brought into daylight, we failed to address it in a timely manner. Of course we have extreme events and natural disasters now. The past decade has been very severe. If we look to climate change we are expecting increased severity and increased frequency.

Senator CAMERON: Dr Goldie, the Productivity Commission report *Barriers to Effective Climate Change Adaptation* has one of its recommendations managing the distributional consequences of climate change for disadvantaged and vulnerable groups. Did the Productivity Commission engage with ACOSS or did you engage with the Productivity Commission on this report?

Dr Goldie: We were not directly engaged for that.

Senator CAMERON: Have you any idea where they got their idea about distributional consequences for disadvantaged and vulnerable groups?

Dr Goldie: It is clearly self-evident and as we have noted in our submission it is well understood. The evidence is there that when it comes to the impact, if you have resources available to you, you will be able to purchase your way out of the recovery process, to relatively quickly place yourself in at least a better situation.

But if you are somebody who has very little already, it is quite clear that the impact on you will be far more severe. Our colleagues in the Queensland Council of Social Service estimated that there could be an increase, even a doubling, of the level of poverty in the locality of the regions that have been impacted by disasters up there. I think it is fair to say that we are not actively tracking that. Part of our focus on this research—which we were only able to release, as you know, in confidence to you earlier, but publicly today—was to highlight that, in the Australian context, given our resources, as Karl has said, it is systemic that we have not put that particular aspect of this issue front and centre. In the hours after the Queensland floods we were struck by the fact that the federal government was able to convene a very high-level urgent meeting of business leaders but community organisations were not included in that process.

Senator CAMERON: Yes, what can I say. One of the other recommendations from the Productivity Commission is about taxes that influence the way resources are used, such as land tax exemptions and conveyancing duty. They then go on to recommend to 'remove these where they would inhibit the mobility of labour or capital'. There is still quite an issue of working poor in Australia. You keep hearing about this issue of 'labour mobility'—the Productivity Commission have a fixation on labour mobility, as if that is going to solve all the problems for industry, the economy and the individual. What are the problems after, say, an extreme weather event that may destroy a house or make it very difficult for the working poor to recuperate? Is labour mobility the answer to that?

Ms Earnshaw: I think that concept of labour mobility is an interesting concept. Looking at that south-east region, for example—which is a rural and remote region—there have been some quite fundamental hits to some small industries there, which are only small industries but which are fairly major employers in the district. There are people, of course, who have lost homes and so they have to then relocate away from the region while their properties are being rebuilt—or they have to live extremely rough, in caravans or tents, to remain in the district. So, in small communities, with respect to that moving of people and that labour out of the community, there is quite clear statistical evidence that a certain percentage of those people never come back. In small communities that has quite an impact. I know from the 2009 bushfires in Victoria, they are only at this point looking at something like 40 per cent of properties being rebuilt—yet here we are four years down the track. So, if you are looking at only 40 per cent of the structures being rebuilt, where are the other 60 per cent of the people actually living and working? They have gone from having something like 2½ thousand beds in that district to somewhere close to 700 or 800 beds having been re-established. That was a really major part of the income and drawcard for that community. So, in terms of economic rebuilding in regions like that, there is a massive impact.

So yes, labour mobility sounds absolutely marvellous when you look at it in a report, but what is it actually doing to the social fabric of a community if your labour is mobilised out of the district? We all know, in countries such as Australia, that it is getting more and more challenging to get younger people and other people in our rural and remote regions and that there is that huge migration to the cities—and that really is going to have a massive impact.

Dr Goldie: And, in a general sense, quite clearly—and this is advocacy that we have been taking up in the broader debate around productivity and workforce issues—once again we have a strong focus on infrastructure but immediately we know the debates are around ports and bridges and the physical aspects of moving things around the country. But we have far less focus on the social infrastructure that is needed—affordable housing and affordable child care, which are two of the major pieces of infrastructure.

The risk of somebody who is on a marginal income, facing the kind of housing costs that they do, striking a balance between trying to find a job and trying to find somewhere which is affordable is deeply difficult at this time. It is one of the reasons we know the federal government initiated a mobility trial, where they provided a bundle of money—not much but enough—to get people to a job somewhere else, with a compact with employers, but it has been very unsuccessful. We agreed that it would be, as did the business groups, because we know that it is far too high a risk for people when they are moving, typically, to where jobs are and housing costs are often very high. This no doubt exacerbates once you have a wiping out of that kind of infrastructure in a local community.

Ms Earnshaw: Sometimes, in terms of community service organisations and the roles that they play in communities, it is about social connectedness and people having a passion and a connection to their community. When you have a well resourced and secure presence within communities, that enhances community connectedness and it keeps people committed to that community, and then you have a higher chance of people remaining, re-establishing themselves and rebuilding the economy within that region. If you do not have that sense of strong community connectedness, then it is very easy for people to leave their community. There is a really vital role, in terms of social recovery, in having those on-the-ground, localised organisations playing a role to maintain the social cohesion.

Dr Mallon: There is one other point around insurance and insurability. I am sure it is crossing your minds.

Senator CAMERON: Not quite yet, but that is okay.

Dr Mallon: In that case, I can step into that issue. I do a lot of work in the private sector and insurance is an issue. We have been looking at projects around insurability. In fact, I did the risk assessment work in Ipswich. Insurability issues were very high before the floods that went through Ipswich and Lockyer hit. What we are finding now is that a lot of those locations are becoming uninsurable. Imagine going to a bank about a house that you want to buy which is uninsurable. I can tell you what the answer will be, and that is that you will not be given a mortgage to buy that house. That means that the value of that house will collapse, because it will move to a nonmortgage price, which is essentially only attractive to cash buyers. Evidence from overseas, from the UK, indicates that that means a 50 to 80 per cent drop in value. So a family's major asset drops by 50 to 80 per cent. The economic implications of that for folks who are not wealthy enough, necessarily, to have multiple homes are profound. These events can create poorness overnight. They can wipe away the value of people's lifelong savings.

The other aspect that starts to come to light then is that people who are moving into rental housing are often unaware of risks and maybe move into very high-risk areas. They do not have insurance, so they are, if you like, doubly vulnerable. On the one hand they are already not necessarily very wealthy, they do not have insurance to cover what they do have and they are moving into high-risk areas. We risk developing things like climate ghettos around Australia, and there are plenty being built right now. I can tell you that now. They are building in locations which are entirely inappropriate. Everybody knows it and yet it is still being allowed to happen. Frankly, it is an outrage, and yet these sorts of approaches still persist. Some of the people in the country who will be least able to cope when these events occur are buying those houses and moving into them.

CHAIR: Thank you, Dr Mallon. I thank you all for your attendance and participation today. I appreciate your submission and for the efforts of each of the entities working with ACOSS.

Senator CAMERON: Could Dr Mallon, on notice, give us some examples where these ghettos are being created and the problems you foresee.

Dr Mallon: I will take that request on notice.

BRAGANZA, Dr Karl, Manager, Climate Monitoring Services, Bureau of Meteorology

SMITH, Dr Neville, Deputy Director, Research and Systems, Bureau of Meteorology

STAFFORD SMITH, Dr Mark, Science Director, CSIRO Climate Adaptation Flagship, CSIRO

[14:50]

CHAIR: Thank you for joining us today. The bureau has provided submission No. 65 and CSIRO has supplied submission No. 93 to the inquiry. Would either organisation wish to make any amendments or alterations to their submission?

Dr Smith: The bureau has one small amendment and a reference that we will give to the secretariat.

CHAIR: As departmental officers, you will not be asked to give opinions on matters of policy though this does not preclude questions asking for explanations of policy or factual questions about when and how policies were adopted. I expect that provision may be interpreted a little liberally today. I invite each of you to make a brief opening statement before we go to questions.

Dr Smith: Thank you for the opportunity to appear before the committee along with our colleagues from CSIRO. As you are aware, providing warnings of extreme weather events is the core business of the Bureau of Meteorology. The effectiveness of our services and the services we provide is very much linked to the preparedness of the community. Our responsibilities for climate monitoring and outlooks makes us keenly interested in variability and trends of these events both for our own internal planning purposes and in terms of the advice we provide to the community.

The review of the bureau's capacity to respond to extreme weather and natural disaster events conducted by Ms Chloe Munro in 2012 traverses at least some of the topics that this inquiry is focusing on. The government response to that review is pending but is expected to be part of the 2013-14 budget process. We are somewhat constrained in what we can say about that response, but if questions go there we will do our best.

Our submission to this inquiry concentrated on recent trends in extreme weather, which is term of reference A, and some observations around expectations for the future, which is term of reference B. I expect CSIRO will give a more comprehensive account of the projected changes.

We also touch on current roles and responsibilities. This is term of reference E, an area that was also explored by the Munro review. Our submission goes to, among other places, the commission of inquiry in the Queensland floods and the Productivity Commission report, which has I think been referenced a number of times. Both are referenced in our submission and contain more detailed material to back up our current submission.

Dr Stafford Smith: Thanks again for the invitation to appear here. As Neville says, the bureau has covered the current weather and climate issues very widely. Although they are touched on here, I was anticipating that I would particularly focus today on our responses to the current suite of climate risks and how those may change into the future and in particular on how we can hope to avoid maladaptation to those future conditions through decisions that we take today or in the near future, which lock us into particular response pathways. I think that idea of decision lifetimes—ones with short lifetimes where you are really only dealing with today's risks, as opposed to ones which deal with long-lived assets or long-lived social structures that need to take account of the future—is a really important concept to have in mind.

I would also be happy to address the issues around uncertainty. I think the details of future climate change are often perceived as imponderably uncertain, but in reality we have got very high confidence that change is actually happening. Indeed, some variables such as rising temperature extremes are much more certain for the future than others, and even for the ones which are less certain there are a whole range of risk mitigation approaches which are widely used in society in other contexts which are appropriate for different sorts of uncertainty. So a proactive approach—which sometimes may involve not taking any action—to reducing risk in most circumstances is possible. But, in general, one size does not fit all circumstances.

Our recent work on impacts and adaptation responses for infrastructure nationally is increasingly developing an understanding of how exposure impacts and potential benefits from adaptation are likely to change over time and when actions of different types are likely to be desirable. Some of that is touched on in our report but I am happy to elaborate.

CHAIR: Thank you, Dr Stafford Smith. The bureau has provided a very detailed submission, as I would expect you to do. Thank you very much for that. You go through in some detail how you have observed changes in different extreme weather events. For the benefit of today's record, can you briefly take us through the different types of extreme weather events; the changes you have observed or are observing in the Australian landscape in

terms of their frequency, if indeed there are changes; and how attributable any such changes can be, based on the scientific evidence, to climate change?

Dr Smith: I might pass the first part of that question to Dr Braganza.

Dr Braganza: The most certain changes in terms of observations or what we can observe are in temperature, obviously, so that is maximum and minimum temperature averages as well as extremes, typically associated with extreme daily temperatures. The attribution of that has been done both globally and in Australia—attribution mostly to anthropogenic or greenhouse gas increases. Those trends in averages have really occurred since about 1950 in Australia. Before that time, temperatures were reasonably flat, so there was not much change. There was probably less knowledge about the temperatures once you go prior to World War II, just due to the sparsity of the network and other issues. But during the period where we observe trends we have got very high confidence in those. They are robust to data analysis techniques and to network changes and things like that.

Average changes in temperature have been occurring since the mid-20th century. The changes in extremes are more observable in the last decade and a half or maybe two decades. That is principally through frequency of those most extreme daytime maximum temperatures and more significantly during nights. For minimum temperatures, record minimum low temperatures are decreasing in frequency; record high minimum temperatures—so warm nights—are increasing in frequency.

In the last decade we are probably setting records for night-time temperatures that are warm at about the rate of five to one compared to cold temperatures. During the day it is about three to one, so record-setting temperatures we have not seen before across the network are three times more likely than cold records. You can continue on with the heat indices, looking at that in several different ways. You can look at the duration of heatwaves, the central intensity of heatwaves, the length of the summer period—all of those changes are consistent with warming, essentially.

For our monitoring for temperature we have about 700 gauges around Australia. For rainfall we have closer to 6,000, and that is really indicating that rainfall is the limiting factor in the Australian environment. It is the thing that we are all really interested in. This is an arid nation; there is marginal country and then there is country that is wet. But it is that limiting factor and our interest is in rainfall.

Unfortunately, due to the higher variability in rainfall, it is harder to look at trends. It is harder to pick out from that background noise. Nevertheless, there are trends—mostly drying trends—across the south-east and the south-west. Those are the ones that have the most significance across the country. And that is in the winter time—the autumn to spring period: about a 10 to 20 per cent reduction in rainfall during that time. And that flows through—

CHAIR: What is the time that you are talking about for that rainfall period?

Dr Braganza: In the south-east it is around May, June and July—late Autumn and early winter. Since about 1995 there has been a step change in that reduction. And in the south-west you have a similar reduction, mostly during the winter months, since about 1970.

It is an important time of the year to lose the rainfall because it is during that time that we prime the catchment. We get wetter soils during that period. That allows run-off to occur during the subsequent months into winter. So the 10 to 20 per cent reduction in rainfall during that time leads to a 60 per cent reduction in stream flow. You can see that most obviously in Perth and south-west WA, where catchments are around the 20 per cent mark.

Overall in Australia, when you average rainfall across the country, it is slightly increasing. That is due to a more intense monsoon over the recent period. The variability there is a lot higher, so we are less confident that we are seeing changes that are significant from that background variability. When you go to rainfall intensity—really heavy rainfall events—in the last three years we have had a lot of records set. We have had record sea-surface temperatures around Australia, which is, in some ways, co-variable with the rainfall; it influences how much rainfall we get.

But the better statistics on that are global. You improve what we call the signal-to-noise ratio by looking at global indices. Certainly the evidence there is that we are seeing increases in intense rainfall events. And all of those things are consistent with the climate change projections.

CHAIR: All of those events are, as you said, consistent with IPCC projections, research and findings. In relation to other events outside of temperature and rainfall in terms of cyclones and bushfires—insofar as the bureau monitors bushfires—are there any observable trends that can be taken?

Dr Braganza: We do observe fire weather, through a range of different fire indices such as the forest fire danger index. Again, we are seeing trends in those that are consistent with increasing extreme heat and, in some ways, in that loss of cool season rainfall across the south-east.

It is a naturally fire prone region, obviously, but particularly in the last decade in the south-east we have seen the cumulative fire index—when you average it over the whole fire season—increasing in the last 15 years. That is most notable at the end of spring and at the start of autumn. So we have an extended fire season, particularly in the south-east. That is significant in terms of preparations for periods of burn-offs and things like that, but also in terms of curing of fuel—how long the fuel has to dry out. There are several things that complicate that, as with flooding. Repeated fires will change the fuel load and change a whole lot of other things that complicate that equation, but in terms purely of the fire weather, we are seeing an increase in extreme fire weather.

When it comes to other phenomena, we are restricted by sample size, to a degree. We do not have a whole bunch of these to do robust statistics on. In terms of tropical cyclones, there is a number of different ways to look at those: how often they occur, what the maximum wind speed is, how much they rain—that is particularly important in Australia—and storm surges and other things. Certainly sea-level rise has an impact on the storm surge and extreme sea levels. If there are base changes in the climate system, such as the propensity of the atmosphere to hold more moisture, that will have an impact on the impacts of a tropical cyclone.

So you can expect them, from now onwards, on average, to have more precipitation and higher storm surges. But in terms of frequency of occurrence there is no real discernible change in the Australian region. That is in line with projections. Mostly the projections are for not a great change in overall numbers of tropical cyclones, but an increase in the proportion of the most intense ones, by wind speed. That will be many decades from now, as the climate system gets warmer. The change that you will see more immediately is more rainfall associated with not just tropical cyclones but all storm systems.

Senator MILNE: Chair, I would like to ask a question on that specific point. In relation to cyclones maybe being less often but more intense—so I want to talk particularly about Queensland now—you said in your submission that there is also going to be a tendency for them to be further south in that as they blow themselves out they could come 100 kilometres further south from where they are currently. Does this mean that the southern part of Queensland, which previously has not experienced cyclones, is now going to experience them or that there is the probability that it will now experience that high level of flooding more often because of the high levels of precipitation associated with those cyclones decaying? Also, what does it mean for the preparedness in terms of building infrastructure, because with those cyclones blowing themselves out there are still going to be storms 100 kilometres further south than they have ever been before in terms of that intensity?

Dr Braganza: I am not sure if our submission had cyclones drifting further south. That could have been CSIRO.

Dr Smith: It might be better to pass to CSIRO on this because they did most of that work.

Senator MILNE: Okay. Just on that particular point: what does that 100-kilometre difference mean for Queensland?

Dr Stafford Smith: Our submission does note that it is possible that they will move further south. I think the problem here is that this is a place where there is a lot of uncertainty, and it is not possible to say for sure that they will move further south but it is also not possible to rule it out. It is that uncertainty. It is something that we should at least be considering in terms of risk management. Do you want me to go on to the impacts? We have carried out some work, which is published and referred to in our submission, on the impacts of extreme winds in South-East Queensland, given the uncertainty as to whether those extreme wind events from cyclones will actually move further south or not. It is a study which explored the potential benefits of increasing the building standards down there if there was no change, if there were simply more intense storms but in the same places or, indeed, if they did actually move a bit further south. In fact, there are benefits in all of those. Although, in a strict cost-benefit assessment of that over the next 100 years in terms of a net present value today, whether that translates through to it making sense to actually change the building code is more a societal decision, I think; but there is some evidence emerging there.

CHAIR: If I can shift from observed trends to your database and then how it is utilised: in terms of the data that is collected as it can relate to assessing the frequency of extreme weather events and the likelihood of impacts in certain regional areas around Australia, how adequate do you believe the current collection mechanisms and collection processes are?

Dr Smith: I think my colleague covered a bit of that in his response before. On the temperature data sets, I think we are most confident about those. We have got very good temperature records that have gone back a number of years, so the conclusions that can be drawn from those are pretty robust. You will see that translated through to the IPCC reports as well. Most of the evidence sitting behind those temperature changes has a lot of evidence to back it up; it is pretty robust. As Karl said, when you go into rainfall, we have a lot of rainfall

measurements and some of those do go back a number of years, but what we call the 'signal to noise ratio' starts to beat you up a little bit because you have not got quite the signal in there. But we can still make some sensible conclusions about that, and Karl referred to two regions where we are making those conclusions.

Sea level is the other one which is very robust. That is basically because the ocean is a very good integrator of our climate signals, and so what we are concluding or what we are seeing out of the sea level records, which in places do back 100 years, is also very robust and all that evidence lines up. If we go to tropical cyclones, as I think both Mark and Karl have suggested, it gets a bit harder. The records rely on satellites for really robust observations and they only go back to the seventies and the eighties. We would have on average, say, only nine to a dozen a year. You really take a long time to build up those statistics. So there in the IPCC report you will find, and both CSIRO and the bureau would concur, I think—that it is very hard to make definitive conclusions; the amount of evidence we would need to do that is just not there. That is broadly, I think, the status across all those areas.

CHAIR: In terms of the data that is available for policymakers to look at the risk profile of certain geographic areas around Australia, there are existing strong datasets that would relate to rainfall events that could contribute to flood events and to tidal movements that could contribute to storm surges. But in the end, while we may not have great data when it comes to being able to predict the frequency or pick up changes in the frequency of cyclones, we know pretty well the type of country that they are more likely to hit, though there is a question as to whether they might move to other areas that is yet perhaps to be determined. Do you believe that all of those datasets are effectively strong enough now, with the right application of mapping and policies and policymakers to develop appropriate risk profiles for different settings?

Dr Smith: I think we do, and Mark will probably add something to this. Generally, for the physical records, what we call the 'climate records', they are pretty sound and pretty robust, though perhaps not to the detail that we want in some regions and so that is why we go to different models to explore them. One of the gaps that came up, I think, in your discussions this morning with the Wentworth Group was that once you get outside the physical climate system—and this is even true for bushfires where we are looking at the environment and changes in the environment or changes in other parts of the system, the nonphysical part and social data—that is where it starts to get harder. So whilst we have a robust physical basis, it gets very difficult when you go outside that. Mark, perhaps you might add to that.

Dr Stafford Smith: What we do have though, I think, is a very good understanding in society generally of how to apply different sorts of risk mitigation and approaches to different sorts of uncertainty. Where you have got a variable which is changing in a monotonic directional way like sea level rise or, indeed, temperature for the foreseeable future, you can apply standard approaches which involve things like critical thresholds and the precautionary principle against those and assess those in an economic way, which can take account of the uncertainty in exactly when the threshold will be reached.

Where you have got variables where the timing and even the direction is less certain, then we have other approaches such as robust decision-making and a taking of real options approach to delaying the need to make the decision until we have more knowledge, but doing that in a thoughtful way which actively values the benefit of that wait.

Then there is a whole variety of others. I think that we mentioned a few in here, but there are certainly some well-documented approaches to that. There is a suite of things that you can do obviously with infrastructure such as putting in bigger foundations but only building a smaller dam, as it were, to begin with until you have a better idea of what scale of dam you really need. There are soft approaches like demand management for water instead of supply. So there is a whole suite of risk management things which do not depend upon us having certainty on everything.

CHAIR: How well do current policies apply those risk mitigation and risk management opportunities that currently exist?

Dr Stafford Smith: I think for all of the ones I have mentioned, you can find policies which apply them really well and not necessarily in the area of dealing with climate change. I think we are still working through how they should be applied in some of the areas that are involving changing risks here. I think that there is a lot of opportunity to explore those further, but the knowledge base is there.

Senator MILNE: I just want to go to that one at the moment on adaptation in particular. We had evidence this morning from a doctor from Cairns who was talking about Cyclone Yasi in that case and the impact on the Cairns Base Hospital. He then went on to talk about the evacuation of Bundaberg. He said that we need a template that every hospital and every aged care facility has that assesses the risk and vulnerability of that facility to the climate

scenario so that they can then determine whether they do have to have a really detailed evacuation plan or that there is little likelihood of one being needed. My issue is that there is always the science—you all said the science is there on a whole range of things—but it is not able to be applied by local government, hospital systems, child-care or aged-care facilities, or whatever. So what is the problem in not wasting, as you said, maladaptation strategies—deciding you are going to build a megadam and you are not sure about that; you might need one only half the size, or whatever it is? What is the problem? We have all the science and we have vulnerability. How are we going to match up the practical application of the science?

In particular, I want to come to the role of NCCARF. I am really distressed that that is being defunded. It seems to me that that was the only thing that had started, with an interdisciplinary capacity, to interpret the climate models and get the information in an accessible form to some of these groups. When I asked the question before, it was said that CSIRO has adaptation facilities and so on, and maybe that could be utilised. Could you tell me what you do compared with what NCCARF does and go to the issue of getting what we know to the people who need the information to make these decisions, to reduce risk and therefore reduce human life costs and other costs?

Dr Stafford Smith: There are quite a few things in that. Let me try and address them, and pick me up if I do not get them all. Firstly, let's not overstate that there are areas of climate science which we still need to know more about. That is clear.

Senator MILNE: Of course.

Dr Stafford Smith: Although there is a great deal of really clear science in that area, there is plenty of science in other areas, including the social sciences, looking at things like barriers to adaptation, which we still have quite a bit to do on to understand some of the things that you are asking about—broadening the suite of sciences, and some of those are not so well developed in this area. I would agree with you that NCCARF has been doing a good job of drawing together the various universities and other research agencies, including the CSIRO, in essentially creating a capacity for adaptation in Australia from a research point of view. I am the science director of our Climate Adaptation Flagship and we have worked very closely with NCCARF. We are part of the network but, perhaps, a slightly peculiar one in that we are a particularly large chunk of effort that is all within one organisation, whereas most of NCCARF is about networking quite small efforts in a whole lot of universities. The roles of the two organisations are not independent but they are quite complementary in terms of us being able to take a more directed and applied research approach, whereas NCCARF has been more about coordinating efforts across many universities.

Partly some of our efforts that have gone through the NCCARF process have been directed to the sort of question that you were asking at the start, which is: how do we go about turning all the climate information into adaptation and planning? We have spent some years—particularly coming out of a period in which we were trying to understand the imperative for mitigation and not being so concerned about adaptation; being more concerned about impacts—thinking about impacts and vulnerabilities in order to make the case for mitigation. Only in recent years have we really switched that focus on impacts and vulnerability to ask about what we should do, given that some of these things are almost certainly going to happen. That leads to the adaptation question that you were asking. On that, there is a growing body of work from a variety of sources looking at how you go from worrying about the problem to actually approaching adaptation planning to respond to it. There are a series of approaches, such as the local government processes in South Australia—that is well advanced—looking at approaches to adaptation planning and actually producing the adaptation actions. Many of them build on the sort of approach that has been around for a decade or so in the UK. The UK Climate Impacts Programme has pioneered much of the decision centred approaches to adaptation.

I come back to your particular context of North Queensland. North Queensland is interesting in the sense that we know that some adaptations work extremely well. For example, we know from evidence after Cyclones Yasi and Larry that buildings which were built to the cyclone code essentially survived intact, whereas others did not. So we do know some good adaptations to take.

I think we have a growing amount of understanding of the complex governance structures and processes in coastal areas in particular which render responding to sea level rise very complex. We are moving really into the social sciences of people's responses there and I do not think that is resolved. But I do think what is coming out there—and we cite some of this towards the end of our submission—is some understanding that clear understandings of responsibilities and who is setting standards, things like that, are important. From the science point of view, I would not say who should do it necessarily, but we can say that you need to have those things clearly set. That goes all the way from understanding who is responsible for the planning processes, who is responsible for enforcing those understandings to the sorts of scenarios they should be planning against which

might require some sort of standard agreement across COAG or whatever. Those are more political issues. The need for some consistency there is clear from the science.

Senator MILNE: So there is a need for a systemic and national approach devolved however. The Bureau of Meteorology's submission says that you could have better utilisation of current environmental intelligence assets. You go on to talk about early warning systems, national flood monitoring and flash flood warnings. I would like you to comment on the adequacy of local government being in control of flash flood warnings and then high-performance computing capacity. What are you talking about there? What sort of investment is required and what sort of difference would that make?

Dr Smith: First, on the flash floods—and we cover this in some detail in both this submission and the Productivity Commission's input. The bureau, through the act at least, does have a responsibility to issue rainfall forecasts, particularly for extreme rainfall. Through the years, we have also adopted a responsibility around riverine flooding—that is, flooding outside about the six-hour time limit. With the accumulation of rainfall and the knowledge particularly of some of the flatter areas, we can make flood forecasts. Unfortunately, we did not realise this I think until more recently that whilst there has been a good understanding amongst the jurisdictions and the Commonwealth about responsibilities, none of this has been codified in legislation or made very clear. This emerged out of the Queensland commission of inquiry.

For flash flooding, whilst we think there is a lack of technical capability that could be brought to this—and this is not unconnected to supercomputing—we know now from places like the UK and the US that forecast models, weather models, can predict rainfall now down to very fine scales. People are running these models in the UK down at less than one kilometre in some situations. That is the sort of capability you need if you are going to address flash flooding. It is probably never going to be purely something that can be addressed by the Commonwealth because a lot of the flash flooding not only depends on the inputs and the rainfall but also depends on local conditions, and that is where local and regional governments have the key knowledge you need to address that.

In our submission, we just refer to the issue that is there and that clarity around those responsibilities is needed—where the Commonwealth could act and where local government could best act. We believe some further clarification around that is desirable. The principle there is that local governments are best placed to manage local risk; the Commonwealth can handle some of the larger risks and, if you like, the national scale and regional scale problems.

Senator MILNE: What about the supercomputer?

Dr Smith: For weather prediction, for climate and for the sort of work we do with CSIRO, supercomputing is just one of the staple tools you need. Over the last two years, people have been burning a lot of supercomputer hours and producing the forecasts and the projections for the fifth assessment. It is great to see the work that is led by CSIRO, which now puts us up in the top category of countries with skill with those models.

But it ultimately depends on the amount of supercomputer capacity you can put at those problems. Whilst I think we now have both world-class weather forecast models and world-class climate models, to drill down to where the people act on the local scale just comes down to resolution—how many grid points you can put in your model, and that just depends on the size of the supercomputer.

So there is a decision we have to make with government about how much investment we should put in supercomputing versus the return we get by being able to have higher resolution—getting down to the scale of catchments and below and being able to do multiple runs, particularly in extreme weather, so you can say, 'These are the likely scenarios from today for a tropical cyclone or for extreme weather', and, 'These are the probabilities that we expect against each of those possible outcomes', rather than, 'Here's a forecast' and using people's intelligence to interpret it.

Senator MILNE: So let's drill down to what that means practically. Say Cyclone Yasi is coming—if you had greater supercomputer capacity you are saying that you could drill down to a much more localised prediction of the actual impact on individual communities rather than just a regional context? I am trying to get a sense of value for money in terms of the community's view of this. What would it practically mean for a coastal region, with or without the supercomputing, in terms of practically getting home, getting your house ready and sorting things out?

Dr Smith: That is a great example. If you took us back 10 years, we could not have given the forecast for tropical cyclone Yasi, simply because we did not have the computers. Now both we and other weather agencies have the ability to do tropical cyclone Yasi—and Rusty was the most recent example, off the North-West Gulf—five or even seven days out. You are right: where it really hits, and where it is really relevant, is as we get over the

land regions where we have the high winds and the rainfall. What that potentially allows us to do is to start predicting some of the impacts and hazards three or four days out, not just saying, 'You're likely to get strong winds and strong rainfall in these regions' but taking it to the next step and perhaps saying, 'These are the likely impacts in these catchment areas', or working with CSIRO or Geoscience Australia in looking at the impacts on built environments. So we could go down that next step, because you would have both the detail—the high resolution—but also the probabilities; you know the spread of possible outcomes, so you can start to give some guidance about the likelihood that a certain community might be impacted more heavily or less heavily than another community.

Senator MILNE: So what sort of dollars are we talking about? The proposition you are putting forward is obviously 'how long is a piece of string' in terms of how much you could spend on supercomputers. But, in terms of what you are now saying, to take us to the next level of capacity, what are we talking about, Dr Smith?

Dr Smith: At this very moment we are just putting in place the research community as distinct from the operational community. The analogy I normally use is putting a research computer into the ANU here in Canberra—and the total operational cost over four years, when that gets up, is going to be in excess of \$100 million. For an operational machine to do those sorts of things you are looking at that same capability plus the sorts of things you would need for a 24/7 operation versus running a research facility. So you are looking at in excess of \$100 million—but probably over a lifetime of about five years. Those are the sorts of orders—but, as you say, how long is a piece of string? The European centre, which is the leading player in this business, is spending probably 50 per cent more than that on some of the leading supercomputers. And organisations in South Korea, the UK, France, Europe and the US are all spending very big on supercomputing for the same reason: to go down to detail, to go down to specifics.

Dr Braganza: If I could just quickly add that the prediction of fire weather is another area where we have had a great gain from supercomputing capacity. If you look around the time of Ash Wednesday, our four-day forecasts now for fire weather is as good as a one-day forecast in the early eighties. We can do hourly forecasts and spot-fire forecasts, where we really push the system. Fire weather is one where you are using 30 different variables, so 30 different grids out of the computer. No-one fights a fire now without basically getting these really high time resolution forecasts from us. In January we did something like 1,600 spot fire forecasts directly in aid of firefighting. Again, it is not just flooding, it is across a whole range of variables. The evidence for the gain you get from the increase of the computing power is obviously there.

Senator MILNE: Dr Stafford Smith, we heard evidence earlier today that one of the problems is that the rules that were written around Commonwealth funding to assist recovery are that there is to be no betterment. So you give people money to build the same road to the same standard in the same place that it was washed-out—and then it gets washed out again. Or if some facility goes the Commonwealth provides the money but they have to be rebuild it the same. That seems a completely ridiculous proposition. When the Attorney-General's Department was writing the rules about funding recovery, were you at CSIRO in your adaptation capacity consulted about what sort of rules need to go around the money so that we don't just put money back into the same thing that failed last time and will fail again?

Dr Stafford Smith: I would have to take it on notice to check whether we were specifically consulted on that, but I can certainly say that the director of our Climate Adaptation Flagship, Andrew Ash, was on one of the committees in Queensland after the 2011 floods and certainly had quite a bit of input on precisely this issue. My understanding is that the rules have changed a little. We are in fact at the moment in the midst of a study exploring the potential benefits from essentially a more or less proactive stance to adaptation, but if you like, betterment, in the short term. We do not have the results from that yet, but I think that somewhere over the next six months we will have some quite solid data there on what the potential benefits of different levels of proactive anticipatory sort of planning like that might be.

Senator CAMERON: I notice that the Bureau of Meteorology's mission statement is, among other things, to

- Analyse and explain trends in environmental data.

and

- Foster greater public understanding and use of environmental intelligence.

I suppose you must be tearing your hair out at times wondering how you can make that work.

Dr Smith: No. I think it is a challenge, certainly in the present environment. Some of the reasons behind our changing, if you like, our vision and mission statement around the intelligence are for the reasons you have heard here today. We think we now are in the unique position of being able to derive intelligence from a variety of data sources, such as Karl and Mark have described, and bring them into a form that the community can use, or

consume if you like, in a way that was not possible before—bringing disparate data sets together. That is the intelligence part. Computer models suggest another part of that. They can do things that we cannot do from the raw data.

As I said earlier on the environmental side, on one part of that, for the traditional weather and climate variables, I think we are pretty well-placed and now with water we are bringing climate and water together and providing intelligence in ways that we have not done before. That is work we do with CSIRO as well.

But on some of the other environmental variables where we are now just starting to make inroads—one of those is an exciting project with CSIRO and others in the Great Barrier Reef—we are now just looking at how we might take that same paradigm into other circumstances such as coral reefs and things like that.

Senator CAMERON: I am raising the issue because yesterday we had the insurance industry appear. Their, I suppose, scientific advisors are a group called Risk Frontiers. Risk Frontiers gave us a submission that said:

A wealth of peer-reviewed research has shown that the economic cost of weather-related natural disasters is rising in concert with growing concentrations of population and wealth ...

No argument about that; I think that is self-explanatory. But they go on to say:

No role can yet be attributed to anthropogenic climate change. This is the case for multiple natural perils and across different jurisdictions. And recent studies suggest that we may be centuries away from being able to detect an anthropogenic climate change signal in US tropical cyclone loss data.

That has been challenged by nearly every scientist that has been before us, just on the basic physics. I am wondering, given the role that the CSIRO and BOM have got, how we can have people who are advising such an important strategic industry being so off-beam in terms of their analysis about the effect of climate change on extreme weather events. How can that happen?

Dr Smith: I do not know whether we can answer for them. They make their own decisions.

Senator CAMERON: I am not asking you to answer for them. I am asking you: how come there is such a difference in what is supposed to be a scientific research organisation providing advice to the insurance industry?

Dr Braganza: It is somewhat easier to define trends in physical environmental parameters such as rainfall and temperature than it is to define trends in the intersection between those and socioeconomic activities. So I think that, while you will find there is a clear trend in extreme weather and in average weather and a whole range of climate indicators across Australia, the complications of changing practices across socioeconomic activities complicates the impact of that. So things like changes in adaptation responses, changes in building codes—a whole range of things—have to be taken into account to try and absorb, 'What is the impact of those changes in the physical world on those socioeconomic systems?' and I do not know that there are clear methodologies for doing that at present.

Senator CAMERON: I am not asking about socioeconomic—I am asking about the physics of weather and climate.

Dr Braganza: That is clear, and that is clear from the submissions that the BOM and CSIRO have put in.

Senator CAMERON: So are you saying that you can clearly, using the science, do a correlation between climate change and more severe cyclones?

Dr Braganza: No, more that, in Australia, you are really looking at extreme heat and loss of extreme cold as the main changes in extreme weather. Rainfall is a little bit more difficult. Certainly in terms of drying trends across the south that is quite clear. With tropical cyclones it is difficult just due to sample size, and I think sometimes the different aspects of a tropical cyclone's behaviour get conflated under climate change. Mostly what people are talking about when they are talking about far-future changes are changes in tropical cyclone wind intensity. They are not necessarily talking about changes in rainfall associated with tropical cyclones or any other storm and changes in where they are occurring and the frequency with which they are occurring.

When we are starting to hit on individual weather systems, then it obviously does become harder. So there are partitions and there are levels of certainty across different variables. If you do not partition those correctly and present a clear narrative of how all those bits fit together then you can come out with what is actually quite confusing information at the other end. I think it is very important that we actually structure that information quite clearly, and that does not always happen when you are intersecting with some of these socioeconomic things.

Dr Stafford Smith: Could I just add briefly to that? I think there is still some contention in this area, but we should be clear that Risk Frontiers is talking about detectability in the economic impacts. So that is, as Karl has said—

Senator CAMERON: Have you read their submission?

Dr Stafford Smith: I have not read their submission but I have certainly read some of the papers that I can hear that it is based on. So there are, of course, a whole series of additional factors, as Karl says.

There are just two quick things to add. One is that their point, nonetheless, about detecting that signal in the economic impacts may well be true, because there are so many complexities in there. That does lead to the need to find mechanisms, other than just straight observing change, to be able to assess how much impact is likely to be there.

The other point I would make is: there is no doubt from our work also that, in the short term, as you have said, the increase in population and the resulting infrastructure is by far the dominant part of the combined effects of climate and population change in terms of impacts. But, when we model forwards, that balance changes over time, and also there is an interaction between the climate and the population thing, such that if you model only the population change or you model only the climate change and then add those two up you get less effect than the two combined. There is an interaction. Those things you would not pick up from the sorts of statistics that are looking at past events. So I—

Senator CAMERON: I might go back and read the *Hansard*. You are confusing me.

Dr Stafford Smith: I did not see their submission, so I am sorry.

Senator CAMERON: You see, in the context of BOM and CSIRO advising the public and trying to get the public to understand these issues, this is a very important situation. If we have a major industry and their scientific advisers saying that you cannot link this at all, this is an important issue. For instance, in the Climate Commission's publication *The critical decade: extreme weather* the question is posed, 'How does climate change influence cyclone behaviour?' They say:

The relationship ... is complex, with some uncertainty in our current understanding ...

That is what you have been saying. They say it is:

... compounded by the lack of long-term ... data ... However, two aspects of climate change ... are likely to affect cyclone behaviour.

I want your views on this:

First, the vertical gradient in temperature through the atmosphere, that is, the difference between the temperature near the surface of the Earth and the temperature higher up in the atmosphere—

you would know the argument if it is correct; I will not read the whole thing. It goes on:

Second, the increasing temperature of the surface of the ocean affects the intensity of cyclones ...

Is that a proposition that we as a committee can take to be a factual proposition, as distinct from the argument that there is no linkage?

Dr Smith: I think that basically those physics are right. In fact, it is the same reason that we can predict Tropical Cyclone Yasi now five to six days ahead: it is because we can predict the environment, which includes that shear, and we have very good sea surface temperature and very good predictions of that. It is those same physics and dynamics which sit inside climate models and allow those to have a little bit of surety that you will have change in the tropical cyclones. So that physical basis, I think, is pretty sound.

Dr Braganza: Yes, I think that is right. I have tried a couple of times to make the point that you can get fixated on wind intensities with tropical cyclones. Tropical Cyclone Oswald was a category 1, so not an extreme cyclone at all, but it caused extensive flooding down almost a record length of coastline. So there are multiple impacts from a changing climate on the behaviour of storms, not just in wind intensity.

Senator CAMERON: I think I am going to get wound up, because we are over time. I did not have much time at all, but can I just ask BOM: have you heard from Cardinal Pell? Has Cardinal Pell ever come down to get some advice on what is really happening on climate change?

Dr Smith: No, we have not heard from Cardinal Pell in recent times.

Senator CAMERON: Do you think you will ever invite him down again?

Dr Smith: As I think our director said last time you asked, the invitation is there always if he wants to come down and talk to us. I am sure it is true for CSIRO as well.

Senator CAMERON: Okay, thanks.

CHAIR: On that note, the committee will have a brief suspension. Thank you all very much.

Proceedings suspended from 15:43 to 15:51

JENSEN, Ms Benedikte, First Assistant Secretary, Adaptation, Science and Communications Division, Department of Climate Change and Energy Efficiency

McLOUGHLIN, Mr Richard, Assistant Secretary, Department of Sustainability, Environment, Water, Population and Communities

SLATYER, Mr Anthony, First Assistant Secretary, Department of Sustainability, Environment, Water, Population and Communities

SULLIVAN, Mr Sean, First Assistant Secretary, Biodiversity Conservation Division, Department of Sustainability, Environment, Water, Population and Communities

CHAIR: I welcome representatives from the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education and the Department of Sustainability, Environment, Water, Population and Communities—I am pretty sure they are the two longest-titled departments in the government! Thank you all for joining us today. As you are all experienced officers, you are well aware of the fact that under Senate rules you will not be asked to give opinions on matters of policy, although this does not preclude questions asking for explanations of policy or factual questions about when and how policies were adopted.

The committee understands that DIICSRTE will be speaking to submission No. 168, provided by the former Department of Climate Change and Energy Efficiency, and the committee has received SEWPac's submission as submission 61. Do you wish to make any amendments or alterations to these submissions? No?

Mr Slatyer: No thanks, Chair.

CHAIR: Very good. Does either department or both wish to make a brief opening statement?

Mr Slatyer: Not from us.

Ms Jensen: And not from me.

CHAIR: Very good. In that case we will proceed straight to the questions. At the outset, I just express my apologies that I will be handing the chairmanship over to Senator Cameron in about 15 minutes or so. Can I start by asking both departments for their take on how effective they believe Australia's current arrangements for dealing with extreme weather events are, in terms of the integration of Australian government services into the responses to and the planning around the handling of extreme weather events.

Ms Jensen: Senator, could you just repeat the end of that question, please?

CHAIR: It was how effective current practices are from a federal government perspective of assisting states and local communities in the handling of extreme weather event situations—and perhaps how Commonwealth government involvement in that sense is coordinated, please.

Ms Jensen: I guess, in relation to the response to extreme weather events, that is more of a question for the Attorney-General's Department.

CHAIR: That is probably a fair point. They declined to come. Okay, that is fine. We might revisit that with them when we hold a subsequent Canberra hearing. Let me shift to the issues of mitigation and how the Commonwealth funds and supports mitigation activities. Can you take us through those programs as they exist and the work done with the states and local authorities to undertake mitigation works?

Ms Jensen: May I suggest that you may mean adaptation? Adaptation is managing the impacts of climate change; mitigation tends to refer to the policies that reduce carbon emissions, such as the carbon price. Is that what you intended? I just want to clarify.

Senator LUDLAM: I was using 'mitigation' in the context of mitigation against the impact of extreme weather events. If you want to take that as adaptation policy or take both of those things together, that is fine.

Ms Jensen: I just need to be clear because mitigation policy currently is not in my area of responsibility. I manage the climate change science and climate change adaptation policy, adaptation meaning measures to manage and reduce vulnerability and exposure to the impacts of climate change. Mitigation tends to refer—

Senator LUDLAM: I am happy to use the term 'adaptation'.

Ms Jensen: I want to make sure I am answering you properly.

Senator LUDLAM: Through the life of this inquiry mitigation has probably been used in a different concept.

Ms Jensen: I am very happy to talk about adaptation. There is a range of ways that my department supports adaptation. The key one is through COAG with the Adaptation Working Group, which currently has quite a full program of work with lots of good engagement by the officials around the table. For example, it recently released

a paper clarifying the roles and responsibilities between the Commonwealth and the states in the adaptation space. We will shortly be starting work with the states and territories looking at those elements of the response to the Productivity Commission report on barriers to adaptation and the spheres of responsibilities of the states. We will be starting that soon. We are also working with the states looking at adaptation in coastal areas.

Outside of COAG, in addition to that the government since 2007 has funded quite a significant research program into adaptation. Overall \$50 million has been expended to the National Climate Change Adaptation Research Facility, which has generated quite a significant critical mass in the research capabilities of Australia. Furthermore, over that period there have been a number of other adaptation related programs which the department has managed, one being the Coastal Adaptations Decision Pathways program, which has been 4½ million in supporting decision-making in a very practical way at the local council level and also involving the states. In fact, this coming week there will be a workshop sharing lessons of best practice from that program of work. One example was work done in the Port Phillip Bay Area looking at how decision-making can inform weighing up the costs and benefits of further development, given the future impacts of flood and inundation costs. So a number of things have been done very much at that level of practical support and guidance for decision-making.

These are matters where businesses, households, local councils and communities are making decisions about relative objectives and how to factor in future climate risk into decision-making. We have long-lived assets and it is important to think about climate impacts now and also into the future. The Commonwealth clearly has a role in providing risk information, which we do in funding the climate change science programs themselves. The Australian Climate Change Science Program, as you would be aware, is 7.8 million per annum and ongoing. It funds our science partners—CSIRO, the Bureau of Meteorology, the Antarctic Climate and Ecosystems CRC, from whom you heard earlier today. The research findings they were giving evidence on are funded by the Australian Climate Change Science Program.

The research findings that they were giving evidence on are funded by the Australian Climate Change Science Program. So, in terms of that fundamental role of the government, they are providing the information on which adaptation decisions are based and that is clearly a key way that that contribution is going on. When it comes to decision making, you need these two things to come together, being the capability at the local level to use that information and to look at how decisions are robust to a range of future scenarios, so there is that role in providing practical tools and guidance and also the coordination role through COAG in looking to see that each level of government is working together.

So that is probably my overview in terms of what has been done in the adaptation space but, as I think the government response to the Productivity Commission report showed, this is in the end very much a cross-cutting issue. The Commonwealth has a role as to how it manages its own assets, whether they be defence establishments down at the coastal level. We are currently running a Commonwealth reference group which is bringing all the relevant agencies together to look at how they further develop and strengthen their approach to risk management while factoring in future climate change risks around the Commonwealth's coastal asset management, which is an important way to protect the Commonwealth's future fiscal costs in fact by making sure that it is taking a leadership role and being an area of best practice itself in the way it manages its own assets. That feeds through because the Commonwealth is often a player at the local level in partnership with communities. So if it is doing its role and working with them, whether they be councils with adjoining land or other organisations, that is actually helping to filter through and embed that knowledge and good practice down at the local level as well.

CHAIR: If I may look specifically at transfer of knowledge to the local level and the support that is being provided there, you mentioned a specific program although I did not quite catch the acronym that you mentioned—

Ms Jensen: It is coastal adaptation pathways program. That may be it.

CHAIR: I was not sure whether you had said 'cat' or 'cap'. So obviously it is CAPP. Can you outline to us exactly what sort of information that has provided for councils? Has it provided information that is available now to all councils in ways that allow them, especially smaller councils, to easily make assessments based on the type of data and the type of mapping that is available to them?

Ms Jensen: That particular program was developed in partnership with the local councils, so it was very much tailored to the needs of the local partners. There was a wide number of programs and it was quite varied because it would relate to the particular needs of an area. A couple of the particular achievements that the program has provided include developing the knowledge base through innovative approaches and pathways for adaptation across various aspects, both looking at the current exposure of the communities and at what are the pathways going forward while informing the decision making and looking at the future scenarios and impacts and then at

how that would inform whether there should be investments and also how to strengthen the resilience of the particular local community. So it is quite varied and hard to sum up. We could take it on notice and provide you with more detail. That may be the best way to do that.

CHAIR: Yes, if you could. Are any of the activities undertaken to date occurring in a way that is providing standards and information to councils in local government areas across the country so they can all then adopt them as the means of making assessments of planning decisions and the means of making local assessments of how to minimise flood risk and how to consider those types of possible consequences from variations in extreme weather events?

Ms Jensen: Over a period of time there has been a series of tools developed and provided. For example, again in the coastal area, there was the first pass assessment, which provided very detailed information that is available to be used at the local level in terms of the future impacts of sea-level rise. That was further developed last year with the launch of the Canute tool, which is a visualisation tool for local planners to look at the future impacts of sea-level rise. We are currently working on some further enhancements to that. That is a specific example of a very particular tool which can inform local decision making. And, as I said earlier, the CAPS program has provided a range of other supports for decision making. That is available to those community partners who have been involved in that project.

Mr Sullivan: Also, at a national level there has been investment across both departments in providing additional funding, in terms of science and in planning under the NRM Planning for Climate Change, which came out of the land sector package. The science component of that is being managed by my colleague, and we expect funding announcements for the planning components to be made in the near future. That provides national-level funding to improve science with respect to adaptation and how that is then incorporated into planning across the whole continent.

CHAIR: My question is to SEWPaC in particular. The Wentworth Group of Concerned Scientists today gave evidence where they particularly emphasised the need to strengthen resilience in soil and water systems to provide greater capacity for more resilient systems to adapt to climate change variability. In terms of the programs and policies operated by SEWPaC, is there particular consideration given to those factors and how soils, land and water might be made more resilient to future variations in extreme weather events?

Mr Slatyer: I can address your question as it relates to water, and Mr Sullivan might pick up the broader question. COAG for some time has stated its intent, through the National Water Initiative and through subsequent COAG processes, that jurisdictions strengthen their water planning arrangements to allow for the risk of more extreme events in the climate.

The National Water Commission is responsible for assessing state or jurisdictional performance in that regard, but by and large states have improved the quality of water planning to enable allocations and other water resource instruments to be modified according to changes in the climate. That is most mature in the Murray-Darling Basin system, where state governments have put in place quite sophisticated regimes for adapting the water availability to the changing climate system.

Most recently, through the Murray-Darling Basin Plan, all governments have committed to very substantial measures to improve the resilience of water based environments and communities—both through the planning process of the Murray-Darling Basin Plan itself and the constraints that it imposes on diversions, as well as the substantial investments, through Water for the Future, to assist irrigation communities to use their water more efficiently. So, from the perspective of the water side of your question we feel that there are considerable policy measures in place, endorsed by the COAG, to enable water planning and management to help communities to deal with the risk of climate change.

In the Murray-Darling Basin, in particular, one of the core objectives of the Basin Plan and the Water for the Future programs is to improve the resilience of the environmental and community systems of the basin. We can give examples of that if the committee is interested in particular investments and so forth, but I might turn to my colleague Mr Sullivan, who could answer your question in regard to other natural resource domains.

Mr Sullivan: The broadest investment prospectus is one in terms of increasing planning, as I referred to before; but a majority of our programmatic investment whether that be through Caring for Our Country or the Biodiversity Fund has a principal aim of improving resilience. We know that that has an impact. SOE reports have said that we are looking at decadal investments in terms of return on those investments, but we know now that the Mallee is more resilient to loss of soil because of the investments that are being made in improving natural resource management across both farmers and off-farm management. We are also improving the policy

environment in terms of corridors and what connectivity means in terms of improving resilience as well. So this is a key focus of our work both at a programmatic level and in our policy construct.

CHAIR: Thank you, Mr Sullivan.

Senator CAMERON: Can I make a broad statement here. In the five years I have been involved in Senate inquiries, I have never seen such a scant submission from a department as the one from the Department of Climate Change and Energy Efficiency. There is no attempt to even go to the terms of reference of this inquiry. I do not know what the problem is, but I have never, ever seen a submission like this. The SEWPaC at least makes an attempt to go to the terms of reference but the Department of Climate Change and Energy Efficiency just does not go anywhere near it. This is a serious inquiry, and I would have thought the inquiry would have been treated a bit more seriously than this. I know you have lost your secretary, I know those changes have taken place, but I would have expected a bit more than this submission. I have to tell you that we have had individuals who have put in more detailed and comprehensive submissions based on the science and on public policy than we have from the two departments. On that basis, I have got to tell you that I am not happy about it at all. Senator Milne.

Senator MILNE: I concur with Senator Cameron. I would like to start by asking Ms Jensen which agency has the leading role across the whole of government in terms of preparing for the impacts of climate change as we are now seeing them and adaptation for climate change?

Ms Jensen: The department of innovation now has the lead coordination role in that adaptations area. We are the lead on adaptation policy for climate change.

Senator MILNE: And who is the lead on mitigation?

Ms Jensen: The lead area on mitigation is now the department of innovation as well.

Senator MILNE: So you are the leading agency for a whole-of-government approach and direction across mitigation and adaptation. How many people work in the adaptation area?

Ms Jensen: In the adaptation area specifically?

Senator MILNE: Specifically.

Ms Jensen: I might have to take that on notice because we have obviously had some change recently. I want to make sure I get you the right numbers here.

Senator MILNE: Ballpark.

Ms Jensen: Ballpark, again, I would have to take that on notice to make sure I get the right numbers.

Senator MILNE: Okay. Who coordinates the national adaptation response in terms of health on climate change?

Ms Jensen: In terms of health specifically?

Senator MILNE: Yes.

Ms Jensen: That is the responsibility of DoHA, the health department.

Senator MILNE: What role would you have in directing, coordinating or working on any response to climate change impacts for health—a coordinating role?

Ms Jensen: We run an interdepartmental committee around adaptation issues, and we have representatives from DoHA.

Senator MILNE: Okay, let us go back to the interdepartmental committee on adaptation issues. How often does it meet, and how many areas of government does it discuss?

Ms Jensen: How often it meets depends a bit on the work program. For instance, over the last four or five months it has been meeting roughly monthly. But, again, I could take that on notice and come back to you with specific details of that. It meets quite frequently.

Senator MILNE: So it is an interdepartmental committee. Almost every single witness at this inquiry has said that what we need is a nationally coordinated response, and what I am seeing is not a nationally coordinated response at all. Just for your information, the department of health has just sacked the four people who did environmental health impacts, so they do not even have that anymore. But, to come back to your department, you talked about NCCARF, for a start—the National Climate Change Adaptation Research Facility. It is being defunded this year. Is its work finished?

Ms Jensen: That is a matter for ministers.

Senator MILNE: Okay. You said it had been operating for four years. That has really only just started coordinating and starting the networks; it is just hitting its straps now. In the absence of NCCARF, who is going to do that work?

Ms Jensen: Again, that is a slightly hypothetical question, because no decisions have been made; it is a matter for ministers.

Senator MILNE: The decision has been made to defund it. I am asking you as the lead agency and the person in charge of coordinated adaptation strategy across government: who is going to be taking on the responsibility that NCCARF has had?

Ms Jensen: Actually, no decision has been made; that is not entirely the case. As I said earlier, that is a matter for ministers through the budget process in relation to the future of that program. I would note that the CSIRO has a very significant climate change adaptation flagship research program.

Senator MILNE: Yes, and we spoke to them, and they said—

Ms Jensen: There are other areas; I just want to note that in terms of the general context.

Senator MILNE: They have also said that they do not do what NCCARF does, that they are complementary agencies and that they do not duplicate one another's work.

ACTING CHAIR (Senator Cameron): Can I just say, Senator Milne, that I think Ms Jensen would be wise to take some of these issues on notice if she is not sure and she is being asked for policy responses. It is not her job to give you policy responses, but she could take some of these issues on notice and come back to us.

Ms Jensen: I would be happy to do that.

Senator MILNE: Okay. So who across the government is managing adaptation to extreme weather events and climate-related events in terms of emergency services?

Ms Jensen: Obviously the Attorney-General's Department are responsible for emergency services, and they also come to our IDC in terms of that coordination role. Adaptation is an issue which is cross cutting, and a range of different agencies will have a role in relation to their particular policy domain. So there is a bit of a parallel there if you think about the Treasury's role in coordinating fiscal issues. Every agency obviously has a responsibility for fiscal management in its own policy portfolio, so it is a similar kind of cross-cutting issue.

Senator MILNE: Yes, but the point that I am making is that nobody is coordinating and driving this effort across the whole of government. So let me ask you why, for example, the Natural Disaster Relief and Recovery Arrangements do not include the natural environment. If you are in charge of adaptation, tell me why that is not in there.

Ms Jensen: I would respectfully say that that is a question for the Attorney-General's Department. I can take it on notice, but the disaster recovery arrangements are in that department's area of responsibility.

Senator MILNE: Can you see where I am coming from? Nobody is driving a coordinated response across the Commonwealth to all of the issues. You say you have this interdepartmental committee. What is it working to? Is there a whole-of-government plan for adaptation?

Ms Jensen: I can take that on notice and come back to you. The government has recently released its response to the Productivity Commission inquiry into barriers to adaptation. That actually sets out a whole-of-government position and a range of responses across a number of different policy portfolios, but we can take that on notice and come back to you with the information.

Senator MILNE: The point at issue is that you are the department that is in charge of adaptation across government, or you are supposed to be, according to what I am hearing. If you have listened to the evidence we have taken in the last couple of days but also over the whole inquiry, we hear at every level—we had ACOSS saying this today—that nobody is incorporating the social services in planning for emergencies related to climate change or anticipating planning decisions. So which agency is doing that and under whose direction?

Ms Jensen: In relation to the non-profit sector?

Senator MILNE: In relation to the community sector, neighbourhood houses and those sorts of things, and the roles that they might play in anticipating planning for natural disasters associated with extreme weather events and so on. Who is determining how they get incorporated into this?

Ms Jensen: I can take that on notice. The functions will be split across a range of areas—for example, FaHCSIA will have a number of responsibilities here.

Senator MILNE: But who will coordinate Attorney-General's over here, Auditor-General's here and FaHCSIA here in relation to working out emergency services, the role of the community organisations in

planning for that and, indeed, getting that through to local government? And who is going to do that in relation to applying the vulnerability issues?

Ms Jensen: Again, as I said earlier, officials meet regularly—recently, monthly—with all the relevant departments, including FaHCSIA, Attorney-General's, DoHA, around the table to coordinate what they are doing and to share information and also expertise around adaptation. That coordination function is being done by this department through that committee. That brings everyone to the table and does that coordination role.

Senator MILNE: Okay, they come to the table, but they are not working to a plan. Do they have performance objectives? Do they have to come back and say, 'By a certain amount of time, we will actually get emergency plans in place, we will have some responses from Health, we will have some responses from building codes, we will have some responses from Environment about what they need and how we can build them into natural disaster relief and recovery planning and funding'? Is it just a talkfest when you get together once a month?

Ms Jensen: It will vary depending on the issue. Recently the program has been developing the government's response to the Productivity Commission report. As I said earlier, we have a separate reference group bringing together the Commonwealth agencies with assets in coastal areas to develop some very detailed guidelines on how to embed future climate risks into how they manage these assets. There are a range of things happening, and the program will vary depending on what is important at the time.

Senator MILNE: This Commonwealth reference group is doing coastal areas at the moment. Is it going to move on to health planning, for example?

Ms Jensen: It has specifically been brought together to look at coastal asset management.

Senator MILNE: Yes, but coastal assets management is one thing; planning for health responses is another. Is there going to be a Commonwealth reference group on that? What I am asking is: who is driving it?

Ms Jensen: Again, the particular lead will depend on the issue. In relation to health, my understanding is that my colleagues at DoHA are doing quite a number of things around health adaptation. At some stage in the future one could not rule out them leading a program in that area, but it is really a question for that portfolio.

ACTING CHAIR: On that issue, is a hospital a coastal asset if it is built on the coast?

Ms Jensen: A hospital clearly is an asset. If it is built on the coast it is a coastal asset.

ACTING CHAIR: Surely what that asset brings to the community is something that should be included.

Ms Jensen: Just to clarify: is that in relation to the scope of the work of the coastal asset management reference group?

ACTING CHAIR: Yes.

Ms Jensen: In relation to the scope, what we have done is keep it to assets that are directly owned by the Commonwealth. In the main, hospitals will be owned by the states and while there is funding coming through from the Commonwealth that was considered out of scope.

ACTING CHAIR: Really? If you cannot protect assets such as hospitals, what is the point? If you are not dealing with those issues, what is the point?

Senator MILNE: Who is?

Ms Jensen: This is in relation to a project where we wanted to inform asset managers in the Commonwealth who are directly managing the assets themselves. There are significant Commonwealth assets, for instance, in the defence area that are on the coast. There are Customs assets in the ports. There is some very substantial asset management where we can make quite a lot of headway and benefit in improving asset management in relation to climate change.

ACTING CHAIR: Isn't this something that COAG should look at? Instead of looking at some of the nonsense that the Productivity Commission has thrown up, wouldn't it be more important to look at the issues of protecting assets that the Commonwealth makes a substantial financial investment in such as hospitals and schools? Why wouldn't we be doing that under a COAG approach?

Ms Jensen: I think you are asking me to form an opinion there. I am quite happy to talk about the work that we are doing at the moment.

ACTING CHAIR: I will not ask you to form an opinion. As Senator Milne put it: who is looking at that issue? If we are not looking at it as the Commonwealth, who is looking at that? And what role would the Commonwealth have, because we are financial contributors to health, education, schools, hospitals—

Senator MILNE: Universities, TAFEs.

Ms Jensen: This is where the COAG process kicks in in terms of the adaptation working group where we are working with the states and territories around how we work collectively with them and spread best practice in adaptation practice. So when it comes to assets and activities which are the responsibility of the states the appropriate approach and coordination role is through COAG, which is what is happening around the adaptation working group at present.

ACTING CHAIR: We might spend a bit of time on that before I go back to Senator Milne. If you are saying it is the responsibility of the states, has the Commonwealth analysed the austerity programs that are taking place in state governments across the country and their effect on being able to provide appropriate approaches on mitigation and other areas dealing with climate change?

Ms Jensen: I would need to take that on notice.

ACTING CHAIR: It would be good if you could.

Senator MILNE: Just to go to COAG: I understood that COAG has just abolished one of its climate change committees.

Ms Jensen: There is a proposal to move some of the functions of the select committee on climate change into other COAG councils but COAG to date has not made a decision on that.

Senator MILNE: I thought it was announced yesterday.

Ms Jensen: We can take that on notice to make sure that we give you the latest information on that process.

Senator MILNE: My understanding is that was announced this week. Walk me through how the roles and responsibilities in relation to climate change work at COAG. Walk me through it. Who directs the agenda? What is time frame for doing something about it? How does it work?

Ms Jensen: I think it would be better for me to take that on notice and then I can give you a full record of the recent meetings and the determinations.

Senator MILNE: Are you confident that Australia is prepared for the extreme weather events that we are currently experiencing, let alone what is projected from the science?

ACTING CHAIR: I think that is asking for an opinion.

Ms Jensen: Again, I could take that on notice.

Senator MILNE: Then I will move to the department. In terms of the natural environment, can you explain to me why you are not part of the Natural Disaster Relief and Recovery Arrangements?

Mr Sullivan: We have made the point in our submission that we are not. That is a decision of government, and I do not think I can comment on why.

Senator MILNE: Has the department proposed that it be considered as part of our Natural Disaster Relief and Recovery Arrangements?

Mr Sullivan: I know we have raised that as an issue, in terms of the impact that that has on our programmatic base, and that is also in the submission. For example, following the Black Saturday bushfires, in the order of \$10 million was then allocated out of program funds for what were disaster recovery efforts. Following the 2011 floods, approximately \$9 million was then allocated for restoration works around previous investments as well as environmental works. Part of this comes around where environmental assets are included as part of the asset base, and I think this is a policy question for government.

Senator MILNE: Are you at the table at this interdepartmental meeting to discuss adaptation to climate change?

Mr Sullivan: Personally I am not.

Senator MILNE: I do not mean you personally; I mean your department—is there a representative of your department?

Ms Jensen: Yes, we certainly have SEWPaC representatives around the table.

Senator MILNE: SEWPaC representatives around the table—

Ms Jensen: Yes.

Senator MILNE: even though natural assets are not regarded as something that should be considered in terms of adaptation?

Mr Sullivan: I think that is putting words into my mouth. I think your specific question was around the Natural Disaster Relief and Recovery Arrangements. However, as I was saying to Senator Birmingham, a large focus of our investment profile and our policy endeavours is on improving the resilience of the landscape, and

that is around improving resilience of ecosystems to not only the longer-term impacts of climate change but also extreme weather events. As to those terms of reference, our submission also points out studies post Yasi which showed that, where we had intact mangroves—and we were lucky that basically 97 per cent of mangroves were intact within that zone where Yasi came across the coast—the estimated damage bill would have been significantly higher in terms of damage to ecosystems, infrastructure and people and human lives if they were not intact.

So in terms of your question, I think it is quite clear that environmental assets are not recognised under disaster relief. Are we providing funding for planning and providing funding for increasing the resilience through landscape approaches to biodiversity conservation and natural resource management? The answer to that is yes. Are we working towards better quantification of showing how those investments actually provide benefits? That answer is yes as well.

Senator MILNE: So, just on that, Mr Sullivan, I saw in your submission that you said that, as to improving the health and resilience of natural ecosystems so they can better withstand the impacts of extreme weather and continue to support economic and social wellbeing, that is something that the government is seeking to do. So when it comes to expanding the ports on the Great Barrier Reef, and dumping spill into the reef, does your department report to the minister on issues like whether or not that will improve the health and resilience of the Great Barrier Reef, for example?

Mr Sullivan: That is completely outside my area of responsibility, so it would be inappropriate for me to comment.

Senator MILNE: Then, if not you, does anybody in the department report on the issue? From the perspective of climate resilience, does anyone in the department report to the minister or ask, as to any of the developments that he is considering, to run the climate resilience adaptation issues past him? Is that a matter of course?

Mr Sullivan: I will take that on notice for you, Senator.

Senator MILNE: Mr Slatyer, this morning we had, Dr John Williams from the Wentworth group saying something different from what you were just saying in terms of water, particularly in New South Wales and particularly in terms of the connection between surface and groundwater, saying that there is not the level of understanding of the complexity of the system, that in fact there is a low level of understanding of that, and I asked him in relation to coal seam gas. So I am asking would you agree, if we are going to build health and resistance in ecosystems, it is important that we have that knowledge before we allow extraction of masses amounts of water for coal seam gas?

Mr Slatyer: The Basin Plan acknowledges that it is important to take a precautionary approach and the authority, in advising the government on the Basin Plan, advised the basis on which it had recommended those diversion limits. The authority has also agreed to review the diversions from a couple of the aquifers about which there is relatively little knowledge and that review process is currently under way. The main point I would make is that the authority, in submitting the Basin Plan, was clear that its view was that an appropriate precautionary approach had been taken to the diversion limits that it was recommending for those aquifers.

ACTING CHAIR: Ms Jensen, you indicated that COAG would be dealing with the Productivity Commission review. Has the department been engaging with the Productivity Commission in preparation for the COAG review?

Ms Jensen: Now that the commission has reported, it is normal for the Commonwealth to then proceed to implement its response in the normal method. Where the recommendations actually relate to the states and territories, we proceed through our adaptation working group to work with them to implement those responses.

ACTING CHAIR: Have you had discussions with the Productivity Commission in relation to what they mean by policies that improve the flexibility of the economy?

Ms Jensen: While the commission was developing its draft report and then its final report, the commission consulted with a number of people including the then Department of Climate Change and Energy Efficiency. There were discussions at that stage. I can take that on notice if you want more information.

ACTING CHAIR: Could you take on notice what the department believes the Productivity Commission is specifically looking at in terms of improving the flexibility of the economy in relation to adaptation? Could you also take on notice the issue of mobility of labour or capital and what you understand you will be taking to COAG on the issue of mobility of labour and capital as it relates to adaptation?

Ms Jensen: We can take that on notice, certainly.

ACTING CHAIR: That concludes the proceedings for the inquiry into the recent trends and preparedness for extreme weather events. I thank all witnesses for their informative presentations. Thanks also to Hansard, to broadcasting and to the secretariat. The committee has resolved that answers to questions on notice to be returned by close of business, Friday, 26 April 2013.

Committee adjourned at 16:40