

## Other issues

4.1 This chapter looks at a number of other issues which were drawn to the attention of the Committee during the course of the inquiry. These include:

- the use of long-term weather forecasting by the emergency services;
- staffing and training issues;
- the lack of stable career paths in the industry;
- the lack of adequate resourcing for the Bureau of Meteorology; and
- the need for a coordinated research agenda between government, universities and the private sector.

## Emergency services

4.2 BoM explained the role that long term forecasting plays in combating natural disasters:

Emergency response management by definition involves reacting to extreme events. Seasonal forecasting cannot provide prescriptive forecasts of specific events but can improve significantly our knowledge of the likely occurrence during coming seasons of meteorological conditions conducive to extreme events such as fire or flood. Such forecasts facilitate strategic planning and response logistics and provide advanced warning for emergency agencies, industry, and the community.<sup>1</sup>

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<sup>1</sup> BoM, *submission 4*, p. 4.

#### 4.3 BoM further explained:

The main benefit of long-term meteorological forecasting to emergency management and disaster mitigation lies in the ability to predict what types of events are more likely to occur in the medium to long term. Knowledge of the likelihood of various types of extreme events and their impact on the environment (e.g. fuel state for bushfires) in the coming season allows disaster mitigation preparation to better focus on the more likely threats. This approach assists emergency services organisations through targeted logistics planning and pre-season public education towards the most likely hazards expected in the coming season.

The Bureau of Meteorology has close relationships with the emergency management and emergency services sectors across all jurisdictional levels and provides support to emergency management planning processes and emergency services responses.

Improved seasonal forecasting assists the Bureau in the provision of early warnings of severe events conducive to severe conditions, including fire, heatwaves, tropical cyclones, severe storms and floods.

Better forecasts of conditions favourable for example to droughts, prolonged heavy rain, the occurrence of tropical cyclones, bushfire risk, a few weeks to months in advance would provide considerable socio-economic benefit for Australia (and for most Pacific Islands and Territories as well as Asian countries to the north of Australia) in planning to mitigate potential natural disasters.<sup>2</sup>

#### 4.4 FESA told the Committee that it uses meteorological information for both strategic and operational planning:

Meteorological forecasts and outlooks are used for:

- long term planning – 2 years and beyond for strategic planning of service delivery, inter-government and national coordination, resourcing and others such as land use planning;
- developing prevention and preparation (mitigation and adaptation) strategies for the medium term – 12 month to 2 year outlooks;
- short term preparation based on 7 to 14 day forecasts; and

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2 BoM, *submission 4*, p. 12.

- response to immediate and day-to-day emergency events with real time data and information for event management including community and industry safety.<sup>3</sup>

4.5 In their submission to the inquiry the DERM confirmed the importance of forecasting to their emergency services:

- Emergency services in Queensland use weather forecasts for a number of purposes including operational response, pre-positioning capability, risk management, planning, community information, reports and profiling expected natural hazard behaviour (e.g. bushfires).
- Providing timely meteorological forecast data allows response strategies to be put in place and allows emergency services to be adequately prepared in terms of staff levels, transportation, pre-positioning of emergency supplies and preparation of evacuation centres.<sup>4</sup>

4.6 FESA identified a number of problems with the current system, including under resourcing of BoM. FESA strongly supports the BoM but told the Committee:

... we perceive that the staffing levels are at the bare minimum and there is limited opportunity for new or extended projects to be initiated. WA is a very large state and we would like to see an increase in the number of automatic weather stations, other tools and the capability of BOM to meet the needs of WA, including needs not yet identified. We are seeking enhanced climate-modelling techniques applicable to Western Australia and enhanced long-term meteorological prediction systems. We are of the opinion that BOM should be funded to a level that ensures that it is at the cutting edge of research and has the capacity to provide forecast services that ensure that the community receives optimum protection, particularly in regard to the provision of information to fire and emergency services in Western Australia.<sup>5</sup>

4.7 DEC reiterated these concerns:

In WA, BoM currently has limited capacity to provide for and deliver fire weather training programs to emergency services groups. It is also understood that there may be insufficient internal training capacity for BoM forecasters.

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3 FESA, *submission 29*, p. 2.

4 DERM, *submission 33*, p. 12.

5 FESA, *transcript of evidence 13 July 2009*, p. 16.

BoM must be adequately resourced and supported with trained staff to undertake this work. The current observation network is fundamentally inadequate for existing requirements and leaves a number of communities and large areas of remote Western Australia with no detailed forecasting capacity.<sup>6</sup>

4.8 DEC further discussed the resourcing it believes that BoM needs in Western Australia:

There is no shared lightning detection network in Western Australia. DEC believes that BoM should be resourced to provide a lightning detection network and capacity to provide a public map of the data for use by emergency services and land managers.

DEC also requests that BoM be funded and resourced to provide more frequent radiosonde balloon flights to improve the frequency of sampling the low level winds and air moisture for bushfire weather forecasting in the more densely populated areas of the south-west.

BoM radar coverage in WA needs to be increased and improved to include Doppler capacity that can monitor wind changes and boundaries. Large sections of the State are not covered at this stage.

DEC would also support an increase in the number of weather datum buoys to assist in the provision of forecasts for its marine park and other marine operations.<sup>7</sup>

4.9 DERM also faced difficulties because of the under resourcing of BoM:

Detailed analysis of local storm, flood and cyclone events is currently provided by BoM to assist emergency management agencies, especially the State Emergency Service and Emergency management Queensland. However, the Queensland Government has found that the level of expertise required to interpret BoM data and models is not always available, limiting the effective use of BoM data. Furthermore, limited resources and an operational focus of key government service agencies often impacts on the level of expertise required to interpret national meteorological data (e.g. BoM data) and models.<sup>8</sup>

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6 DEC, *submission 31*, p. 3.

7 DEC, *submission 31*, p. 4.

8 DERM, *submission 33*, p. 14.

## Staffing and training issues

- 4.10 A number of witnesses expressed concern over the level of staffing at the BoM and the flow on effect on the quality of long-term meteorological forecasting. The CPSU outlined the current situation:

Around 50 per cent of the bureau's overall budget is spent on salaries for staff. So in a shrinking budget situation either we pay people less or we have fewer people to do the same amount of work. That is the reality. In 2007-08 it was a particularly bad year and there was so much pressure on funding that we did not have any new observers or meteorologists recruited. I work in the training centre and we run training courses for new recruits, but in that year we did not run them because there was simply no money to pay those people, because they get paid when they do their training as well.<sup>9</sup>

- 4.11 CPSU provided examples from several States of recent staff cutting:

In the Northern Territory, for example, staffing pressures reduced a 13-person roster down to an 11-person roster during 2008, but that workload remained the same. Because of the staffing pressures, particularly in the Northern Territory, they have completed a workload assessment to see how much time is actually needed to complete everything required on this shift. They found that forecasters need 14 to 18 hours to do their work properly but they have to shove this into a 12-hour shift. So these pressures jeopardise the quality of the service that is being output by those forecasters.

In Western Australia, as well, the roster has been reduced from 13 to 11 people. One person – previously there were two people – is responsible for all the aviation-type forecasting for about a third of the country, with Western Australia being one of the largest areas we have. In South Australia, again, a roster which previously had 10 people on it has now been reduced to about eight people. There has been further pressure to reduce that to seven, although the forecasters have fought this strongly. They believe eight is the minimum number needed to complete the jobs.

In Tasmania there have been two contractors used to fill gaps in the roster over the past few years. Sometimes this was for periods of about a fortnight and sometimes it was for several months.

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9 CPSU, *transcript of evidence 29 June 2009*, p. 53.

Contractors have also been required to fill gaps in the South Australian Severe Weather Section. Severe weather watch, such as for bushfires and severe thunderstorms, is one of the most high-impact things we deal with. We are relying on contract staff to come in and fill these gaps. Here in Victoria we lost one full-time severe weather position as well. This required some US forecasters to come in and fill those gaps over the past summer. So, in one of the worst fire seasons we have had, we had one less full-time position and backfilling from overseas staff.<sup>10</sup>

- 4.12 Additionally, the CPSU told the Committee that observational staff have been reduced across the country:

The number of technical officers – both observers and engineering staff – has been continually reducing since 2003. In 2003 we had 560 technical officer staff, whereas now we are down to 476 technical officer staff as at 30 June 2008. So that is decreasing. We have taken some new technologies on board to help fill some of these gaps, but technology needs to be serviced – we need to have engineers who are able to go out – and it is a very broadly-spread network. If we do not have these people who can maintain these instruments then the quality of that information could be impacted upon as well.<sup>11</sup>

## Careers

- 4.13 CPSU discussed the need for suitable funding to enable retention of qualified staff:

One manager observed that: “We have some talented research scientists here in Australia who are capable of providing great innovation to help improve long-term forecasting methods and technology. They can only do this if they are given a stable job and sufficient resources to do the work”. Australia will not be a world leader and may lose the current level of international respect it has achieved if sufficient resources are not available to attract, retain and train properly qualified staff, along with the funds to invest in research and innovation.<sup>12</sup>

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10 CPSU, *transcript of evidence 29 June 2009*, p. 54.

11 CPSU, *transcript of evidence 29 June 2009*, p. 54.

12 CPSU, *submission 3.1*, p. 2.

- 4.14 The Committee asked the BoM about their recruiting process and what training programs they had in place:

We run a meteorology course within the Bureau each year. Students range in age from 14 to about 20 years old. The majority would come along from a Bureau of Meteorology perspective, but we do provide training to other, external groups as well. We have maintained that program fairly regularly over years, so that keeps the numbers coming in, if you like.<sup>13</sup>

- 4.15 The Committee further asked whether or not the BoM was having difficulty filling its recruitment requirements:

Probably the thing that has changed a little bit is that when we advertised the courses five, six years ago we would get 200 or 300 applicants for these 20 positions, but in more recent times it has got down to around 100. Now, that is still a good field from which to pick up 20 people, but that is a trend we have noticed – the declining numbers that are applying for the positions – and we assume that that is related, potentially, to the declining number of science graduates coming through. But we certainly have not had any trouble filling the positions.<sup>14</sup>

- 4.16 The Committee also expressed concern regarding the extensive use of short-term contracts for staff. The CPSU confirmed this was an issue:

That will always be an aspect of working in this sector. From our point of view, it is an industrial concern for people as most people want to have security at their work, to know where they are going in the longer term and to have that option. It is also a concern in terms of the quality of the work that the organisation is able to produce if both individuals and the organisation do not have that longer-term capacity to plan what they are doing. I think it does create difficulties.<sup>15</sup>

- 4.17 The CPSU suggested that the prevalence of short-term contracts is part of the managerial culture which has emerged due to fear of overloading an organisation with 'dead wood', permanent employees who do not perform. The CPSU advised that this could be avoided by implementing a strict regime of performance assessment and management. CSIRO have implemented such a scheme:

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13 BoM, *transcript of evidence 12 August 2009*, p. 5.

14 BoM, *transcript of evidence 12 August 2009*, p. 6.

15 CPSU, *transcript of evidence 29 June 2009*, p. 64.

A slight innovation in our last enterprise agreement, which goes back to the point again, is that we now have five-year reviews of staff at a lower level in the organisation – five-year reviews have been operating at a higher level – and that does not win us any friends of our members when we implement those sorts of changes. But, on the whole, the science community recognises that performance has to be a key part of the whole deal, and I would still argue that it is a more efficient way of dealing with people. If you are managing people properly and reviewing performance and setting directions, people who know they are not performing are likely to move on anyway. But, if you have a hard contract, I have seen it turn out to be just so inefficient so many times. People use the last year of the contract, even if it is the fourth or fifth year of a five-year contract. It is still a huge inefficiency in the system compared to proper review and workforce planning and minimising the use of contracts. We have a lot of support for that basic position from the membership and even among managers, I suppose, in the organisation; they can see benefits in that. But it is a never-ending battle to maintain that position in the fight because of the culture of using short-term contracts, which I find particularly galling in a long-term science organisation.<sup>16</sup>

- 4.18 Another solution put forward by the CPSU is to improve the conditions of contract workers and to extend the term of contracts from three years to five or six years:

I will get back to the point that we fought for a long while in our organisation to get more equity for term people, so we got severance payments for them and other conditions. In effect, they became the equivalent of full-time employees if you wanted to get rid of anyone at any particular time. So if a person was on a three-year contract and that came to an end they were entitled to a severance payment so they may as well have been ongoing.<sup>17</sup>

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16 CPSU, *transcript of evidence 29 June 2009*, p. 64.

17 CPSU, *transcript of evidence 29 June 2009*, p. 63.



## Adequate resourcing

- 4.19 CPSU stated that this inquiry should address the need for BoM to be funded to maintain staffing levels that preserve efficient, effective and high standard long-term forecasting.<sup>18</sup>
- 4.20 Further, CPSU suggested that particular budgetary measures, such as accrual accounting and the two per cent efficiency dividend, moves towards shorter term project funding rather than ongoing funding.<sup>19</sup>
- 4.21 CPSU added that its members are:
- ... particularly concerned that, while the range and quality of services provided by BoM has increased dramatically in recent years, due to funding constraints no commensurate increase in staffing has occurred. Our members are committed to delivering efficient and effective public services, and firmly believe these can only be achieved through adequate public funding.<sup>20</sup>
- 4.22 CPSU believes that current funding pressures damage BoM's capacity for innovation:
- With reduced staffing levels BoM will have fewer motivated, skilled and experienced employees. This will compromise the integrity of the Bureau's observational data, and reduce its capacity to extract value from the high standard climate change monitoring tools it has developed. Innovation opportunities and essential services will be severely curtailed under such circumstances.<sup>21</sup>
- 4.23 CPSU discussed the value of all forecasting services, quoting the UK example:
- ... in monetary terms [forecasting] benefits the nation far more than it costs. The 2007 study specifically examined the Met Office's Public Weather Service (PWS) which is responsible for weather forecasting and climate prediction. The total PWS budget of £UK83.2 million was contrasted to the 'public value' of £UK353.2 million which the service generates. The PWS saves lives and

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18 CPSU, *submission 3*, p. 1.

19 CPSU, *submission 3*, p. 1.

20 CPSU, *submission 3*, pp. 1-2.

21 CPSU, *submission 3*, p. 2.

delivers financial benefits while serving ten different government departments, over 600 different agencies, and the UK public.<sup>22</sup>

- 4.24 CPSU stated that its members have supported the UK approach to valuing the service provided by their government forecaster:

In the words of a CPSU member who is also a climatologist: “To some degree, dynamical climate forecasting in the Bureau exists on a shoestring. Achieving a critical mass of people and expertise in this area, even if it only improves outlooks marginally, will return such investment many times over ...”<sup>23</sup>

- 4.25 CPSU stated that BoM must be fully funded for the services it provides:

... feedback from our members, and the information and recommendations contained in other submissions to the inquiry, suggest that the demands on BoM’s long-term meteorological forecasting capacity will continue to increase. This will require an ongoing commitment to fully fund, and adequately staff, the Bureau for its services.<sup>24</sup>

- 4.26 CPSU provided several examples of services or data quality diminishing due to limited funding. One particular example was that of staffing levels in observation stations:

Human Observers are particularly important to provide data for climate models. One CPSU member pointed out that: “The models used to produce long-term forecasts rely on good observations as a starting point for their computations and for verification of the model, after the season has [passed]. Despite this important role, the number of human observers in the Bureau is decreasing and there were no new observers at all coming into the Bureau in 2007/08 (there was no observer training course in 2008).<sup>25</sup>

- 4.27 CPSU pointed out that BoM itself drew attention to the problems arising from the Commonwealth government’s public sector funding models in its 2008 submission to the Senate Inquiry on Climate Change and the Australian Agricultural Sector:

“Despite the best efforts of the Bureau to rationalise its basic monitoring networks and to continue to improve efficiency

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22 CPSU, *submission 3.1*, p. 2; Met Office, ‘How valuable is the Met Office?’, [www.metoffice.gov.uk/corporate/verification/valuable.html](http://www.metoffice.gov.uk/corporate/verification/valuable.html), accessed 25 October 2009.

23 CPSU, *submission 3.1*, p. 3.

24 CPSU, *submission 3.1*, p. 2.

25 CPSU, *submission 3.1*, p. 7.

through the introduction of the latest technology, the relentless pressure of 'productivity dividends' will inevitably place the integrity and future continuity of Australia's climate record in jeopardy.<sup>26</sup>

### Committee comment

- 4.28 The Committee agrees that the Bureau of Meteorology provides a crucial national service, relied upon by government, business and the public.
- 4.29 The Committee recognises that the services provided by the Bureau of Meteorology are of far greater value than the relatively modest investment by government, and that the Bureau should be fully funded and adequately staffed to meet the nation's needs.
- 4.30 The Committee is concerned by the erosion of qualified staff from the Bureau of Meteorology and recommends that steps be taken to ensure adequate staffing levels for the Bureau.
- 4.31 To this end, the Committee recommends that employment conditions be reviewed and that a more secure tenure be provided to relevant staff, including increasing contracts from three years to five years.

### Recommendation 7

**The Committee recommends that the Bureau of Meteorology employment conditions be reviewed and that a more secure tenure be provided to relevant staff, including increasing contracts from three years to five years.**

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26 CPSU, *submission 3.1*, p. 7.

## Coordination of research between government, universities and the private sector

4.32 The Committee heard of the extensive research being conducted, not only by the BoM and CSIRO but by State Government agencies and universities. However, the Committee was told that there is no coordinated research agenda.

4.33 Professor Nicholls discussed the current fragmented approach to forecasting research:

Australia's operational climate forecasting systems are based on the work, a couple of decades ago, of a few scientists in the Bureau of Meteorology and Queensland Department of Primary Industries who had the security and resources to pursue innovative research on this challenging topic. More recently, the development of improved forecast systems has relied on short-term research contracts from a variety of agencies. These funding agencies have little interest in the development of an improved national forecast system, because of their very specific geographical and sector foci.<sup>27</sup>

4.34 Professor Nicholls stated that the recognition that reliance on such a fragmented approach would lead to little improvement in forecast systems led to proposals to establish a national centre, institute or funding mechanism dedicated to the development and application of improved seasonal to inter-annual climate forecasts. However, despite several such proposals, such an enterprise has not been established.<sup>28</sup>

4.35 Professor Nicholls recommended the establishment of a dedicated research facility for weather and climate research:

The simplest strategy to ensure that Australia develops innovative and improved approaches to increase our ability to forecast seasonal-to-interannual climate fluctuations such as droughts, and to use such forecasts effectively, is to establish a centre of excellence or a CRC with long-term (more than seven years) funding and dedicated staff and resources. Such a centre would combine the expertise of climate researchers in universities, the

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27 Prof Neville Nicholls, *submission 12*, p. 5.

28 Prof Neville Nicholls, *submission 12*, p. 5.

CSIRO, the Bureau of Meteorology, and various State Government bodies in a collaborative approach to this challenging problem.<sup>29</sup>

4.36 Professor Nicholls emphasised that:

The alternative, current approach, of competitive bidding by individual researchers for small, short-term research grants militates against collaboration between agencies and universities, and is ineffective in the development of the complex systems needed for operational climate prediction.<sup>30</sup>

4.37 Professor Nicholls added that:

Continued reliance on a fragmented approach to funding Australian research on seasonal-to-interannual climate prediction will ensure that Australia's performance in this field continues to slip relative to other countries, where climate prediction research is more effectively resourced. Eventually, this fragmented approach will ensure that Australia becomes reliant on other countries to provide the systems and models for prediction, and probably even the forecasts themselves.<sup>31</sup>

4.38 The Australian Academy of Science discussed the problems of integrating weather and climate research in Australia:

An on-going problem, however, relates to integration of research from various groups into a national common agenda. The creation of the CAWCR and the ACCESS initiative has begun to address this problem but the formal links between CAWCR and the research intensive Universities remain formative.<sup>32</sup>

4.39 The Committee asked CSIRO whether the organisation had formal links with the universities to facilitate a cross-institutional research agenda particularly with regard to access to the CSIRO computing facilities. CSIRO told the Committee:

Yes, across both the Bureau and CSIRO in research and development. We have strong links with folk in the university sector across a number of universities who are working on climate and meteorological science, basic physics and oceanography, so we do have very strong collaborative links with the university sector. In terms of the model development, ... of building the

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29 Prof Neville Nicholls, *submission 12*, p. 6.

30 Prof Neville Nicholls, *submission 12*, p. 6.

31 Prof Neville Nicholls, *submission 12*, p. 6.

32 AAS, *submission 25*, p. 6.

access modelling framework, we have formal structures to engage with the university sector. We have an access coordination committee which meets frequently for the university, the bureau folk and CSIRO researchers to discuss how that collaboration should work. Just this year the National Computational Infrastructure facility dedicated two full-time positions to support that research collaboration on the development and application of access ...

In terms of access to supercomputers ... the academic community does have access to the National Computational Infrastructure facility here in Canberra at the Australian National University.<sup>33</sup>

- 4.40 The Committee queried why some academics may be missing out on access to supercomputing facilities. CSIRO told the Committee that the research field is very competitive:

It may be that their research priorities do not float to the top in the competitive processes of academia. The use of the National Computational Infrastructure supercomputer does have a large component of merit based allocations of time on it, so it may be that some academics are not competitive and others are.

I am on the merit allocation committee for the NCI machine. Each year we review the proposals from the researchers and the stronger ones will get a share of time on that machine. Some will have quite a large share of time on that machine, those that could easily facilitate working with us directly with our modelling systems that we already have on that machine.<sup>34</sup>

- 4.41 The Committee was also impressed by the amount of research work being undertaken by state agencies. The Queensland Government has taken a whole-of-government approach to weather and climate and established the Queensland Climate Change Centre of Excellence (QCCCE). The Centre's work includes:

... climate system modelling using global and regional climate models; developing, promoting and interpreting seasonal climate forecasts; providing tools to assist industry better manage climate variability and to assess and adapt to climate change risks; and collaborating with national and international climate institutions.<sup>35</sup>

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33 CSIRO, *transcript of evidence 12 August 2009*, p. 6.

34 CSIRO, *transcript of evidence 12 August 2009*, p. 7.

35 DERM, *submission 33*, p. 4.

4.42 The QCCCE is contributing to the international research agenda through collaboration with a number of international centres including:

... the UK Met Office Hadley Centre, The Walker Institute, in the USA institutions such as the IRI, University of Colorado and National Oceanic Atmospheric Administration, and in China the Chinese Academy of Sciences, to promote research of particular relevance to Queensland, in particular improving understanding and modelling of phenomena such as ENSO, the Pacific Decadal Oscillation and to improve historical climate data sets by contributing to the international ACRA (Atmospheric Circulation Reconstructions of the Earth) project.<sup>36</sup>

4.43 DEC told the Committee of the collaborative research program being undertaken by the Western Australian Government, the BoM and CSIRO through the Indian Ocean Climate Initiative (IOCI). The IOCI focuses on the detection and attribution of climate change and providing climate change projections for Western Australia.<sup>37</sup>

4.44 To coordinate and extend these various collaborative efforts the Australian Academy of Science suggested that the draft proposals put forward by the Australian Climate Change Science Program developed by the Department of Climate Change are implemented to overcome the structural limitations in the current system.<sup>38</sup> The Australian Climate Change Science National Framework calls for a National Climate Change Science strategy which includes:

- A high level coordination group comprising major funding bodies, key research organisations and senior scientists and chaired by the Chief Scientist. The coordination group will develop and oversee execution of an implementation plan for this Framework;
- The implementation plan will draw on the resources of all relevant organisations. Where necessary, the high level coordination group will facilitate formation of cross-institutional teams to advance key elements of climate change science;
- The Chief Scientist will report annually to the Minister for Climate Change and Water and the Minister for Innovation Industry Science and Research on progress in implementing this Framework;

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36 DERM, *submission 33*, p. 29.

37 DEC, *transcript of evidence 13 July 2009*, p. 27.

38 AAS, *submission 25*, p. 6.

- The Department of Climate Change will establish a mechanism to liaise with States and Territories and other stakeholders on climate change science, with a particular emphasis on ensuring the national program delivers useful information about likely future climate change.<sup>39</sup>

4.45 The CSIRO Staff Association suggested that Australia needed broad participation from all sectors of the economy and society to improve meteorological prediction and forecasting. In their submission to the inquiry they detailed the steps that need to be taken to encourage coordination, cooperation and innovation across relevant sectors:

- Universities should increasingly be involved in national efforts for meteorological prediction and forecasting, but some coordination is required (say a "hubs-and-spokes" model often invoked in the Higher Education debate at present);
- State and Federal governments should act jointly, say through COAG (Council of Australian Governments), to promote meteorological prediction and forecasting in emergency response, planning and development and aspects of regulation (chemical hazards, building codes);
- Support for open access to meteorological and forecasting prediction and observational data to facilitate whole-of-government decision making and whole-of-research sector participation;
- Enhanced information technology platforms and infrastructure to facilitate and enable coordination and communication aiming at the broadest participation of all levels of society;
- Enhancing process studies as coordinated priorities (radiative, subgrid scale and boundary-layer parameterisations, cloud and convective models, terrestrial parameterisation, social and economic models), particularly for Australian conditions;
- Clearly, some diversity in systems and approaches at least at the R&D level should be encouraged, with a balance between focus and diversity, to address the wide scope of meteorological prediction and forecasting; and
- Developmental innovation should be shared both domestically and internationally with coordination and enhancement of collaborations, with an outcome of expansion of overall services.<sup>40</sup>

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39 Australian Climate Change Science: A National Framework, [imos.org.au/fileadmin/user\\_upload/shared/IMOS%20General/documents/external\\_reports/cc-science-framework.pdf](http://imos.org.au/fileadmin/user_upload/shared/IMOS%20General/documents/external_reports/cc-science-framework.pdf), accessed 4 November 2009.

40 CSIRO Staff Association, *submission 9*.



## Committee comment

- 4.46 The Committee was impressed by the extent of the research being carried out in Australia by, not only the Bureau of Meteorology and CSIRO, but State Government agencies and universities.
- 4.47 However, the Committee was concerned to hear that there appears to be a lack of national coordination to the research agenda and that information is not being shared effectively.
- 4.48 The Committee noted that Australia was once in the forefront of meteorological research but has now fallen behind and that the lack of coordination between government, universities and the private sector may be a contributing factor to this lapse.
- 4.49 The Committee understands that Australia faces substantial challenges due to the range and diversity of its weather regions. Many of Australia's economically important industries, including agriculture and tourism, are extremely weather sensitive and require reliable forecasting information to ensure future viability. The continuous development of innovative end products to enhance management and decision-making is essential for Australia's future economic well-being. Australia also faces the challenge of extreme weather conditions and inherent natural disasters. A coordinated research effort is required to improve the capability and capacity of emergency services to combat and respond to disastrous events.
- 4.50 The Committee recommends the establishment of an institute of meteorological science to develop an ongoing partnership between the relevant research bodies and implement a coordinated research agenda.

### Recommendation 8

**The Committee recommends that the Australian Government establish an institute of meteorological science to develop an ongoing partnership between relevant research bodies and implement a coordinated research agenda.**

**Maria Vamvakinou MP**

**Committee Chair**

**November 2009**