CSIRO Staff - CSIRO'S Future

CSIRO Staff Association

A Section of the Community and Public Sector Union

23 April 2009

Committee Secretary
Standing Committee on Industry, Science and Innovation
House of Representatives
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Parliament House
CANBERRA ACT 2600

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Dear Madam/Sir,

CSIRO Staff Association Submission

Inquiry into long-term meteorological forecasting in Australia

Terms of Reference

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

Introduction

The CSIRO Staff Association is a section of the Community and Public Sector Union (CPSU). We represent approximately 3000 staff in CSIRO, including scientists, technical staff, support and administrative staff. Our members include meteorologists and climate scientists in the *Centre for Australian Weather and Climate Research* (CAWCR), a joint venture between the Bureau of Meteorology and CSIRO.

CSIRO has many other research activities, particularly in agriculture, urban environment and resource management, which are dependent on innovation and outputs of climate and meteorological prediction systems.

Our submission supports the broader CPSU submission representing wide public sector policy and services in all sectors of the government involving climate and meteorological impacts (agriculture, emergency response, marine and

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environment, health and aging, mining and energy, aviation, defence, infrastructure, transport, tourism).

It deliberately focuses on the *research and development* issues that contribute to innovation in meteorological prediction and forecasting and issues that affect research staff in delivering the innovation that benefits Australia.

Our fundamental position is that services provided by meteorological prediction and forecasting represent clear, useful and essential benefits for Australia and its society, and that future benefits will accrue from ongoing services and from enhancement by further innovation and investment in the public sector including research.

We welcome the Standing Committee Inquiry and argue for increasing public support for meteorological activity and the infrastructure that enables it.

Meteorological Research and Development

Australia has a long tradition of contributing to meteorological innovation and delivering science upon which prediction and forecasting systems have been built.

Australian meteorological services have been developed with a long and distinguished history including the establishment of CSIRO Divisions of Meteorological Physics and Cloud Physics in the 1940s.[1,2]

Many innovations in meteorological prediction and forecasting were pioneered in Australia, for example: surface-layer flux parameterisations, cloud physics models, remote sensing, pollution dispersion modelling, and early spectral numerical models of global weather patterns.[3]

The most recent organisational change has been the formation of the *Centre for Australian Climate and Weather Research* (CAWCR), to consolidate research activity and support the development of Australian forecasting and prediction systems.[4] Over 270 scientists are devoted to model development, observations, weather and climate prediction. A core purpose is to innovate with new earth-system modelling and data assimilation capabilities.

ACCESS[5]

The *Australian Community Climate and Earth-System Simulator* is a current focus of research activity. This computer simulation system is planned to encompass short-term weather prediction, seasonal prediction and climate prediction in a unified and comprehensive way, particularly utilising the growing availability of satellite-derived remote sensing data, new ocean measurements, and enhancements in computer power.

Australian weather and climate prediction tasks span at least 5% of the earth's surface, simply based on our claimed territories, although typically we have even

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[1] *Windows on Meteorology: Australian Perspective*. 1997. (Editor Eric Webb) CSIRO Australia. ISBN 0 643 06038 3

[2] Federation and Meteorology. 2001. http://www.austehc.unimelb.edu.au/fam/fam.html

[3] Winds of Change. 1998. John Garratt, David Angas & Paul Holper. CSIRO Australia. ISBN 0 643 06363 3

[4] http://www.cawcr.gov.au/

[5] http://www.cawcr.gov.au/research/access/index.php

more areal responsibilities in the southern hemisphere particularly for aviation services. Australia's climate types also span a wide range, from the tropics to ice-bound Antarctica, and encompassing deserts, alpine and rangeland regions in between. Weather and climate prediction also encompass prediction scales from minutes to hours for emergency hazards, from days to a week for our nightly news weather forecast, from months to a year for seasonal prediction, and years, decades and beyond for climate change. The vast scope of the task of just providing *understanding* of the meteorological nature of Australia and its territories, let alone prediction and forecasting services to support a vibrant developed economy, cannot be understated.

Despite these challenges, the short-term forecasting and prediction services provided by the Australian public sector match world's best practice for single predictions.[6] However, this represents over 50 years of innovation and significant long-term investments made globally in the past. Medium-range forecasting and inter-seasonal prediction is much earlier in the innovation and development phase, and requires appropriate long-term commitments to develop services to aid decision making in agriculture, tourism, energy use and many other sectors.

The Staff Association submits that restrictions of services emerge from:

- Insufficient staff and resources to develop the science and models for full prediction and forecasting services, including probabilistic predictions, into the future;
- Insufficient staff and resources to monitor climate and meteorological observations to fully understand the Australian territories (for example, ocean going research vessels, remote sensing infrastructure and infrastructure in the tropics);
- Insufficient staff to adequately deal with the broad variety of natural hazards and climate risks, including bushfires, floods, cyclones, precipitation and hail extremes, volcanic-ash aviation hazards, air-quality hazards, UV radiation extremes, wind-damage extremes, drought, temperature extremes, frost and fog prediction, coastal inundation, dust and salt transport, agricultural spraying and pest management, detecting CO_2 leaks from carbon capture and sequestration, airborne spread of animal and human diseases and on-and-on;
- Insufficient super-computing capacity (notwithstanding recent enhancements) to fully exploit prediction and forecasting techniques (for example, ensemble prediction techniques and air quality forecasting);
- Insufficient investment in workshop and technical staff to build, develop and integrate sensors and sensor networks for innovative data gathering and assimilation for prediction systems.
- Insufficient public investment (NPP – new policy proposals) in new operational prediction and forecasting services to innovate from uptake of R&D (for example, emergency response for chemical/biological/radiological hazards); and
- Complexities in Australian governance for national policy proposals for meteorological prediction and forecasting (for example many emergency response services are state not national jurisdictions). Who has ultimate responsibility?

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[6]Roberto Buizza *ECWMF.* Public Lecture. February 2009 BoM, Docklands, VIC http://www.cawcr.gov.au/events/cawcr_da_ep3/Buizza.pdf

Australia continues to produce world class research outcomes, but further investment, planning and coordination is required to enhance the prediction and forecasting services for a safer, more adaptable and more efficient and productive Australian society, i.e. broad public good outcomes.

Coordination and Open Access

Because of our peculiar scale: a small population with huge territories and diverse climate, coordination, cooperation and innovation are necessary traits to foster in Australia. In particular, we need better public sector policies on how to act to achieve outcomes from enhancing meteorological prediction and forecasting.

The Staff Association submits that:

- 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, sub-grid 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 shared both domestically and internationally with coordination and enhancement of collaborations, with an outcome of expansion of overall services.

A key to better outcomes from enhanced prediction and forecasting services is broad participation from all sectors of the economy and society. Such engagement requires better resourcing of public sector infrastructure with open provision, where possible, of information for decision making at all levels. This requires coordination of education, training, information technology, service development and communication channels, with transactions costs all kept minimal i.e. facilitated with public goods.

International Perspectives

Climate is clearly a global issue and its science is part of a shared global science commons. The ACCESS model is an example of coupling of the British

Meteorological Office Unified Model[7] with Australian systems (terrestrial surface models, southern ocean and ice models) for long term continuous innovation where Australia is unable to resource the whole global task independently.

Australia's research output in atmospheric science and meteorological prediction is approximately 1% of overall global activity. However, the impact of CSIRO published research is well above world-average rates. Most of this Australian research is conducted in publicly funded research agencies.[8]

The Staff Association submits that:

- Australia is in the position of striving, but struggling, to participate in global meteorological prediction and forecasting innovation, but nevertheless successfully competes with the world in short-term forecasting;
- Australian staff involved in the development of meteorological prediction and forecasting services need continued international cooperation, ongoing training and exchange with global science programs;
- Australia must enhance and strive to meet its international obligations in meteorological and climate observations, with ever more openness and sharing of data;
- Australia must resource the infrastructure to align with international developments and participate in global programs for earth observation, ocean observation, and atmospheric monitoring (for example, Cape Grim atmospheric constituents baseline observations[9]);
- Australia has an essential role in global science to gather, maintain and expand observations of meteorology and climate over indefinite long terms for our region and large parts of the southern hemisphere;[10] and
- Australia is almost uniquely placed as a developed country to promote meteorological and climate observations in the tropics (currently vastly under-resourced) likely leading to major impacts in science and services for the tropics.[11]

Much of the innovation required for development in Australia will have its genesis in international ideas (also largely from the public sector), but Australian adaptation will require local R&D effort and broad public sector engagement, both with an increased international outlook.

Summary

The Staff Association wishes to reiterate that innovation in meteorological prediction, forecasting and observation should not be seen as a means of efficiency to provide public sector services at lower costs. Instead innovation from public sector R&D leads to broader and more valuable services often delivered at

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[7] http://www.metoffice.gov.uk/science/creating/working_together/um_collaboration.html

[8] *Analysis Of CSIRO Divisional Publications*. 1999-2003. 2005. Linda Butler and Kumara Henadeerage. http://repp.anu.edu.au/staff/linda/consultancies.php

[9] http://agage.eas.gatech.edu/

[10] WMO Integrated Global Observing Systems (WIGOS). http://www.wmo.int/pages/prog/www/wigos/index_en.html

[11] *Venturous Australia - building strength in innovation*, http://www.innovation.gov.au/innovationreview/Pages/home.aspx

increased short-term cost from new investment in infrastructure, technology and human capabilities. Improved planning, coordination within government, and support for open access will maximise the returns on new investment and easily offset the short-term cost over the long term. Australia has benefited from innovation in meteorological prediction from before Federation and benefits for all of society will accrue from continued and increased public sector investments in Australia.[12] Australia is in the position of potentially taking leadership roles for meteorological prediction, forecasting and observation in the tropics, and for other South Pacific regions. In doing so we would be both a good global citizen, and also mitigate regional instability for our benefit, by better helping manage meteorological risks in neighbouring developing nations.

Yours Sincerely

Sam Popovski
Secretary

[12] http://www.history.sa.gov.au/chu/programs/sa_history/sa_dry/map_goyders.htm