Submission No: 21.

Weather Risk Management Services

Ms Maria Vamvakinou MP
House of Representatives
PO Box 6021
Parliament House
Canberra ACT 2600

24 April 2009

Dear Ms Vamvakinou,

Submission to the House of Representatives Industry, Science and Innovation Committee Inquiry into Long-term Meteorological Forecasting in Australia

This submission is made by Weather Risk Management Services, which is a privately owned consulting firm in Sydney, Australia.

A copy of that submission is enclosed.

Please let us know if we can supply any further information or otherwise assist the House of Representatives Industry, Science and Innovation Committee Inquiry into Long-term Meteorological Forecasting in Australia.

Yours faithfully

Dr. Christian Werner
Managing Director
Weather Risk Management Services Pty Ltd

Submission to the House of Representatives Industry, Science and Innovation Committee Inquiry into Long-term Meteorological Forecasting in Australia

From *Weather Risk Management Services Pty Ltd*

Background: Weather Risk Management Services Pty Ltd (WRMS)
WRMS is a privately owned consulting firm, which specializes in tailored forecasting and weather and climate risk assessments for the Australian and overseas weather sensitive energy, soft commodities, construction and agricultural markets.
Considerable expertise has been gained in R&D in numerical weather prediction modelling and climate modelling and directly applied in a commercially demanding environment to weather sensitive industries. WRMS has to prove every day, that weather and climate forecasts can add value to weather sensitive industries.

Scope of this submission

This submission addresses all Terms of Reference of the Inquiry.

The efficacy of the current climate modelling methods and techniques and long-term meteorological prediction systems

Current status of climate modelling methods and techniques and long-term meteorological prediction systems in Australia has not kept up with the international efforts to maintain and further develop those systems. The current Predictive Ocean Atmosphere Model for Australia (POAMA) does not display the non-linear characteristics often displayed in the real climate system, for example, it often appears that climatic indices (eg Nino3 and Nino3.4) derived from this system are monotonically increasing. Some progress has been made, but the applicability of POAMA forecasts to weather-sensitive industries remains limited. The national and especially international trend is to make increasingly use of so-called ensemble forecasts, where many forecasts are performed daily and thus allowing not only a more reliable forecast, but also provide an assessment of the uncertainties associated with the forecast.
In order to produce a skillful long-term meteorological forecast, statistical and dynamical (computer) models can be employed. Statistical models operate under the banner of the similarity principle, i.e. they require historical data to construct a forecast, and generally have limited skill when it comes to changes in the climate system or other meteorological processes become more important over time. Climate or seasonal prediction models (dynamical models) due not suffer from this, but require, like weather prediction models rather large resources in terms of computers, human capital, observations from land, sea and space, and most importantly coupled models of the earth-atmosphere system that incorporate the land surface, ocean and the atmosphere.
Currently, publicly available seasonal forecasts are not based on the latest science nor on the latest seasonal coupled forecasting systems, and they have failed to predict a month ahead or season ahead heat wave activity over the southern states of Australia in recent years.

Innovation in long-term meteorological forecasting methods and technology

Unfortunately, over the years a continuous underfunding (or defunding) of sections in the weather and climate modelling community in Australia meant that there has been little, if any capability building. Perhaps the largest consequence is that the Global Assimilation and Prediction System (GASP) of the BoM is to be replaced by the UK Hadley Centre's Unified Model (UM), a forecasting model that can be used for short to longer term forecasts. One of the driving reasons behind the BoM's decision to decommission the GASP system and go with the UM (model) is, that no 4DVAR was available in the GASP system. The BoM's POAMA model can be seen as a past attempt to maintain some expertise in the climate modelling field, but since it was brought online in 2002, little progress has been made to make full use of so-called ensemble type forecasts, and instead so-called poor-man's ensembles are produced, meaning that the ensembles are generated by bundling up forecasts of previous days to form a large enough ensemble.
By comparison the US National Center for Environmental Predictions (NCEP) runs four times per day ensemble forecasts with 21 ensembles, resulting in a total of 84 ensembles member forecasts for the next 16 days. As a result meaningful uncertainty measures together with the forecasts can be provided, and they are probably one of the most widely used forecasts at a global scale. The US success is based on the intellectual capital and technical resources available.

The impact of accurate measurements of inter-seasonal climate variability on decision-making processes for agricultural production and other sectors such as tourism

Over the years, much attention was given to the possible economical impacts of accurate seasonal outlooks on the agricultural and tourism sectors, and very little, if any attention to other parts of the economy, which contain a well recognized weather risk component. Energy markets here in Australia as well as overseas, depend heavily not just on short-term meteorological forecasts, but also on reliable seasonal outlooks for (i) their business planning processes, (ii) allocation of risk capital, (iii) tariff case submissions (retail markets), (iv) hedging costs, and (v) long-term physical and financial contracts. Reliable long-term forecasts are also required for soft commodity trading and risk management decisions. Our experience in these markets is that the profit and loss profile is a significant part of this multi-billion industry. Due to the aforementioned lack of skill of the currently available public seasonal forecasts, only a small number of energy market and soft commodity market participants make use of seasonal forecasts, and instead climatologies are employed to provide a first guess forecast. This is obviously a suboptimal process, and in case of significant climatic anomalies can prove to be a very expensive exercise, and in the extreme can lead to significant losses. So, why are currently available seasonal forecasts not taken fully or even partially into account? The reason is that they are not easy for nonmeteorologists to interpret nor do they provide useful information for decision-making process to particular weather sensitive parts of the Australian economy.

Potential benefits and applications for emergency responses to natural disasters, such as bushfire, cyclone, hail, and tsunami, in Australia and in neighbouring countries

The potential benefits and application for emergency responses to natural disasters are significant, and would allow a more proactive approach to natural disasters, rather than a passive approach. Advanced planning and management would also allow a more efficient allocation of resources dealing with emergency response resources.
Recent bushfires in Victoria can serve as an example that prior knowledge of bushfires or weather conditions conducive to the generation and maintenance of bushfires would have had a significant impact on life and property losses. To be of any value to applications to emergency responses and the early detection of natural disasters, long-term meteorological forecasting needs to be able not just to supply the so-called mean state of the climate, but also the extreme values within the expected climatic patterns (temperature, precipitation, wind speed and direction, soil moisture, wave heights, etc). This in itself is a grand challenge in science, and requires significant resources and expertise.

Strategies, systems and research overseas that could contribute to Australia's innovation in this area

Australia must maintain and increase its capability in seasonal forecasts and methods employed. The prior knowledge of the mean state of the climate for the next few weeks or months ahead is not enough. Extreme values of weather and climate events have a significant impact on life, property and financial decisions in Australia and neighbouring countries. In case of early natural disaster detection we can also make reference to emergencies and national security.
Historically, meteorological computer models have required very large investments in supercomputing facilities. With the continuous innovations in computer sciences costs per computational unit have significantly decreased over the years. The latest technology, already being applied to meteorological computer models, has shown investment reductions of a factor of 10 to 100, and a significant computational performance increase. It is, therefore advisable to forge partnerships with businesses that have already this expertise in employing these new technologies. Further, the government sector involved in meteorological modelling and forecasting would further benefit in partnerships, as significant knowledge transfer would provide, at the end of the day, a better outcome to parts of the Australian and neighbouring countries economies and to the general public.
Adequate funding will remain one of the central issues for long-term meteorological forecasting, and one way of guaranteeing such funding is to place a special tax on, or have contributions from, all weather sensitive industries.