



## Climate Services

Output Group 1.3 – Meteorological and Related Services and Products – comprises two Major Outputs: 'Climate Services' and 'Weather Services' outputs. The Climate Services output is reported in this chapter.

The Climate Services output encompasses the management of meteorological and oceanographic data; the use of these data to derive products that describe Australia's climate; the development of techniques for applying the data in a wide range of social, economic and environmental contexts; and the provision of climate information and advice to general and specialist users. Drought and climate change continue to be major features of the Australian social landscape with a high demand for related services.

Observational data are quality controlled and archived in the national climate and related databases. These databases are being brought online in order that Australia's climate record be freely available to government, industry and the public through the convenience of the internet.

The Bureau also monitors short and long-term climatic fluctuations and issues predictions of climatic anomalies that affect the environment as well as weather and climate-sensitive sectors of the community. Information on tidal conditions and ocean circulation for the Australian region are also provided within this Major Output

Due to the global nature of climate, collaboration with national and international organisations is essential for the Bureau to fully respond to the information needs of decision-makers.

This chapter also includes activities relating to the former Analysis and Prediction output which has been redistributed across other outputs (see Agency Overview).

## Output Performance Information 2008-09

Output performance is measured against a number of performance targets. The results achieved for 2008-09 are provided below along with a commentary on significant variations.

Description of Output	Provision of climate data, climate monitoring, oceanographic, commercial and cost recovery services.
Contribution to Outcome	Enhanced community safety and well-being through preparation of meteorological and related products and information and the effectiveness of meteorological and related services used by the general public and other major social, environmental and economic sectors.
Key result	To provide reliable, responsive, climate data, information, monitoring, prediction and advisory services.

Key Performance Indicator	Target	Result
Climate services contribute, through timely and accurate information and advice, to: <ul style="list-style-type: none"> <li>• minimising economic and other costs of disaster preparedness;</li> <li>• the safety, comfort, convenience and general welfare and economic benefit of the public and major community groups;</li> <li>• government and community planning;</li> <li>• the management of the environment, including natural resources; and</li> <li>• the economy and efficiency of primary and secondary industry.</li> </ul>	Accuracy of Seasonal Climate Outlook (SCO) products as measured by SCO skill score exceeds that of climatology (50%).	60%
	430,000 climate data, information, monitoring, prediction and advisory services provided.	592,643
	7,500 consultative services provided.	9,500
	3 million telephone, facsimile and internet accesses to automated climate service delivery systems.	4 million
	3,500 oceanographic products issued.	4,235
	36,500 tide predictions issued.	36,500
User needs for climate services and consultancy services are identified and, within available resources, satisfied.	85% of users surveyed are 'satisfied' or 'very satisfied' with climate and consultative services.	93%
	90% of commercial contracts are completed on time.	Nil (see Note 1)

<p>The data stored in the National Climate Centre (NCC):</p> <ul style="list-style-type: none"> <li>• are appropriate in terms of types of parameters included;</li> <li>• comply with relevant national and international guidelines in respect of density, frequency and length of period of observations stored;</li> <li>• have been subject to appropriate quality control;</li> <li>• are of acceptable quality; and</li> <li>• are stored optimally in terms of security and accessibility.</li> </ul>	85% of users surveyed are 'satisfied' or 'very satisfied' with climate data services.	93%
	96% of regular observation entries for major climate variables into the national climate data base are successfully completed within preset quality control standards.	99.7%

Notes:

(1) There were no commercial contracts undertaken in 2008-09 under this Major Output.

## Comments on Output Performance

The target for the percentage of regular archive entries into the climate database was exceeded in 2008-09, completing a succession of 13 consecutive years in which the target was equalled or exceeded (Figure 22). Most other targets were also exceeded.

The volume of data archived within the Australian Data Archive for Meteorology (ADAM) continues to expand, and will continue to do so in line with technological developments and funding opportunities, and through extensions to the Bureau's observational network.

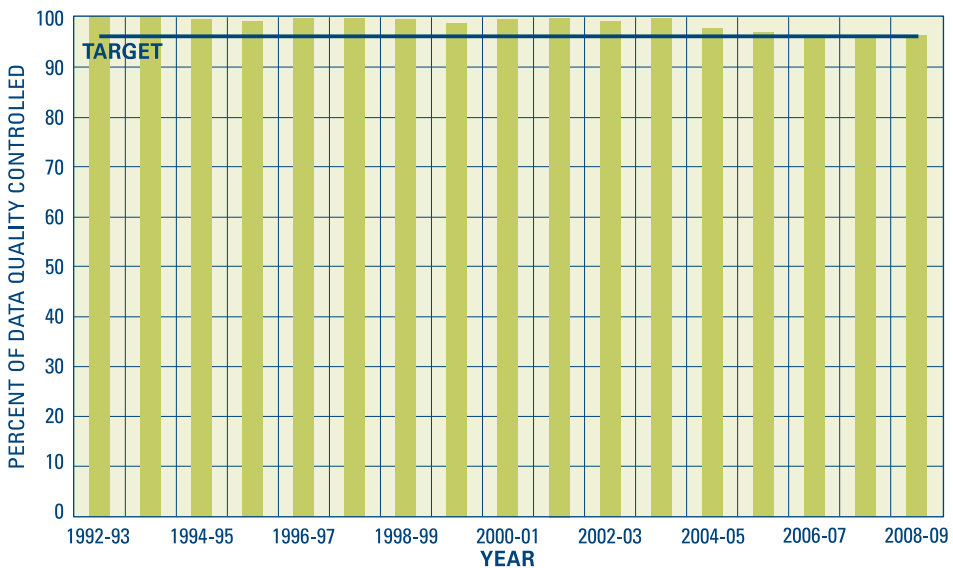


Figure 22. The percentage of regular archived entries into the national climate database that were successfully completed within present quality-control standards (target is 96 per cent, as indicated by the black line). In the past year efforts have been made to enter data from earlier years (1989-96) not previously digitised.



## Achieving the Outcome

The Climate Services Major Output was delivered through the Climate Data, Climate Monitoring Service and Oceanographic Services outputs. The major developments in these output areas in 2008-09 and their contributions to the outcome are considered below. Climate Policy Advice activities are also described.

### Climate Data

The Climate Data output includes the archival, management and quality control of meteorological data, as well as the provision of a range of services, including user-specific advisory services, to support the effective use and application of climate data by both public and private sector organisations. The Bureau also meets the needs of the general community for both raw climate data sets and analysed data such as maps, graphs and statistical meteorological information. The development and distribution of new and updated climate products supports decision-makers in sectors including government, agriculture, research and tourism.

Data archival and management is focused on the collection, storage and quality control of observed meteorological and related data. Meteorological observations and a number of derived data and products are stored in ADAM. These data are subject to various levels of quality control depending on their quantity and type.

Liaison with other areas of the Bureau, most notably those which operate the Bureau's data collection networks, is an important aspect of Climate Data activities, and the continuing development of automated quality control reports and analysis of those reports helps identify systematic errors in data collection equipment and software. Advisory services are also provided to National Meteorological and Hydrological Services of other countries through forums provided, for example, by the World Meteorological Organization (WMO). Both types of activity are aimed at ensuring that observational and data management practices serve the national and global need for reliable, consistent, high-quality climate data.

Work continues to improve the efficiency of data ingest and processing algorithms to make data accessible more quickly after the collection time. Similarly, systems and processes for the quality control of data in the database are becoming more efficient, resulting in improvements in the detection and correction of errors. This increases the overall reliability of data within the national climate database, improving their usefulness for both internal Bureau and external client needs.

#### Major Developments 2008-09

- For commonly-used climate variables such as temperature, winds and evaporation, the turnover time between taking an observation and the delivery of the fully quality-controlled observed data into the climate archive was reduced by some 40 per cent in 2008-09. This improvement was attributable to the implementation of faster, semi-automated quality control processes, and improved operational efficiencies. The improved processes also allow more errors in the data to be found and eliminated compared with past systems.
- The development of semi-automated quality control processes for precipitation data reached the production trial stage by the end of 2008-09. When implemented operation-

ally, these processes should significantly improve the timeliness and reliability with which quality-controlled rainfall data are added to the climate database and made available for use.

- A newly developed system for archival and processing of rainfall intensity data has automated many tasks involved in loading, processing and ingesting the rainfall intensity files, and provided new tools for visualisation and manipulation of the data. Data can now be overlaid on topographic maps and satellite cloud imagery, enabling faster and more extensive checking of the data against geographic influences and the prevailing meteorological situation. The result is more efficient delivery of processed rainfall intensity data to the climate database. Such data are used in particular for flood analysis and in engineering design of structures subject to extreme rainfall events.
- Work commenced to archive marine data within ADAM, including sea level, tidal and waverider buoy data as well as tsunameter data, making these data more accessible. In particular, the availability of an archive of sea-level data will aid in monitoring the effects of climate change and assessing implications for future development and activities in the coastal zone.
- Through the Vanuatu Climate Data Digitisation project, initiated by the Vanuatu Government and supported by funding from the Australian Agency for International Development (AusAID), the Bureau helped the Vanuatu Meteorological Service develop a digitisation program to transfer its paper-based climate data to electronic formats. This project was part of a larger, and successful, 'data rescue' initiative (funded in part by AusAID and in part by the Department of Climate Change) that has helped boost the climate data management capability of Pacific Island countries. This will not only enhance their capacity to manage climate variability and extremes, but will ultimately enable a better understanding of the current and likely future climate processes affecting the South-West Pacific region including Australia.
- The community was provided with direct access through the Bureau's website to daily rainfall data for all of the several thousand rainfall stations managed by the Bureau across Australia and to monthly datasets of highest, lowest and mean maximum and minimum temperature at all available Australian stations, some of which have more than 100 years of record. The system also provides a suite of tools that enable users to obtain visualisations of the data including in graphical forms (Figure 23). The continued development and implementation of interactive online data access tools enables both general and specialist users, including government and industry, to more readily access and apply meteorological data in support of decision-making processes.
- The Bureau's suite of baseline climatological datasets was extended to include frost potential, ultra-violet (UV) radiation, apparent temperature and mean temperature. These datasets are now available in raw and Geographic Information System (GIS) formats on CD or DVD media, and are freely accessible to the community as maps through the Bureau's website (Figures 24 and 25). The development of reference climate datasets provides a basis for comparison of current climate with past and expected future climatic conditions, and supports investigations into climate variability.
- The Bureau added to its existing suite of gridded datasets. These provide information at each point of a regular grid of points across Australia (as compared with information provided for specific station locations). The added datasets include daily rainfall (1900-2008), monthly and annual temperature (1911-2008), atmospheric data from the Bureau's compu-



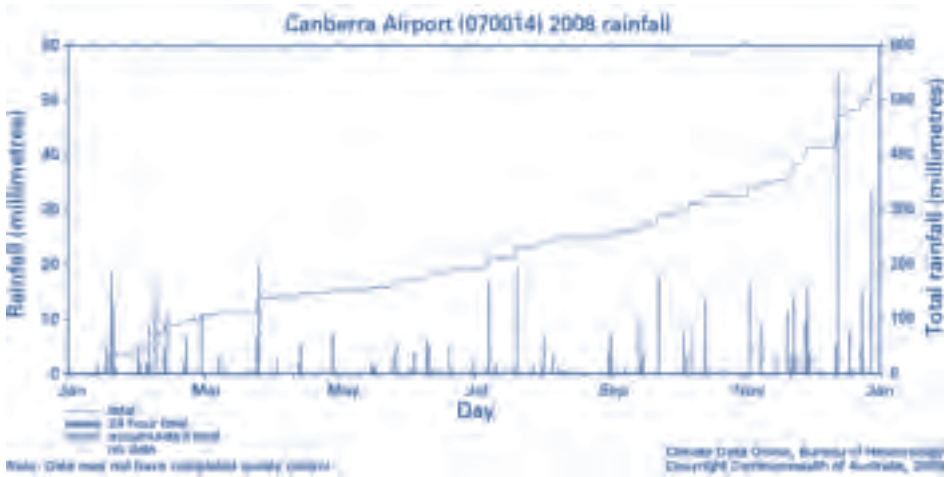


Figure 23. The online availability of historical rainfall data provides the community with local information about recent conditions for thousands of locations around Australia. The figure above shows rainfall at Canberra Airport during 2008.



Figure 24. One of the maps of average indoor apparent temperature, which is a measure of human thermal comfort, now available through the Bureau's website.



Figure 25. Map of annual average number of potential frost days which can be used by the agricultural community to identify areas at risk of frost. The data used to generate these maps are available to the community for analysis and research.

ter models (2004-2008) and computer model ocean data (2003-2008). The production of gridded datasets of climate information extends the geographic reach and applicability of climate data, providing scientists in industry, government and the education sector with standard Australia-wide data for modelling, research and analysis purposes.

- The completion of a solar radiation project funded by the Department of Climate Change saw the development of more than 500 solar exposure datasets in support of the renewable energy industry. These Australia-wide datasets are derived from satellite data and were developed specifically for inclusion in the Renewable Energy Atlas of Australia, compiled by the Department of the Environment, Water, Heritage and the Arts and released in October. The Bureau datasets covered monthly and annual solar exposure, hourly average direct solar exposure and hourly average global solar exposure, for each month of a period of years extending from about 1990 to 2007.

## Pacific Climate Change Science Program: Component 1

The Pacific Climate Change Science Program (PCCSP) is a new \$20 million program aimed at helping Australia's neighbouring island countries - Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu - gain a better understanding of how climate change will affect their region. The PCCSP is part of a much broader \$150 million Australian Government initiative called the International Climate Change Adaptation Initiative (ICCAI), which aims to meet high-priority climate adaptation needs in vulnerable countries in the region. The ICCAI is jointly managed by the Australian Agency for International Development and the Department of Climate Change.

The overarching aim of the PCCSP is to enhance capacity to assess key climate vulnerabilities and risks, formulate appropriate adaptation strategies and plans, and support the inclusion of adaptation in decision making, planning and development. The ICCAI recognises that some adaptation is already taking place in the region, and that there is enormous potential for more adaptation to occur given the current understanding of climate change science. The PCCSP will assist adaptation efforts by raising awareness of the science.

The program has five components. Component 1 of the Program commenced in 2008-09, and is titled 'Recent and current climate and trends'. This component involves an assessment of recent climate variability and change, which will lead to better understanding of the likely climate change in the region. This understanding is essential for interpreting and validating projects from global climate models. A new interactive climate change monitoring website was developed for the display, analysis and graphing of climate data for observation stations in the South-West Pacific. As tropical cyclones are the most destructive weather phenomenon to impact on tropical parts of the Australian continent and islands in the South Pacific and South Indian Oceans, the development of a tropical cyclone archive, climatology and seasonal prediction is a focus of PCCSP Component 1. The Bureau's National Climate Centre has completed the development of the tropical cyclone archive for the southern hemisphere, based on Australian data as well as data provided by the National Meteorological and Hydrological Services of Fiji, France and New Zealand. An analysis of year-to-year variability in tropical cyclone activity and links to variations in broad-scale climate patterns such as the El Niño-Southern Oscillation has also been produced along with an analysis of trends in tropical cyclone occurrences in recent decades.

## Climate Monitoring Service

The Climate Monitoring Service output covers the monitoring and prediction of climate, including its variability from season to season as well as longer term climate trends. The service provides a real-time climate watch for Australia and its surrounds, including the Pacific and Indian Oceans which drive much of Australia's climate variability. The emphasis is on periods of more extreme climate, such as droughts and associated drivers such as El Niño, which have substantial social, economic and environmental consequences. Data from the Bureau's national observation network form the primary basis for this output, augmented by a range of national and international datasets derived from satellite observations.

The year saw extremes of climate with severe drought and above average temperatures continuing in southern Australia and widespread floods in the north. The driver for much of this variability was a La Niña episode in 2008 which was subsequently replaced by El Niño conditions in 2009. The Bureau continued to produce seasonal outlooks of climatic conditions across Australia, as well as nine-month outlooks for ocean conditions in the Pacific and Indian Ocean which are critical in assessing the state of the climate including the occurrence of El Niño and La Niña events. A national Seasonal Climate Outlook is published every month, which gives the likelihood of warm or cool, and wet or dry conditions based on statistical analyses. In addition, the Bureau's coupled atmosphere-ocean climate model, the Predictive Ocean Atmosphere Model for Australia (POAMA), is used to provide broader-scale, long-range forecasts (three to nine months ahead) of the evolution of oceanic conditions and of large-scale climate drivers such as the El Niño/La Niña phenomenon in the Pacific Ocean. The value of POAMA was demonstrated by the prediction of the onset of the 2009 El Niño event, advice of which was made available to the Australian community some months in advance of its development. This was the first such event for which the Bureau of Meteorology has been able to confidently provide significant forewarning to the Australian community.

The Bureau provided targeted advice to relevant Ministers, key government officials, agencies and the public on the developing ENSO situation through routine products such as the ENSO Wrap-Up and the Model Outlooks of ENSO Conditions. These regular advisory services enable more robust planning and management throughout the community in relation to expected climatic conditions.

Monitoring climate variability and change remains an important part of this output. Datasets and analyses relevant to climate change are updated in real-time, allowing monitoring of climate variability and change over the country to be based on all available data, including those most recently collected. A key area of activity is the creation of high quality datasets of specific climate parameters, comprising time series of data which have been carefully and exhaustively checked in an intensive process for non-climate influences such as changes in instruments or station conditions, and suitable corrections being made to remove all such influences from the data. These datasets are made available through the Bureau's website, and are of particular interest to researchers and other community sectors interested in climate change projections. The importance of high quality datasets for climate change studies was demonstrated by their use in 2008-09 in a report authored by the CSIRO and the Bureau of Meteorology as part of the Australian Government's review of drought relief arrangements.



## Major Developments 2008-09

- The Bureau's POAMA climate model provided predictions of a high probability of an El Niño event developing by the 2009 winter. A special media release was issued in May to warn of the incipient El Niño event and its possible consequences, with an associated period of intensive media interviews and public briefings. Prior to the development of the POAMA system, only limited commentary was available on the likelihood of El Niño and La Niña events; this is the first time that such a seasonal forecast has been issued since POAMA became operational. Regular advisory services such as these enable more robust planning and management throughout the community in relation to expected climatic conditions.
- A new high-quality cloud dataset for Australia was completed during the year, providing a new perspective on Australian climate change and improving the understanding of drought in a changing climate. The dataset consists of records of cloudiness at 165 stations, for the most part extending back to the mid-1950s, and corrected for changes in site location, observer and time of observation. These data reveal a pattern of decreasing cloud cover across parts of southern and eastern Australia, particularly during winter, and unusually low cloudiness over Australia in recent years. This is the first comprehensive study of cloudiness changes over Australia and increases the ability of researchers and other sectors of the community to link such changes with other trends in rainfall, temperature and streamflow, and to recognise and understand the nature of cloudiness in climate variability and change.
- The development of a number of new climate products was completed during the year under a major project funded by Land and Water Australia's Managing Climate Variability (MCV) program. These products are made available through the 'Water and the Land' section of the Bureau's website and include new education pages ('Australian Climate Influences'), a 'rainfall ranges' product which shows current rainfall accumulations compared with historical values, and a product showing a new way of presenting the Bureau's seasonal climate outlook, in terms of the probability of exceeding certain rainfall thresholds over the coming season. This more user-friendly presentation should increase the ease of understanding of the seasonal outlook, and its use in improved management of the impacts of climate variability by the community.
- A new Australian Climate Extremes Monitoring System, applied to rainfall and temperature extremes, was deployed as part of the Bureau's operational processes during the year. Each day this system provides an analysis of those areas of Australia which have experienced extreme climatic conditions such as heavy rainfall, heatwaves and extremes of cold, as well as an estimate of the return period for such an event as a measure of the local severity of conditions. The system is also linked to the Bureau's database of forecast parameters for the next five days, allowing, for example, any weather forecasts of 'record' conditions to be routinely and clearly identified at the time the forecast is made. The system therefore provides for the systematic, routine detection, monitoring, and early warning as well as reporting of extreme events across Australia. The information is available to Bureau staff involved in forecasting and analysing recent weather, and when integrated with normal Bureau products and services provides a basis for improved planning and management ahead of extreme events. In particular, it allows community sectors that are sensitive to climate extremes to better understand the specific impacts of extremes on their activities, and hence to better manage and plan for future such events. The system provided invaluable

guidance for the community and emergency authorities when applied to the heatwaves over southeast Australia during January and February.

- The Bureau of Meteorology partnered with Land and Water Australia, Bureau of Rural Sciences, Meat and Livestock Australia and the Birchip Cropping Group to document local weather and climate drivers and deliver climate change information for rural producers across southern Australia. This initiative was part of the National Agriculture and Climate Change Action Plan 2006-2009, an initiative of the Council of Australian Governments. It aimed to provide a policy framework promoting adaptation to climate change and a practical approach to mitigation. Under the plan, the Bureau developed educational material (Figure 26) on Australian climate. This information was delivered as part of training and briefing sessions, in partnership with State agricultural departments and rural advisors, across southern Australia and has been used to build understanding in rural communities of the role and drivers of recent climate variability and change. The aim of the initiative was to foster better understanding of climate change, and hence more informed choices and decisions about adaptation options for agriculture.
- The Bureau of Meteorology and CSIRO partnered, under contract to the Department of Agriculture, Fisheries and Forestry, to produce the report 'An assessment of the impact of climate change on the nature and frequency of exceptional climate events' as one part of the Australian Government's three-part review of National Drought Policy. This report looked at significant shifts in the likelihood of climate extremes such as drought and heatwaves under future scenarios of climate change. A key finding was that both the frequency and severity of these events are likely to increase under a range of greenhouse gas emissions, and that these changes meant that current drought policy was problematic in a changing climate.

## Oceanographic Services

The Oceanographic Services output generates a range of data, information and products on current and forecast ocean conditions for the Australian region tailored to meet the sectoral needs of the marine, defence and emergency services communities in particular, and to underpin the development and effective and sustainable operation of ocean observing systems which provide input to weather and climate monitoring and prediction.

This output also encompasses activities carried out by the Bureau as part of Australia's contribution to international collaboration in support of oceanographic observations and services, including those occurring under the aegis of the WMO and the Intergovernmental Oceanographic Commission (IOC). The Bureau's role in such activities provides Australia with a major voice in the development and implementation of international policies and strategic plans, supporting the Government's national plans and projects in the development and provision of oceanographic services to the community, as well as Australia's national and regional disaster mitigation and climate change activities.

Activities related to tsunami warning are reported in the 'Weather Services' chapter.

### Major Developments 2008-09

- Research continued under Phase II of the BLUElink ocean analysis and forecast system to enhance the quality, resolution and accuracy of ocean analyses and forecasts being delivered to the Royal Australian Navy to support its tactical operations, in particular through



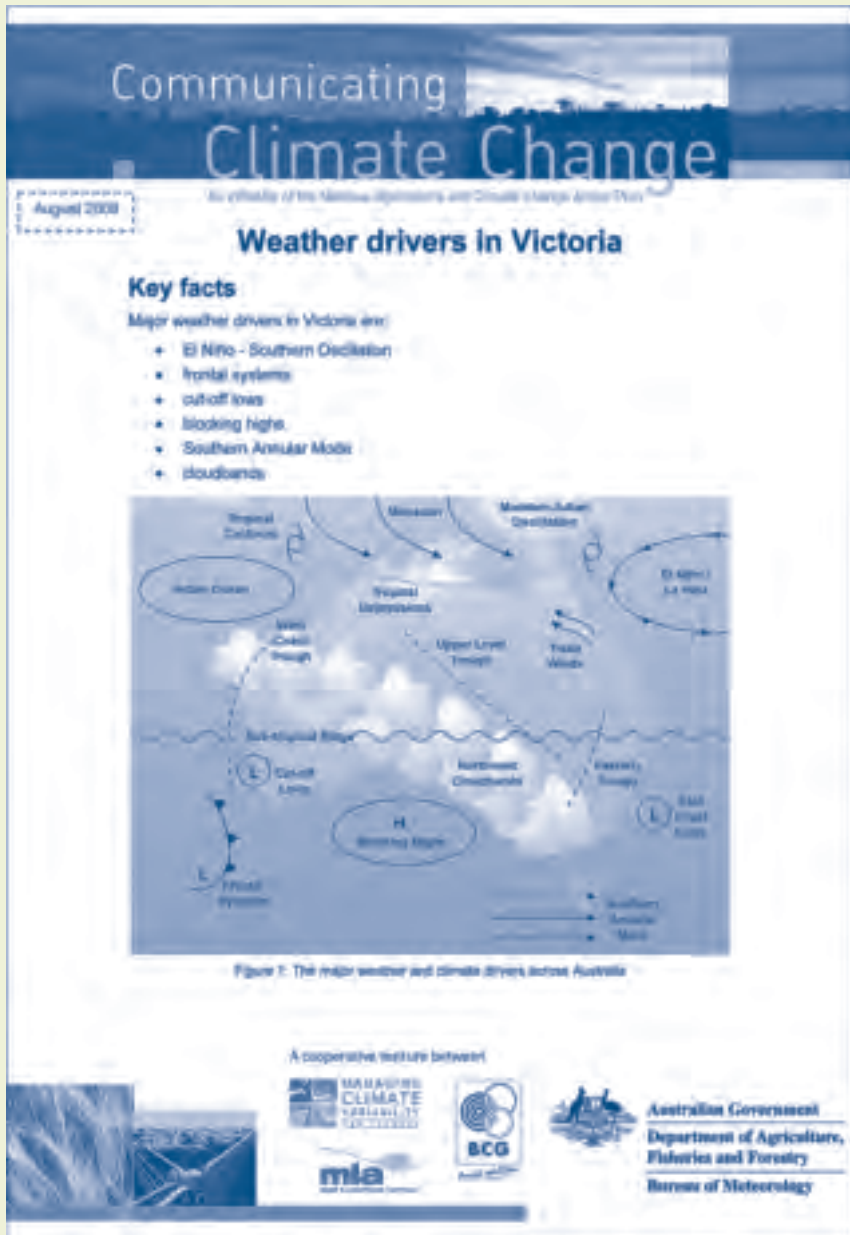


Figure 26. 'An assessment of the impact of climate change on the nature and frequency of exceptional climate events', a report prepared by the Bureau in collaboration with the CSIRO, concluded that the frequency and severity of extreme weather events was likely to increase.

model enhancements and improved assimilation of ocean data. Work has also begun on a number of national and regional application projects for the BLUElink ocean forecasts, to demonstrate their value in direct application to a range of uses in Australia and the region, in fields such as offshore industry, fisheries, research and the marine environment, for example in tracking marine mammals or sea surface object drift. The projects seek to demonstrate the added value BLUElink model predictions can provide to high resolution local or regional ocean forecast models. The Bureau's ocean forecasts form a vital component of overall services in support of the Australian Defence Force, and the success of the demonstration projects will increase the likelihood that BLUElink will make an important future contribution to maritime safety, the national economy and the sustainable management of Australia's marine environment.

- The Australian Government's strategy A Marine Nation: National Framework for Marine Research and Innovation was publicly launched in March by Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research. The framework was prepared by the Oceans Policy Science Advisory Group (OPSAG), which has been chaired for the past two years by Dr Neville Smith, acting Director of Meteorology at the time of the strategy's release. The Bureau of Meteorology supports the OPSAG Secretariat. The framework is aimed at ensuring more effective deployment of national resources and coordination to enable further development of comprehensive, high quality ocean data, monitoring and prediction services. This is the first comprehensive strategy for Australia's \$38 billion marine industry sector, and sets the direction for nationally-coordinated marine research. It meshes well with the recommendations of the recent Review of the National Innovation System which supported closer collaboration between publicly funded research agencies and universities, and proposed 'marine industries' as one of nine national innovation priorities.
- The Bureau hosted two meetings of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology in Melbourne in December. Two Bureau staff members were part of the Australian delegation (including the principal delegate) to the 25th IOC Assembly in June and the Bureau also participated actively in a range of regional activities related to the Global Ocean Observing System of the IOC. This participation ensured that Australia's voice continued to be prominent in international ocean coordination activities which directly affect the Australian region, and that Australia continues to strongly influence and guide global ocean issues which impact on its national interests and programs in marine observing, science and operations.
- During the year there were four international visitors to the Bureau's National Tidal Centre in Adelaide - two from Malaysia, one from India and one from Singapore. They were provided with courses and training in the theory and analysis of tides, basic oceanography and tide gauge operations to help advance sea level monitoring activities in their countries and improve tsunami detection capabilities in the Indian Ocean region.
- Development and testing of a replacement data logger for use in the refurbishment of the Australian Baseline Sea Level Monitoring Array was completed. The refurbishment will modernise and improve the capacity of the array to deliver essential sea level services for Australia for future decades, including accurate tide predictions, real-time sea level monitoring for port operations and extreme events, and high quality sea level data to support Australian and international analyses and studies of climate and climate change.





Participants in the Fifth WMO Training Workshop on Wave and Storm Surge Forecasting in Melbourne in December. The workshop formed part of Australia's contribution to international collaboration under the aegis of the World Meteorological Organization.

## Climate Policy Advice

Climate variability and change have significant consequences for Australian society, the environment and the economy, and the large number of related media and community enquiries received by the Bureau over recent years indicates that there is intense interest within Australia on these issues. The Bureau, as the government agency responsible for monitoring the climate, participates in numerous national and international activities and interactions that generate policy advice to government on climate-related matters, including high-level briefings to Ministers, Ministerial Councils and their supporting committees, and to other State and Federal government departments on climatic conditions and outlooks and other climate-related issues. These activities inform decision-making on critical areas such as drought and climate change, and thereby contribute to government planning and the development of policy priorities and responses.

More specifically, the Bureau contributes information and advice to governments through face-to-face briefings of bodies under the Council of Australian Governments process, such as the Primary Industries Ministerial Council and the Murray-Darling Basin Ministerial Council, and is also represented on several of the subsidiary groups established under these inter-jurisdictional structures.

In addition, the Bureau informs policy through involvement in government inquiries and the development of plans for climate-sensitive sectors of the economy. Indirectly, advice is also given through background material contained in proposals to funding initiatives managed by agencies such as the Department of Climate Change and AusAID, as well as through the implementation of funded projects.

## South Pacific Sea Level and Climate Monitoring Project

The South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) has been providing a range of sea level and tidal services to the 12 participating Pacific Island countries since its inception in 1991, under sponsorship from the Australian Agency for International Development (AusAID). The daily tide predictions have become an essential element of the good management of maritime activities in and around the islands' major sea ports. These ports are the key transportation centres through which vital trade in exports and imports of manufactured goods, food and raw materials takes place. The predictions also support public safety at times of major adverse weather such as severe tropical cyclones, and peak tidal events when low-lying coastal areas are at risk of inundation.

The project operates a network of sea level observing stations in the Pacific Island countries to provide real-time sea level data, and also provides long-term management of the data accumulated over the lifetime of the project. The data management, including collection, processing, quality assurance and archival, supports the maintenance of a high quality climate reference data set suitable for detecting trends in sea level changes that may be linked to global and regional climate change.

Development of strategies to put the network on a long-term sustainable footing is an important issue. Towards this end, a proposal for a major project to refurbish the network over a period of approximately three years was submitted to AusAID during 2008-09. The proposal covered renewal of sensors, data loggers and communications equipment, upgrading of the site environs and the meshing of the operation of the network with other sea level monitoring activities for which the Bureau has responsibility, such as operation of the national sea level baseline and tsunami monitoring networks. Key elements of integration include the use of common operating standards and equipment such as sensors and data handling devices, and common arrangements for maintenance, repair and ongoing enhancements.

Many Commonwealth and State Government agencies regularly use the Bureau's climate data and products in the development of policy as well as in carrying out their operational functions. In particular, the Bureau works with the Bureau of Rural Sciences in providing routine inputs to drought monitoring and the related Exceptional Circumstances process, which has served as a basis for decisions on the distribution of government funding for drought relief. The Bureau's Regional Offices engage with State and Territory government agencies on climate matters through consultative committees or regular seminars. In addition, the Bureau collaborates with the Department of Climate Change and CSIRO to develop and implement the scientific agenda for climate change research as well as the communication strategies for informing governments and industry on the results of that research.



At an international level, the Bureau contributes strongly to climate policy initiatives on several fronts. The Bureau has a seat on the Management Committee of the WMO Commission for Climatology and Bureau personnel also provide scientific support on climate change issues associated with Australia's negotiations under the UN Framework Convention on Climate Change (UNFCCC), especially through involvement in discussions of the UNFCCC Subsidiary Bodies focusing on Climate Change Research and Systematic Observations. Specific issues of importance were the identified priority gaps that came out of the Global Climate Observing System (GCOS) Secretariat's progress report on its Implementation Plan, and the avenues proposed to address them. The UNFCCC Subsidiary Body on Scientific and Technical Advice draws useful conclusions and makes important recommendations on how to address gaps in systematic observations in developing countries. Through participation these outcomes are more likely to be consistent with Australia's position, while enhancing the international reputation of the Bureau of Meteorology.

The Bureau actively supports the GCOS and, in collaboration with climate organisations elsewhere in the Pacific, assists in the implementation of the Pacific Island GCOS initiative.

The Bureau provides the Australian representation, as Vice-Chair for Working Group 2, to the Bureau of the Intergovernmental Panel on Climate Change (IPCC) and participates in the Australian Delegation to Panel sessions and a number of other IPCC activities.

Written submissions were made to several parliamentary inquiries, including the 'Inquiry into long-term meteorological forecasting in Australia' by the House of Representatives Standing Committee on Industry, Science and Innovation, and the 'Inquiry into climate change and environmental impacts on coastal communities' by the House of Representatives Standing Committee on Climate Change, Water, Environment and the Arts, and the Bureau appeared as a witness at related public hearings.