New climate change projections, specifically for the regional scale, are being developed to support the management of natural resources such as land, water, soil, plants and animals.

CSIRO, with support from the Bureau of Meteorology, is developing climate change projections for Australia’s regional natural resource management (NRM) organisations. The projections will be used to assist the sustainable management of Australia’s land and natural resources under a changing climate. CSIRO and the Bureau will be working closely with NRM and research communities to ensure climate change projections support regional planning needs for the medium term.

**NRM Climate Change Projections**

The climate change projections that will be delivered in June 2014 will be the most extensive set developed in Australia’s history. They will include information from new climate models and new scenarios of greenhouse gas and aerosol emissions.

Funding for the project has been provided by the Department of the Environment (DOE) under Stream 2 of the Regional Natural Resource Management Planning for Climate Change Fund (NRM Fund).

**What is New in 2014?**

**New Methodologies and Information**

- New generation climate model results from the Climate Model Intercomparison Project Phase 5 (CMIP5)
- Use of new IPCC emissions scenarios, Representative Concentration Pathways (RCPs), which include a range of plausible future greenhouse gas concentrations in the atmosphere
- Use of several different downscaling methodologies which will help to develop projections at a finer scale than previously available
- Comprehensive analysis of observed climate trends across Australia
- Easy access to ready to use climate change projection data sets for various applications

**Communication of Results**

- Delivery of information through a web portal which will enable free and easy access to comprehensive locally relevant and regionally searchable information
- Guidance material and training to support uptake of projections information and data

**What is a Climate Change Projection?**

A plausible description of a future climate based on a set of future conditions including atmospheric concentrations of greenhouse gases and response of the climate system. These simulations are based on mathematical models which represent scientists’ understanding of the physical properties of the climate system. Different models have different features, so they generate projections that differ in some respects. This means projections have a range of uncertainty at a given location.

CSIRO and Bureau scientists have worked together since the 1990s to produce national climate change projections. These projections have been grounded in the results from global climate models (GCMs) with strong links to regular assessments from the Intergovernmental Panel on Climate Change (IPCC).

Research methodologies have advanced significantly over the past two decades with new generations of climate models used, new climate variables analysed, greenhouse gas emissions scenarios updated and more spatial detail available.

**Variables that Will Be Projected**

**Common Meteorological Variables**

Temperature, rainfall, relative humidity, solar radiation, potential evaporation, windspeed, sea surface temperature and sea level.

**Other Variables and Weather Phenomenon**

Tropical cyclones, east coast lows, El Niño Southern Oscillation, fire weather, runoff, soil moisture, snow cover and drought.
NRM CLUSTER REGIONS

The 54 regional NRM organisations across Australia have been grouped into eight regional ‘clusters’ for the delivery of Stream 2 of the NRM Fund (see map). The regional climate change projections will be delivered through these NRM clusters. The design of the clusters takes into account the nature of the projected change in climate, the range of adaptation options set by biogeography, and the predominant land use.

As part of the NRM climate change projections project, each cluster will receive:

- Interim products sharing the results of climate change projections research
- A targeted report providing information on the projected climate changes for the region, the processes driving change and the confidence in the projections
- Access to a comprehensive web portal where climate information and projected changes for the region can be explored at varying levels of detail.

CLIMATE FUTURES APPROACH

The NRM climate change projections will build on CSIRO’s Climate Futures approach which simplifies communication of climate projection uncertainty. The approach involves identifying a small number of future climates and representative climate models that represent the range of plausible climate change outcomes. This reduces data management demands and helps researchers and planners to identify the climate projections that are most relevant (e.g. of highest risk) to the cluster region.

The sample table below shows how climate model output (for a particular time and emissions concentration) can be arranged into climate futures. Users are able to identify futures that include ‘most likely’, ‘best case’ and ‘worst case’. For example, when using the table below to plan water supply infrastructure, the ‘Much hotter’ and ‘Much drier’ climate future might represent the worst case.

<table>
<thead>
<tr>
<th>TEMPERATURE PRECIPITATION</th>
<th>LITTLE CHANGE Up to 0.5°C warmer</th>
<th>WARMER 0.5°C to 1.5°C warmer</th>
<th>HOTTER 1.5°C to 3.0°C warmer</th>
<th>MUCH HOTTER &gt; 3.0°C warmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUCH WETTER &gt; 15% wetter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WETTER 0 to 15% wetter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LITTLE CHANGE -5% to +5%</td>
<td></td>
<td></td>
<td>Likelihood: 4 of 25 models (16%)</td>
<td>Likelihood: 2 of 25 models (8%)</td>
</tr>
<tr>
<td>DRIER 0 to 15% drier</td>
<td>Likelihood: 2 of 25 models (8%)</td>
<td>Likelihood: 10 of 25 models (40%)</td>
<td>Likelihood: 3 of 25 models (12%)</td>
<td></td>
</tr>
<tr>
<td>MUCH DRIER &gt; 15% drier</td>
<td>Likelihood: 2 of 25 models (8%)</td>
<td>Likelihood: 2 of 25 models (8%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LINKAGES TO IMPACTS AND ADAPTATION RESEARCH

The DOE, through Stream 2 of the NRM Fund, is also supporting research teams to work with the NRM clusters on identifying and understanding regional impacts. The climate change projections team at CSIRO and the Bureau are working closely with impacts and adaptation research teams to better understand the needs of end-users regarding climate change projections for research and planning, to generate projections that meet most of those needs and to deliver data, guidance and training for a range of applications.

NRM WEB PORTAL

Climate change projections for Australia’s NRM regions will be delivered via: www.climatechangeinaustralia.gov.au