



WORKSHOP REPORT

NextGen Climate Change Projections

Science ideas and issues for national climate
change projections in Australia

June 2018

Earth Systems and Climate Change Hub Report No. 5

The Earth Systems and Climate Change Hub is supported by funding through the Australian Government's National Environmental Science Program. The Hub is hosted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and is a partnership between CSIRO, Bureau of Meteorology, Australian National University, Monash University, University of Melbourne, University of New South Wales and University of Tasmania. The role of the Hub is to ensure that Australia's policies and management decisions are effectively informed by Earth systems and climate change science, now and into the future. For more information visit www.nespclimate.com.au.

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Citation

NESP Earth Systems and Climate Change Hub. 2018. *NextGen Climate Change Projections: Science ideas and issues for national climate projections in Australia*, Earth Systems and Climate Change Hub Report No.5, NESP Earth Systems and Climate Change Hub, Australia.

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Published: June 2018

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Key Findings

- How climate projections are used, by whom, and for what purpose has changed greatly in recent years. These changes will need to shape how the next generation (NexGen) of national climate projections is designed and developed.
- The next suite of projections must focus on providing climate change information and services tailored to existing and new stakeholder needs.
- A coordinated approach across a wide variety of agencies will be required.
- There are unprecedented amounts of new climate model information to assess and use. The NexGen of climate projections will require improved data processing, analysis and visualisation, synthesis of various data sets, and a targeted strategy for creating and using high-resolution modelling and downscaling.
- Now is the time to start discussing and planning the next major release of climate projections. There are compelling reasons to time the release to follow the IPCC Sixth Assessment Report, phase 6 of the Coupled Model Inter-comparison Project (CMIP6) and phase 2 of the Coordinated Regional Downscaling Experiment (CORDEX2), in approximately 2023-24.
- There is a strong need for targeted, updated and additional products and services before this new major release. A minor release prior to 2020 is needed, with information about topics such as climate changes at the Paris agreement targets of global warming of 1.5°C and 2 °C, and projections tailored for sectors such as finance.

Background

Climate projections have been produced in Australia since the late 1980s. However the landscape of climate change projections is always changing in terms of the science, communication methods, who uses the projections, what the projections are used for, and how they are used.

There is a range of possible routes the development of future climate projections could take to enhance the four main indices of success: projections that are scientifically credible, salient, legitimate and actionable. The timing, credibility and inputs used in a new release need to be mindful of the international context, particularly the next Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC AR6) and associated Coupled Model Inter-comparison Project phase 6 (CMIP6) global climate model simulations. The research and modelling context within Australia is also important, including the capacity for new modelling, assessment and communication.

This workshop aimed to gather ideas from science experts and stakeholders on how the next generation of climate projections for Australia should be designed and delivered.

Key themes emerging from the workshop

A coordinated effort across the Australian climate change science community and end users

Workshop participants agreed that the development of NextGen national projections will need to be coordinated within and across agencies in many arenas, including research and communication with governments. This will assist with the coordination of logistics and management of projects proposals, advice and delivery of products. It will also assist in strengthening the science-policy interface.

Delivering to stakeholder needs

There are a wide range of stakeholders who need climate projections data and information, each with their own information needs. Participants discussed the advantages that tailoring projection products to a priority list of key user sectors would bring over providing only generic information. New and emerging stakeholder needs for climate change information and services are now becoming clear. An example of a new stakeholder in this area is the finance sector, with their emerging interest in accurate and tailored climate information.

Participants also discussed how projections for the United Nations Paris Agreement global targets of limiting global warming to 1.5°C and 2°C are relevant for a range of stakeholders, in particular governments, so should be presented as part of new products and services.

It was clear from discussions that these new and emerging stakeholder needs require updated products and services prior to a major new release of national climate projections.

Communication of projection outputs

Previous climate projections have much value and continue to be used by a variety of stakeholders. As a result, there is a need for continuity in the presentation styles and content between the current suite of projections and any new projections, and clear guidance as to what is new or different in any new release. This will also be important for contextualising previous information, rather than undertaking a total reboot every few years.

Ways to enhance communication of projections could include:

- Presenting storylines and realistic ‘scenarios’ rather than projected ranges of change as the central entry point into future climate change. The feasibility and usefulness of scenarios needs to be investigated.
- Framing projections more directly within the climate change we have seen that has been due to human influence (using detection and attribution) and a scientific assessment including physical drivers to enhance credibility and salience.
- A focus on risk and risk management, rather than uncertainty, to assist in using projections in decision-making frameworks.

Improvements to modelling and data

Workshop participants discussed the need to better account for model deficiencies (e.g. decadal drought, 'grey zones' of model resolution) and poorly constrained uncertainties (e.g. carbon cycle) in the next release of projections. It was acknowledged that modern data processing, analysis and visualisation will also be crucial. Better links to other tools to assess vulnerability and risk (e.g. Geoscience Australia database of assets) will also need to be developed.

Many new datasets will soon be available which will need to be assessed and potentially included/incorporated into the NextGen projections, including:

- CMIP6 – primarily the future scenarios named ScenarioMIP, but several other components as well
- Coordinated Regional Downscaling Experiment (CORDEX) - CORDEX2 and other downscaling datasets
- the UK perturbed physics ensemble (PPE)
- initialised simulations - the multi-year to decadal prediction work done in Australia and internationally
- *weather@home*, Global and Australia-New Zealand
- simulations of 1.5°C and 2°C specifically (e.g. HAPPI-MIP and BRACE).

As a result, there will be an increased need to evaluate and combine different datasets and handle model independence (e.g. selection and weighting by dependence). The use of not only the usual projections ('scenario-MIP'), but several other releases (e.g. Highres-MIP, Decadal-MIP, HAPPI-MIP) was also discussed by workshop participants.

Downscaling global climate models to intermediate scales (5-60 km) can reveal useful information about regional climate change, and is seen as desirable by many applications, including state-based research. This downscaling is most useful when undertaken in a coordinated program such as the CORDEX and CORDEX2 framework. Leveraging off larger programs such as CORDEX Australasia is advantageous, as producing a new ensemble of downscaling using multiple methods would require a lot of coordination and resources.

Very high resolution modelling (e.g. 1.5 km termed 'convection permitting') has been run in the United Kingdom, New Zealand and elsewhere. It shows the potential to reveal new insights into particular questions such as around extreme rainfall and urban microclimates. We need a good strategy to use existing modelling and produce new modelling in this area.

Workshop participants noted that there is likely to be scientific and political interest in what the new CMIP6 ensemble holds for Australia. This increased interest could be a motivation for support for a major update to climate projections.

Towards the next release of national climate projections

All proposals for new work on climate projections will require a strong vision statement and value propositions for the various components. This should be an immediate priority.

During discussions at the workshop the majority opinion was that the timing of the next large new release of climate change projections should follow the IPCC Sixth Assessment Report and CMIP6, since Australia largely leverages off international efforts (as opposed to the UK who largely generate their own inputs). This would mean a release date of the next generation of climate change projections in around 2023-2024. CMIP6-based model inputs will provide a point of difference from the previous generation of projections. The proposal to base NextGen projections mainly on CMIP6 and downscaling by CORDEX2 (with other model ensembles used as complementary sources of information) was supported by the majority of workshop participants.

According to this timeline, work on the major release would need to start around 2020 for tasks such as stakeholder engagement, assessment of early CMIP6 outputs, downscaling of CMIP6 outputs for CORDEX2, and optimal ensemble generation work. Some or most work on improved tools and methods could be developed earlier than 2020, as part of an effort to enhance current projections work (e.g. tailoring projections for risk management, the finance sector, and presenting information about the Paris Agreement targets). New model inputs could then be incorporated into this framework as they become available.

A structure that draws on expertise in all relevant agencies would have many advantages. A structure similar to, or even flowing out of, the NESP Earth Systems and Climate Change Hub that features numerous partner agencies and has strong links to other agencies (such as universities and government research currently not partners in the Hub) would feature these advantages.

Workshop participants agreed that efforts need to be made to 'mainstream' climate change information and services in the medium to long term, including ongoing services and regular updates. This means incorporating the projections into an ongoing service structure, such as those provided by the Bureau of Meteorology.

The benefits of separating the research and delivery streams of activity, and also separating the experimental and the operational product versions was discussed by workshop participants.

A framework for ongoing service could be based on 'vulnerability and adaptation services', where specialists work with agencies to first assess their climate vulnerability and risks, thresholds and limits. Projections would be incorporated after this assessment is complete, and if needed.

Workshop next steps

Discussion on the next steps involved the workshop organising committee and David Jones (Bureau of Meteorology), Jatin Kala (Murdoch University), Dewi Kirono (CSIRO), Roger Jones (Victoria University) and Jo Mummery (independent).

Next steps include:

- Produce a map of decision points for the next 10 years
- Produce a strawman proposal for testing with stakeholders (both the major new release and minor release in the nearer term)
- Devise a coordination and communication plan for the short to medium term.



Appendix 1: Meeting details

NextGen Projections Workshop: Science ideas and issues for national climate projections in Australia

Date:

23-24 November 2017

Place:

Melbourne Convention Centre, Victoria

Workshop purpose:

To view and discuss the big issues in the climate projections field before any new specific national projections projects begin. Topics for discussion include:

- an assessment of the strengths and weaknesses of previous projections
- the evolving science, new data sources, new methods, and communication frameworks
- how to take climate change science through to impacts and adaptation applications via products and services.

Workshop Sessions:

- Projections past and present – a history of Australian projections
- New and emerging users and uses, detection and attribution, extreme events
- Commissioner perspectives - federal and state government funders and program leaders
- International perspective – UK and NZ experiences
- Landscape of potential data sources – CMIP6 and an array of other sources

Discussion Panels

Idea pitching

- Discussion and debate of ideas gathered from the expert group, including prioritising for further stress testing.

Related Websites:

- Climate Change in Australia Web site – www.climatechangeinaustralia.com.au

Appendix 2: Meeting participants

Organisers:

- Michael Grose, CSIRO
- Jason Evans, UNSW
- Rob Colman, Bureau
- John Clarke, CSIRO
- Jo Brown, Bureau
- Aurel Moise, Bureau
- Marian Sheppard, CSIRO

International participants:

- Fai Fung - Climate service manager, UKCP18 Project, UK Met Office
- Sam Dean - National Institute of Water and Atmospheric Research, NZ
- Olaf Morgenstern - National Institute of Water and Atmospheric Research, NZ

Government participants:

- Miriam McMillan - Federal Department of the Energy and Environment
- Matt Riley - NSW Office of Environment and Heritage
- Sophie Muller - Tasmanian Climate Change Office
- Clare Brownridge - Victorian DELWP

Australian science expert participants

- 38 invited experts from CSIRO, Bureau of Meteorology, Centre of Excellence for Climate System Science, Universities (UNSW, Monash, Melbourne, University of Tasmania, Murdoch University and Victoria University), and Queensland State Government Research.
- Jo Mummery (independent)



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