



CCRSPI

NATIONAL CLIMATE CHANGE RESEARCH STRATEGY FOR PRIMARY INDUSTRIES

Australia's primary industries responding to climate change

Australia's primary industries and the communities that depend on them need to be sustainable, competitive and profitable now, and into the future, to secure Australia's food supplies and national prosperity. The predicted changes in the Australian climate are substantial, and the effects will vary widely across the country. Changes in temperature, rainfall, atmospheric carbon dioxide levels, ocean currents and chemistry, winds, nutrient supply, and extreme weather conditions will all generate impacts and opportunities for Australian agriculture, fisheries and forestry industries.





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This fact sheet gives an overview of some of the key predicted impacts of climate change, and highlights some of the responses our primary industries are developing to prepare for, adapt and manage these impacts. Importantly, this response is based upon a shared view amongst our primary industries that:

- Climate change is real and will have biophysical, social and economic impacts at different scales (local, regional, national).
- Climate change presents opportunities and challenges for different commodities and the communities that depend upon them.
- Australia's primary industries have been, and will continue to adapt to climate change by adding to existing skills, experience and knowledge about running successful agricultural enterprises in our already highly variable climate.
- It makes sense for primary industries to collaborate and coordinate their response to climate change so that existing information can be shared and new research undertaken in a cost effective manner to meet the needs of many rather than a few.

Developing this shared view through working together to prepare the National Climate Change Research Strategy for Primary Industries (CCRSPI) has provided primary industries with a common purpose in addressing current and predicted climate change impacts. The table on the following pages summarises some of the biophysical and social impacts of climate change.



CCRSPI Partners

Rural Research and Development Corporations

- Australian Egg Corporation Limited
- Australian Pork Limited
- Australian Wool Innovation Limited
- Cotton R&D Corporation
- Dairy Australia
- Fisheries R&D Corporation
- Forest and Wood Products Australia
- Grains R&D Corporation
- Grape & Wine R&D Corporation
- Horticulture Australia Limited
- Land & Water Australia
- LiveCorp
- Meat and Livestock Australia
- Rural Industries R&D Corporation
- Sugar R&D Corporation

Government

- Department of Agriculture, Fisheries and Forestry
- Department of Agriculture and Food, Western Australia
- Department of Primary Industries, New South Wales
- Department of Primary Industries, Victoria
- Department of Primary Industries, Water & Environment, Tasmania
- Department of Primary Industries and Fisheries, Queensland
- Department of Regional Development, Primary Industry, Fisheries and Resources, Northern Territory
- Primary Industries and Resources, South Australia

Other

- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Australian Council of Agricultural Deans



Projected impacts of climate change in Australia

Factor	Climate change impact
Temperature rise	By 2030, the temperature is projected to warm by about 1°C annually over Australia for the mid-range emissions scenario (relative to 1990). Inland areas are likely to experience stronger warming of up to 1.8°C, with coastal areas warming a little less. By 2070, annual warming is around 1.8°C (range of 1.0°C to 2.5°C) for the low emissions case and around 3.4°C (range of 2.2°C to 5.0°C) for the high emissions case, relative to 1990. Mean warming in winter is expected to be less than in other seasons. In south-eastern Australia, El Niño events may tend to become drier and La Niña events may become wetter (CSIRO and BoM, 2007).
Rainfall	For 2030, rainfall is projected to decrease by 2–5 per cent across Australia, except for northern Australia where little rainfall change is projected. Importantly, runoff will also substantially decline, resulting in significant negative impacts for water quality and quantity. In 2070, annual rainfall is estimated to decrease by about 7.5 per cent across Australia, except in the far north. Changes in rainfall and flow on rainfall reductions are expected to vary widely across regions and seasons. Although northern Australia is projected to experience little change, south-western Australia is projected to experience decreased rainfall of up to 40 per cent by 2070. Across Australia, the decreases in rainfall are projected to be greatest in winter and spring. The models also show an increase in daily rainfall intensity (rain per rainy day) and in the number of dry days. Due to the projected changes in rainfall, soil moisture is likely to decline over much of southern Australia (CSIRO and BoM, 2007).
Pests and diseases	Changes in temperature, rainfall and humidity are likely to alter the distribution, occurrence and frequency of pests and diseases.



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Rising atmospheric carbon dioxide

Atmospheric carbon dioxide concentration has increased steadily from about 350 parts per million (ppm) in 1990, to the current atmospheric carbon dioxide (CO₂) levels of about 380 ppm. World carbon dioxide emissions are expected to increase by 1.9 per cent annually between 2001 and 2025. By 2030, atmospheric carbon dioxide levels are expected to be about 430–455 ppm, and 525–705 ppm by 2070 (CSIRO and BoM, 2007).

The steadily increasing concentration of carbon dioxide (CO₂) in the atmosphere directly affects productivity, product quality and resource use efficiency of plants and vegetation. Higher atmospheric CO₂ concentration increases the efficiency of plant use of light, water and nitrogen and possibly the uptake of other minerals like soil phosphorus. Increases in carbon dioxide concentration could have positive carbon fertilisation effects by increasing the rate of photosynthesis, enhancing growth in some plants. However, higher concentrations of carbon dioxide could also reduce crop quality by lowering the content of protein and trace elements.

Extreme events

Extreme events such as flooding and droughts are projected to increase in frequency and severity as the global climate changes. Such events are likely to reduce agricultural productivity and production by decreasing crop yields and increasing stock losses (CSIRO and BoM, 2007).

An increase in fire-weather risk is likely with warmer and drier conditions. It is likely that the fire season will lengthen, shifting periods suitable for prescribed burning toward winter.

Sea level rise

Global sea levels rose by about 17 cm during the 20th century, and by about 10 cm from 1920–2000 at the Australian coastal sites monitored.

By 2100, a global average rise of 18–59 cm is projected, with a possible addition from ice sheets of 10–20 cm. However, further ice sheet contributions may substantially increase the extent of sea level rise (CSIRO and BoM, 2007). This will have implications for planning and flood defences.



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Other marine changes

General ocean warming around Australia, changes in ocean chemistry and circulation patterns are projected (Stokes and Howden, 2008). Substantial warming has occurred in the three oceans surrounding Australia. For example, the ocean temperature around Maria Island, Tasmania, has warmed by approximately 1.5°C since the 1950s.

By 2030, the ocean temperature is projected to warm by 1–2°C around Australia with the greatest warming off south-eastern Australia (2°C).

By 2070, the ocean temperature is projected to warm by 2–3°C around Australia with the greatest warming off south-eastern Australia (3°C).

Warming ocean temperatures, in particular on the east coast, are expected to threaten coral reefs with more frequent bleaching events, cause fish species to migrate towards cooler water at the poles and threaten kelp forests.

Ocean acidity is projected to increase as levels of carbon dioxide in oceans increase; reducing the availability of calcium carbonate, which is required by many creatures with calcium carbonate shells.

The East Australia Current is likely to strengthen, resulting in warmer waters extending further southward.

Estuaries are likely to be affected by rising sea levels and changes in flows of freshwater from rivers, impacting on fish breeding cycles (CSIRO and BoM, 2007). Changes in agricultural land use patterns can also impact on fisheries stock through run-off and loss of sea grass habitat.

Social impacts

Climate change impacts have the potential to alter the size, structure and demographics of communities as commodity production contracts, expands or moves location, or as new commodities are produced.

There is also the possibility of more frequent and extreme events such as bushfires and cyclones that will affect rural communities and the enterprises they rely upon.

Buildings, suburbs, towns and cities will need to be better designed for water and energy efficiency, as well as recognising the health impacts of longer, drier seasons and more extreme events such as flooding and prolonged drought. For coastal areas, rising sea levels will potentially reduce investment in low lying regions, with long-term planning in these communities requiring a gradual move further inland.



The information discussed in the table on the previous pages demonstrates the possible severity, now and into the future of the predicted changes to Australia's biophysical environment. These biophysical changes will have flow on social and economic impacts in the communities that support and depend on primary industries, as well as through industry supply chains, both suppliers and retailers. The inter-connectedness of these impacts means that industry and government need to work together to find integrated, flexible solutions crossing commodity, regional and community boundaries.

Building on existing skills and knowledge

Farmers have been skillfully adapting their farm business decisions in response to climate variability for centuries. Farmers are also adept at managing in uncertain biophysical, economic and social environments. Farm businesses must manage risks from uncertainty in market share, input costs (such as fuel and fertiliser), consumer demand, distribution networks and global regulation (free trade agreements etc.) While climate change adds another layer of uncertainty for farm businesses, the "good news" is that Australian primary producers have a track record of innovating and creating value out of uncertainty.

Given meaningful, relevant information, underpinned by a strong research effort, primary industries will find ways to adapt to climate change. Already, some of the exciting opportunities to emerge for businesses and producers as a result of climate change are:

- Primary producers that take a lead in addressing climate change can realise greater market share and profits, as well as accessing public funding to support change.
- New products and services are already being developed to address climate change such as innovations in cooling systems and use of renewable energy.
- Many of the measures to prepare for, and adapt to, climate change represent good business management and can save money.
- Changes in export markets will offer opportunities for Australian companies.
- Significant regional market opportunities may emerge as a result of new ways of farming, new commodities, and commodities being produced in new areas.



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There are also a number of strategic and operational initiatives that primary industries, research investors and providers, are investing in together, or individually, to help build capacity to address climate change. These include:

- Investing in research, scenario planning and considering future market structures.
- Analysing and disclosing climate related financial risks and opportunities.
- Developing industry-wide plans and communicating with commodity producers, businesses and decision makers on what climate change means for their businesses and industry.
- Requiring major suppliers to adopt principles for managing climate risks.
- Engaging in policy dialogue at the state, regional and national levels.
- Having relevant disclosure material prepared for the investment community and insurance companies.
- Communicating with customers on their needs, preferences and concerns.

These initiatives are positive ways primary industries are sharing their information and experience of responding to climate change, as well as working together to invest in areas they currently do not have enough knowledge to act.

Collaborating and sharing knowledge

Investing in understanding climate change and developing new ways of functioning within a changing environment, enables primary industries to keep abreast of the evolving state of knowledge. Planned and ongoing research helps address rapidly emerging questions, and informs debate within industries, government and communities.

While each primary industry sector has issues specific to them and their stakeholders, there are many cross-industry issues that provide opportunities for collaboration in developing a regional, industry, research or communication response. In recognition of this, CCRSPI has been developed for agriculture, fisheries and forestry. CCRSPI covers the management of climate change impacts, including adaptation, and the management of greenhouse gas emissions, including mitigation.



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The development of this research strategy is a joint initiative of all the rural research and development corporations, state and territory governments; the Australian Government Department of Agriculture, Fisheries and Forestry; and the CSIRO. The strategy is managed by Land & Water Australia.

Importantly, CCRSPI focuses on how climate change will impact on primary industries, the people who work in them, the policy decision makers who will contribute to shaping the future of primary industries, and the regional communities in which primary industries operate. The research strategy is set within the context of a range of policy, research and development activities being undertaken to address climate change issues. It aligns with Australian Government policy, to significantly reduce emissions and establish partnerships with business and industry to deliver energy and water efficient projects with a focus on productivity and innovation.

CCRSPI is founded on primary industries collaborating, coordinating and communicating with each other so that information can be shared, knowledge generated and responses developed to deal with climate change. Australia's climate and ecological realities give a real imperative to the CCRSPI initiative as it will help primary industries to identify and realise innovations that prepare for, and enable farmers and the communities that depend upon them to adapt to climate change.

For more information about CCRSPI, climate change and Australia's primary industries, the website — www.lwa.gov.au/ccrspi — has a range of information and publications as well as details about the research that is currently underway to ensure primary industries are equipped to make the best possible decisions to manage issues associated with climate change.



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References

- A National Climate Change Strategy for Primary Industries: Phase I Report, 2008, Land & Water Australia, Canberra.
- CSIRO and Bureau of Meteorology, 2007, Climate Change in Australia — observed changes and predictions, CSIRO, Canberra.
- Stokes, C.J. and Howden, S.M. (eds), 2008, An overview of climate change adaptation in Australian primary industries — impacts, options and priorities, CSIRO, Canberra.