Improved seasonal climate forecasts:

the benefits for Australian industry (excluding agriculture)

The aim of the national Managing Climate Variability program is to help farmers and natural resource managers manage the risks and exploit the opportunities presented by Australia's increasingly variable climate. For more than 20 years, we have invested in research and development that aims to improve climate forecasts for the season ahead, particularly for the period of 2–8 weeks and 3–6 months out.

In 2014, we engaged The Centre for International Economics to estimate the value of improved seasonal forecasts for Australia's economy. The information below is based on their analysis for 11 sectors of the economy.

A separate companion fact sheet is available for the agriculture sector (see the end of this fact sheet for details on where to access it).

Climate variability and economic performance

Climate variability and extreme weather events can affect the economic performance of a range of sectors. For example, temperatures affect demand for electricity; cyclones, winds, waves and strong currents can halt offshore oil and gas production; rainfall in catchment areas is the primary determinant of water supply levels; flooding can fill coal mines and damage equipment; and climate affects insurance payouts, staffing and financial resources.

The degree to which the value of a sector's output is impacted by climate is referred to as its 'climate sensitivity'.

How industry can use seasonal climate forecasts

The ability of businesses and industries to make use of seasonal climate forecasts in mitigating risk is influenced by the characteristics of that industry or business, such as:

- capital and infrastructure intensity
- approaches to, and expertise in, risk management
- the type of weather conditions to which activities are sensitive
- the extent that management systems have already adapted to expected ranges of climate variability.

The mitigating action and the lead time required can differ substantially. For example, an electricity generator might factor the climate forecast into their demand forecasts, which are done on scales of minutes to years; a coal mining company might decide to move equipment, which could require weeks of lead time; an oil and gas company might shut down and evacuate an offshore rig, which requires days of lead time. Each business and industry needs to understand the extent to which it can cost-effectively mitigate the impacts through the use of improved seasonal climate forecasts.

The value of climate forecasts for the economy

Although the available data is limited, The Centre for International Economics was able to consider the climate sensitivity of 11 sectors. For six of these sectors—coal mining, construction, electricity, offshore oil and gas, transport and water—they were able to quantify the potential benefits of improved seasonal forecasts. The probabilistic method they used to estimate the value of improved seasonal forecasts incorporates:

- the extent to which losses can be mitigated
- the costs of mitigation activities
- the cost of uncertainty and incorrect forecasts.

Despite some uncertainties, the estimated value of improved seasonal forecasts was found to be positive and significant for a number of sectors (Table 1). The potential annual value ranges from $192 million for construction to $2 million for electricity. It is important to note that this value is much lower than the value of climate sensitivity because not all climate effects can be mitigated through the use of forecasts. In addition, the value of climate sensitivity cannot be used as an indicator of the value of climate forecasts to the various sectors. Climate sensitivity is a measure of the extent to which the value of output of a sector is affected by climate. The value of a climate forecast is a measure of the extent to which the impact of weather events can be avoided or reduced using the climate forecast information.

The potential benefits are likely to steadily emerge over 20 years for the electricity, coal mining and transport sectors, and over 30 years for the construction, offshore oil and gas, and water sectors.

Table 1. Climate sensitivity and the potential value of improved forecasts, by industry sector

Sector	Annual value of improved seasonal forecasts A$ million	Annual value as a share of industry value added %
Construction	192	0.20
Offshore oil and gas	93	0.46
Coal mining	68	0.33
Water	28	0.27
Transport	5	0.02
Electricity	2	0.01
Total	**388**	
Potential present value over 20 years	*1 000*	

Note: All values are in Australian dollars at 2012 prices.

Source: The Centre for International Economics, 2014

From their broad, qualitative assessment, The Centre for International Economics ranked the sectors in order of the potential value of seasonal climate forecasts to each sector (Table 2).

Coal mining ranks highly because it is part of a sector that is already familiar with risk management technologies. While the coal mining sector does not necessarily have the most cost-effective adjustment options available (particularly over a seasonal timeframe), it has the ability to absorb and use probabilistic information, which is crucial if forecasts are to be of value.

At the other extreme, the retail trade and tourism sectors, while having some cost-effective adjustment options, are institutionally not in the position of being able to effectively use probabilistic forecasts.

The insurance sector is seen as a special case, insurance being a form of risk management and also because of the potential for seasonal climate forecasts to change the nature of the contractual relationships.

Table 2. Ranking of the industry sectors most likely to find improved seasonal forecasts to be of value

Industry sector	Short-term adjustment options	Appropriate systems in place to manage probabilistic forecasts	Cost effective responses available	Likely usefulness of seasonal forecasts
Coal mining	☆☆☆☆	☆☆☆☆☆	☆☆	☆☆☆☆
Electricity	☆☆	☆☆☆☆☆	☆☆☆	☆☆☆
Construction	☆☆	☆☆☆	☆☆☆☆	☆☆☆
Offshore oil and gas	☆☆	☆☆☆☆	☆☆	☆☆☆
Financial and insurance services	☆☆	☆☆☆☆	☆☆☆	☆☆☆
Transport (road and air)	☆☆	☆☆☆	☆☆☆	☆☆☆
Health care (and social assistance)	☆	☆☆☆	☆	☆☆
Water (water supply and waste services)	☆	☆☆☆☆	☆☆☆	☆☆
Emergency services (public administration and safety)	☆☆☆	☆☆	☆☆	☆☆
Retail trade	☆☆	☆	☆☆☆	☆
Tourism	☆☆	☆	☆	☆

Sectors are listed in descending order of 'Likely usefulness of seasonal forecasts' (the right-most column), on a scale of 1 to 5 where five stars indicates 'most useful' relative to other sectors. All rankings are qualitative.

Recommendations

The Centre for International Economics makes the following recommendations:

- Develop a clear product statement for how the seasonal forecasts will be improved, the technology underlying them, and how they will intersect with existing risk management tools.
- Work with the coal mining, electricity and construction sectors to develop case studies (possibly based around historical events) that can both demonstrate and research how improved seasonal forecasts will practically work in these sectors. This is likely to generate important information both for agents in the sector as well as for the climate forecasting researchers.
- Engage with the insurance sector to improve understanding of seasonal forecasting in the context of a range of implications for risk management. As a sector with major investment in risk quantification and the contractual sharing of risk, it is likely to provide valuable insights for the forecasting research.
- Develop awareness of the 'human' side of improved seasonal forecasts: particularly the ways in which they will affect attitudes to risk and attitudes to production and insurance contracts. The cases studies noted above will be a major contribution to this.

More information

Download the following documents at: http://www.managingclimate.gov.au/publications/benefits-of-improved-forecasts

- **Fact sheet:** 'Improved seasonal climate forecasts: the benefits for Australian agriculture'
- **Full report:** 'Analysis of the benefits of improved seasonal climate forecasting for sectors outside agriculture'
- **Full report:** 'Analysis of the benefits of improved seasonal climate forecasting for agriculture'