

Australian Actuaries Climate Index: Heavy rain and high sea levels in eastern Australia due to La Niña

28 April 2022

- **Localised extreme rainfall in eastern Australia contributed to flooding in NSW and QLD.**
- **Above average sea level values observed in every part of the country.**
- **Record set for low temperature index in the Murray Basin, indicating warmer minimum temperatures.**

The summer of 2021/22 continued the trend set by a wet spring, with an ongoing La Niña event leading to increased rainfall and warm ocean temperatures on the east coast of Australia.

There was significant flooding in parts of QLD and NSW in late February that led to the deaths of 22 people and an estimated \$2.5 billion of insurance claims as at 14 April (noting this figure is subject to revision and includes losses incurred in summer 2021/22 and autumn 2022 as heavy rainfall and flooding continued into that season)¹. However, despite what was seen on the ground, no climate index records were set for the East Coast North and East Coast South clusters for the summer of 2021/22.

This is due to the fact that the index captures information over a time span of 3 months and across large geographical areas. It therefore reflects overall climate trends as opposed to localised catastrophes.

To further explain this apparent discrepancy, Figure 1 presents disaggregated data for February of 2022 for each station, in addition to the usual seasonal index values. Each point represents a weather station, with the colour reflecting the percentage of days in February where the rainfall exceeded the 99th percentile calculated from the base period of 1981-2010. Weather stations close to Brisbane and Sydney had up to 18% of days in February exceed the 99th percentile, while other areas had no exceedances at all. When aggregated to a season and cluster level, this leads to mid-range index values overall.

The Bureau of Meteorology made similar observations regarding rainfall this summer, stating that rainfall was above average along the east coast and in parts of SA, while being below average in southern WA and in Tasmania². La Niña has been in effect since November, which played a part in the higher rainfall in the eastern parts of the country and may lead to a continuation of wet weather in autumn³.

Sea surface temperatures have been unusually warm off Australia's east coast, which contributes to higher sea levels as the warmer water expands⁴. This was seen in the sea level index, which was above reference period average for every part of the country. This season was the 24th consecutive season that the sea level index was positive for the country as a whole, as shown in Figure 2.

The Murray Basin, which covers parts of NSW, VIC and SA, set a record for the extreme low temperature index this summer, as shown in Figure 3. This indicates that minimum temperatures have increased relative to the reference period. This trend was also seen in the Southern Slopes Victoria, which have not had a negative minimum temperature index value since 2012. Trends of this nature can impact the propagation of diseases, pests and insects that were previously less likely to survive in lower temperatures.

The Australian Actuaries Climate Index, which was launched in November 2018, is an objective measure of extreme weather conditions and changes to sea levels.

"The Australian Actuaries Climate Index is a great example of how [Actuaries use data for good](#), in this instance by objectively analysing complex data sets to provide easy to understand insights on an important issue," said Actuaries Institute President, Annette King.

¹ <https://www.insurancenews.com.au/the-broker/flood-claims-keep-climbing-as-cost-hits-2-5-billion>

² <http://www.bom.gov.au/climate/current/season/aus/summary.shtml>

³ <http://www.bom.gov.au/climate/enso/>

⁴ [bom.gov.au/climate/enso/#overview-section=Sea-surface](http://www.bom.gov.au/climate/enso/#overview-section=Sea-surface)

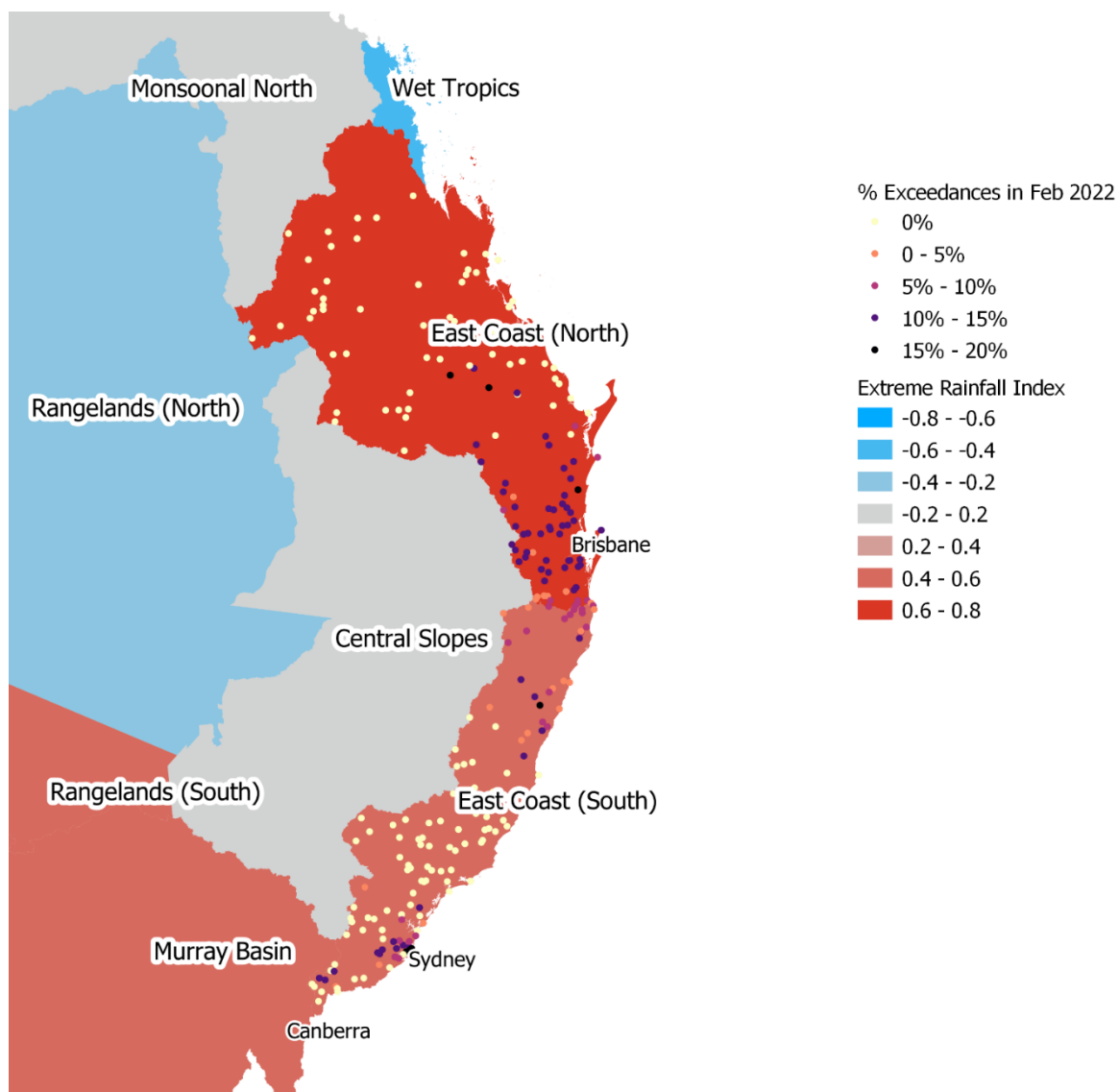


The Index is updated quarterly. It shows changes in the frequency of extreme high and low temperatures, heavy precipitation, dry days, strong winds and changes in sea levels across 12 Australian regions that are climatically similar. Each season is compared to the same season in previous years, and against a reference period from 1981-2010.

The Index is calculated at the end of each season by Finity Consulting following the release of data from the Bureau of Meteorology.

References are based on the data underlying the AACI, which tracks changes in the frequency of extreme high and low temperatures, heavy precipitation, dry days, strong wind, and changes in sea level, mainly concentrating on the 99th percentile of observations.

Figure 1: Extreme Rainfall – Seasonal Index Values & Individual Stations



Note: the stations on this map reflect the month of February only, while the index values cover the season as a whole (1 December 2021 – 28 February 2022).



Figure 2: Sealevel in Australia

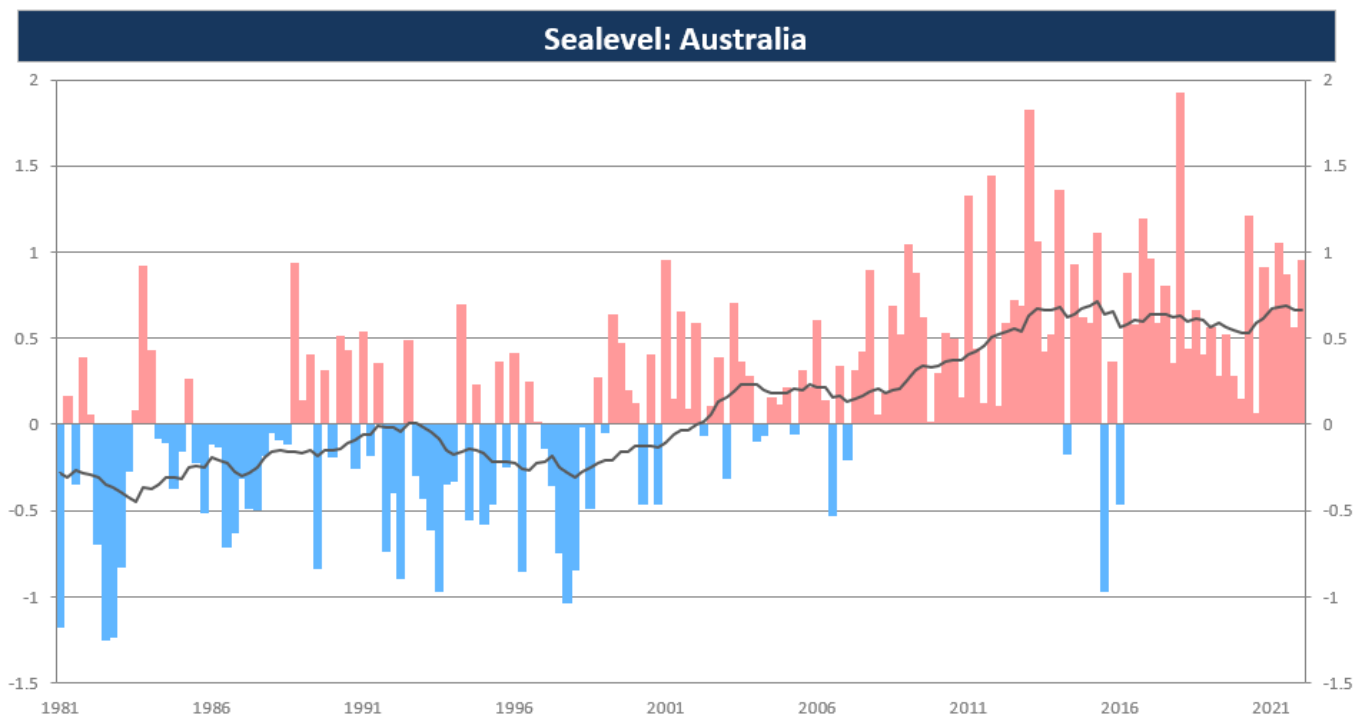
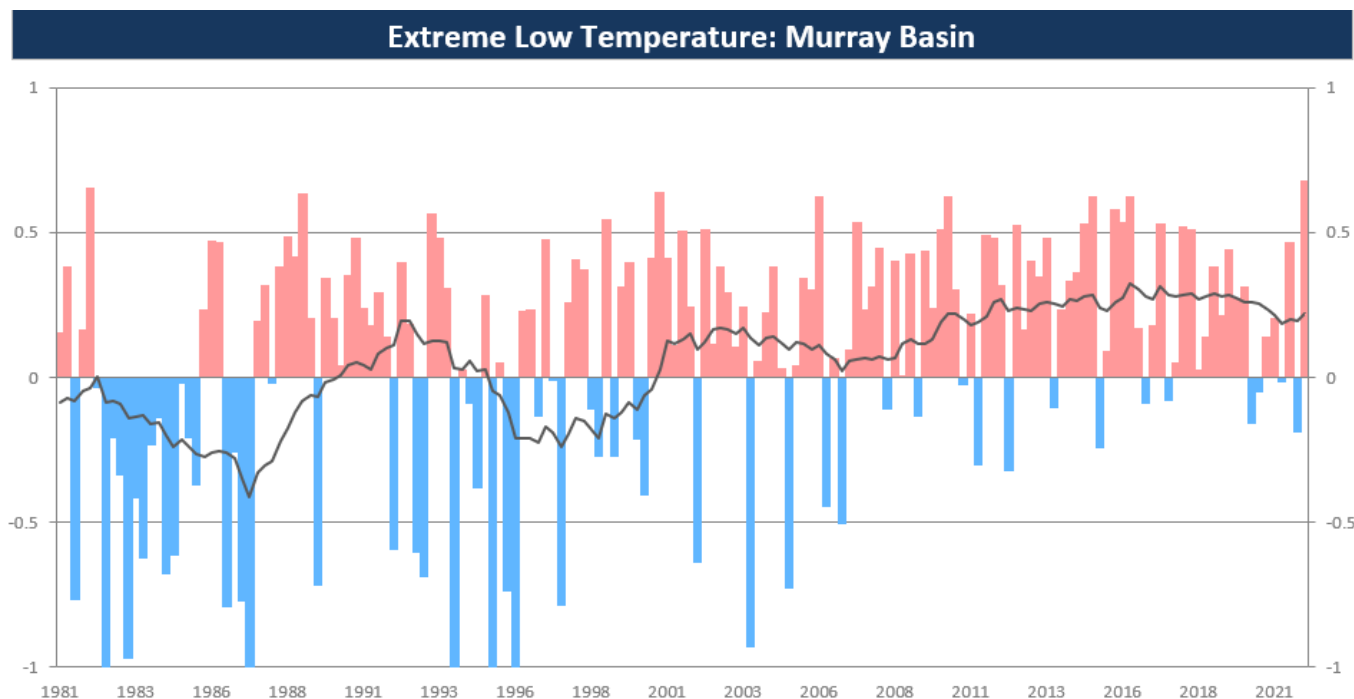


Figure 3: Extreme Low Temperature in the Murray Basin



Notes to charts: Red bars indicate a reading which is above the reference period average and blue bars indicate a reading which is below the reference period average. The black line shows the five-year moving average and provides a robust measure of how the index and weather extremes are trending over the longer term. Further details on calculation and interpretation are available in the Design Documentation [here](#).



A link to the [AACI](#) is here

The Actuaries Institute's broad range of papers on climate risk can be found here: [Climate Risk Resource Centre](#).

Rade Musulin, Chair of the Actuaries Institute Climate Risk Working Group and Principal at Finity Consulting, is available for comment.

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As the sole professional body for Members in Australia and overseas, the Actuaries Institute represents the interests of the profession to government, business and the community.

Actuaries use data for good by harnessing the evidence to navigate into the future and make a positive impact. They think deeply about the issue at hand, whether it's advising on commercial strategy, influencing policy, or designing new products. Actuaries are adept at balancing interests of stakeholders, clients, and communities. They're called upon to give insight on complex problems, they'll look at the full picture. Actuaries analyse the data and model scenarios to form robust and outcome-centred advice.