

## More on probabilities and seasonal climate forecasts

Climate has both typical (for example, seasonal) and random components — the use of probabilities can help us recognise and use this to advantage. Here we explain a little more about why we use probabilities, represented by the bar graphs, in NIWA seasonal climate outlooks.

### Random components

Seasonal forecasts are by their nature about probabilities, or the odds of different outcomes. Because there is a random component to the weather, there is also a random component to climate variations (longer time periods). This means that we cannot predict seasonal climate variations exactly, in advance.

### Typical components

Instead, we must understand how the odds of different climate events vary. For example, when we look at historical records, we do not see that an El Niño event always lowers the seasonal temperature in Manawatu by 1°C. Instead, we see that an El Niño tends to favour lower temperatures, without ruling out occasional warmer than average seasons. El Niño changes the odds in favour of a cool season, in much the same way that a heavy track might change the odds in favour of a particular horse winning a race.

### Factors that change the odds

In some years and seasons, when there is a particularly strong climate influence in operation (say during a very strong El Niño), we can be more certain about the outcome (perhaps a 70% chance of cool conditions). However even then we can not be categorical, because of the influence of those random components in the course of events through the season. When there are no external influences biasing our climate in any direction, the best we can say is that any outcome is equally likely.

While certainty is not possible, there is enough information in the forecast odds to add value to regular economic decisions. Over the course of several seasons, this knowledge and use of climatic “odds” will translate into dollars saved.

### Why three month climate outlooks?

The seasonal climate reflects averages of the weather over a particular period. The longer the averaging period, the more the background climate “signal” is seen, and the more the day-to-day variability is averaged out. Experience has shown that an averaging period of at least three months is required to predict climate signals with some reliability, as opposed to more random weather-related variations. We could choose a longer forecast period, but this would lead to an increasing loss in forecast skill. The further ahead the forecast is made, the less accurate it becomes. The three-month time period is a compromise between averaging out the randomness, and retaining the maximum amount of skill in the forecasts.

### Know where you’ve come from, and where you are, to know where you’re going

Climate outlooks are designed to help understand developing situations, while still maintaining a wariness of unexpected outcomes. A climate outlook should be added, if you like, to what is already happening on the seasonal time scale, to create an outcome arising from past, present, and expected conditions.

For example, if an adverse event such as a drought is in progress, is the situation likely to deteriorate or improve? Conversely, might a favourable season, such as a mild winter, be likely to continue into spring?

### A final tip

A climate forecast can suggest that a season is likely to be, for example, wetter than average, but it cannot give the timing and size of rainfall events that might be needed to break a drought. In the case of breaking a drought, the immediate weather may be more important than the climate of the next three months. But the probabilities associated with the climate expectations can help plan responses that will, in the end, protect against, or make the most of, the weather. It’s all about playing the odds to the best advantage.