Executive summary

This report provides a broad overview on the current drought across south-east Australia. For detailed information, the National and Regional authorities provide excellent resources. A wide, intense, and long-lasting drought is affecting south-eastern Australia since early 2017. Precipitation were scant over the last two years, compared to the long-term average, leading to one of the worst droughts on record for the region. The outlook is bad for the next few months, aligning towards another dry spring. Rural communities are struggling to keep farming businesses viable, and government support is now essential.

Risk of drought impact for agriculture (RDrl-Agri)

The indicator RDrl-Agri shows the risk of having impacts from a drought, by taking into account the exposure and socio-economic vulnerability of the area, with particular focus on the agricultural impacts.

Considering Australia a wealthy nation, the coping capacity and intervention scale of government is high, effectively limiting the potential impact of droughts. This factor is incorporated in the risk indicator, which shows moderate values despite the magnitude of the drought (figure 1). The area currently affected has increased compared with September 2018 (figure 2) and involves roughly 85% of the total population of New South Wales, plus south-eastern Queensland.

**Figure 1:** Risk of drought impact for agriculture (RDrl-Agri), New South Wales (Australia) from 21st of September and 1st of October 2019.

**Figure 2:** Risk of drought impact (RDrl-Agri), evolution overtime in New South Wales (Australia).
Precipitation

Precipitation includes both rain and snow. Figure 3 shows the long line of under-performing monthly rainfall. While a significant deviation from the average may be expected at any time of the year, the sequence of scarce precipitation month after month is striking and the root cause of the big deficit, as depicted by the cumulative balance from 2017 onwards (figure 4).

**Figure 3:** Monthly total precipitation near Narrabri (New South Wales, Australia, coordinates: -30.67 N, 149.9 E), as compared with the long-term monthly averages (1981-2010).

**Figure 4:** Cumulative precipitation over 29 months near Narrabri (New South Wales, Australia, coordinates: -30.67 N, 149.9 E). The bar colors indicate the cumulative deficit (red gradient) or surplus (blue gradient), compared to the cumulated monthly long-term average (solid line), for the same period and location. The boxes overlapping the bars are the monthly totals stacked.
Standardized Precipitation Index (SPI)

The SPI indicator monitors the occurrence of meteorological drought. The lower (i.e. more negative) the SPI, the more intense is the drought. Longer time periods of SPI accumulation (12, 24, and 48 months) can be considered as proxies of hydrological drought. Looking at roughly 50 years of precipitation records, the current event ranks amongst one of the three worst droughts for the yearly and long-term SPI indicators of figure 5.

Figure 5: time-serie of SPI for a cumulative period of 12, 24 and 48 months near Narrabri (New South Wales, Australia, coordinates: -30.67 N, 149.9 E).

Considering the 3-monthly negative outlook for October-December\(^3\), a further decline in SPI may be expected, along with the intensification of the drought. The 6-monthly outlook is uncertain and although suggests precipitation within average, it is certainly insufficient to fill the gap generated by scarce rainfall during the last couple years.

fAPAR anomaly

The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the fraction of the solar energy absorbed by leaves. fAPAR anomalies, specifically the negative deviations from the long term average over the same period, are a good indicator of drought impacts on vegetation.

Figure 6 is self-explanatory about the extension and intensity of the anomaly associated with the drought, covering a large area across the State and beyond. Despite a partial recovery in two of the last four yearly quarters (figure 7), the situation remains substantially unchanged as compared with the same period of 2018.

Figure 6: fAPAR anomaly in New South Wales (Australia) for the period between 21st of September and 1st of October 2019.

Figure 7: fAPAR anomaly, evolution over time in New South Wales (Australia).

Soil moisture anomaly

This indicator aims to provide an assessment of the top soil water content, which is a direct measure of drought conditions, precisely the difficulty for plants to extract water from the soil.

Similarly to the previous two indicators, soil moisture anomaly remains at record lows, despite a slight improvement from the former ten-days window of mid-September. Soil moisture anomaly, and fAPAR likewise, overlap with the areas that are experiencing wild fires.

Figure 8: Soil moisture anomaly in New South Wales (Australia) for the period between 1st of September 2019 and 1st of October 2019.

Figure 9: Soil moisture anomaly evolution over time in New South Wales (Australia).
Reported impacts

The drought was extremely severe already in mid-2018\(^4\) \(^5\) and widely reported throughout. The current situation is the extension of the same conditions and consequences to the whole of 2019.

The agriculture sector is the most affected, mostly livestock and dairy farms struggling to feed their cattle while maintaining business sustainability. Government is providing support through several assistance pathways\(^6\). The economic impact on the primary sector is in the order of billions of dollars, considering 2018 and 2019 altogether. Australian authorities regularly monitor the economic impacts of droughts\(^7\), for the event of 2018 they released an in-depth analysis\(^8\). Concerning wider issues, such as population welfare, thorough analysis has been done in the past over the same region\(^9\), so it is reasonable to assume the same could apply to the current situation.

Reservoir managers are challenged by shrinking water volumes, currently at low to critical levels\(^10\). River ecosystems face major impacts and actions to mitigate are taking place\(^11\) \(^12\).

The drought is feeding bushfires in the northeast of New South Wales, where the fire season started one month earlier than usual\(^13\).

In general, there is a negative trend in precipitation over Southern Australia, observed since around 1970\(^14\), leading to more frequent and long-lasting droughts. This entails increasing impacts and mitigation costs for communities and the Government.

\(^12\) https://www.theguardian.com/australia-news/2019/sep/16/nsw-government-faces-crunch-call-on-water-rights-as-drought-deepens
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