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Development of the Australian Drought Monitor

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Introduction

Drought is the most severe climatic and costly natural disaster inflicting serious impacts on the socio-economy of Australia. An Australia-wide drought monitor has been developed to provide detailed and timely data regarding drought conditions that will aid producers and policy makers alike. The Drought Monitor development is an integral part of the Northern Australia Climate Program (NACP), a major partnership between Meat & Livestock Australia, the Queensland Government and the University of Southern Queensland.

The Australian Drought Monitor is based on the U.S. Drought Monitor (USDM) concept, which was developed by Mark Svoboda and his team at the National Drought Mitigation Center at the University of Nebraska-Lincoln in the late 1990s. The Composite Drought Indicator (CDI) used for the NACP project is a scaled down version of the U.S. Drought Monitor and uses the blended approach. The CDI is currently widely applied in Europe, Asia, India, Jordan, Tunisia, Lebanon, Morocco, United Arab Emirates, New Zealand and others. The Drought Monitor is a web-based dynamic map that is updated monthly using a broad range of observational technologies including weather data, drought indices, in situ networks and remote sensing platforms. It consolidates and synthesizes data to summarise the current status of drought that will aid producers, agricultural value chains, scientists and policymakers with decision making and planning.

Development of the Drought Monitor

The CDI is based on the combination of four different variables:

- Standard Precipitation Index (SPI) – 3 month
- Evapotranspiration anomaly (ET)
- Soil Moisture anomaly (SM 0 – 1.0 m)
- Normalized Difference Vegetation Index anomaly (NDVI)

It is possible to add other variables or replace current variables with others. Each dataset is percentile ranked over a baseline period and the results combined using a weighted average. Principal Component Analysis (PCA) is used to determine the optimal weighting for the CDI for each grid cell (5 km x 5 km) for every month over Australia and can be applied to any scale from country to state to shire.

The CDI is calculated back to April 1992, which is when data for the NDVI began. This provides a hindcast of 32 years. The CDI is available on several rolling timescales including 1, 3, 6, 9, 12, 24 and 36 months.

Calculation of the CDI

For each parameter, the percentile is calculated over a reference period and the results are ranked:

- 0 - 2 % Exceptional drought
- 2 - 5 % Extreme drought
- 5 - 10 % Severe drought
- 10 - 20 % Moderate drought
- 20 - 30 % Abnormal drought

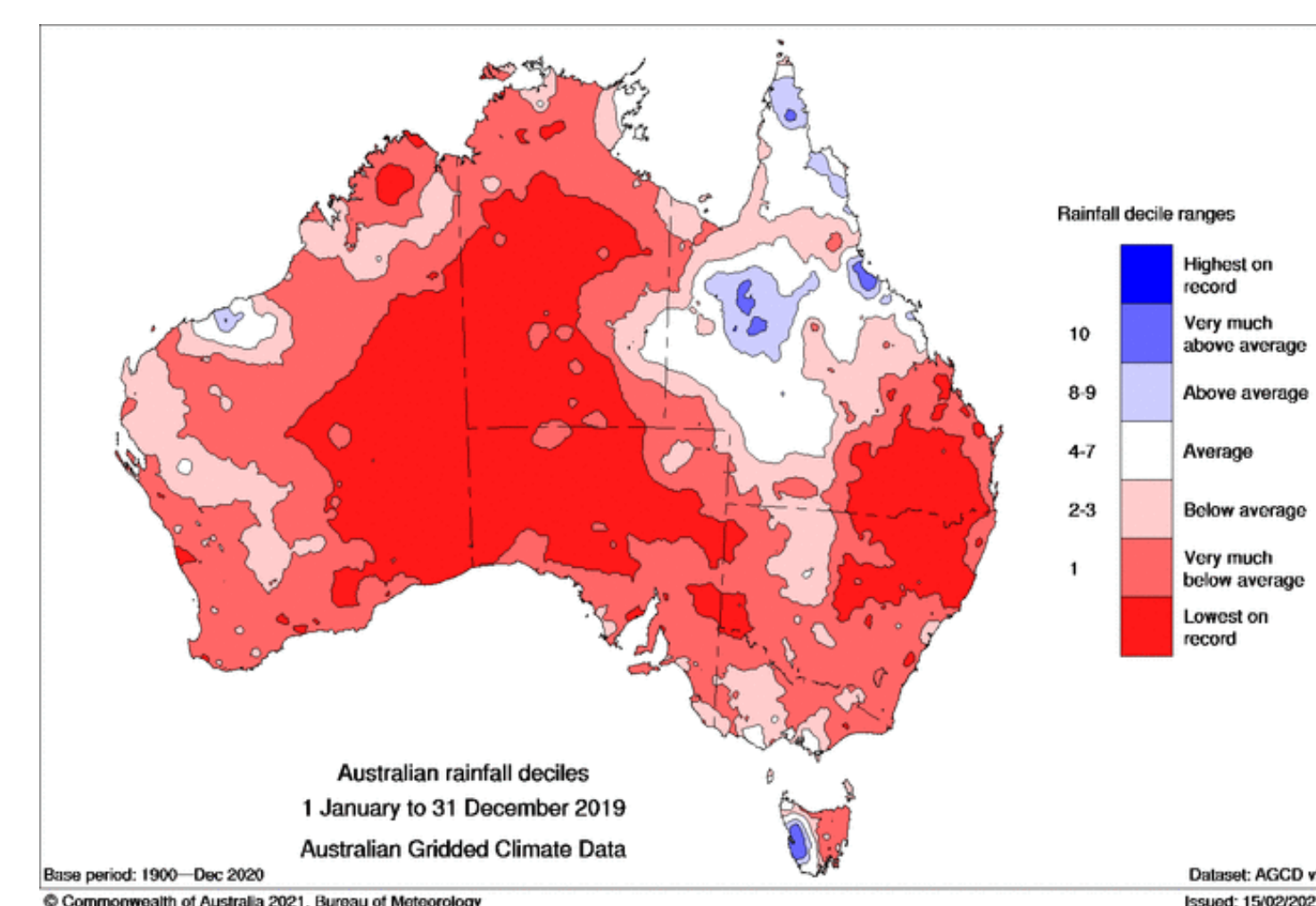
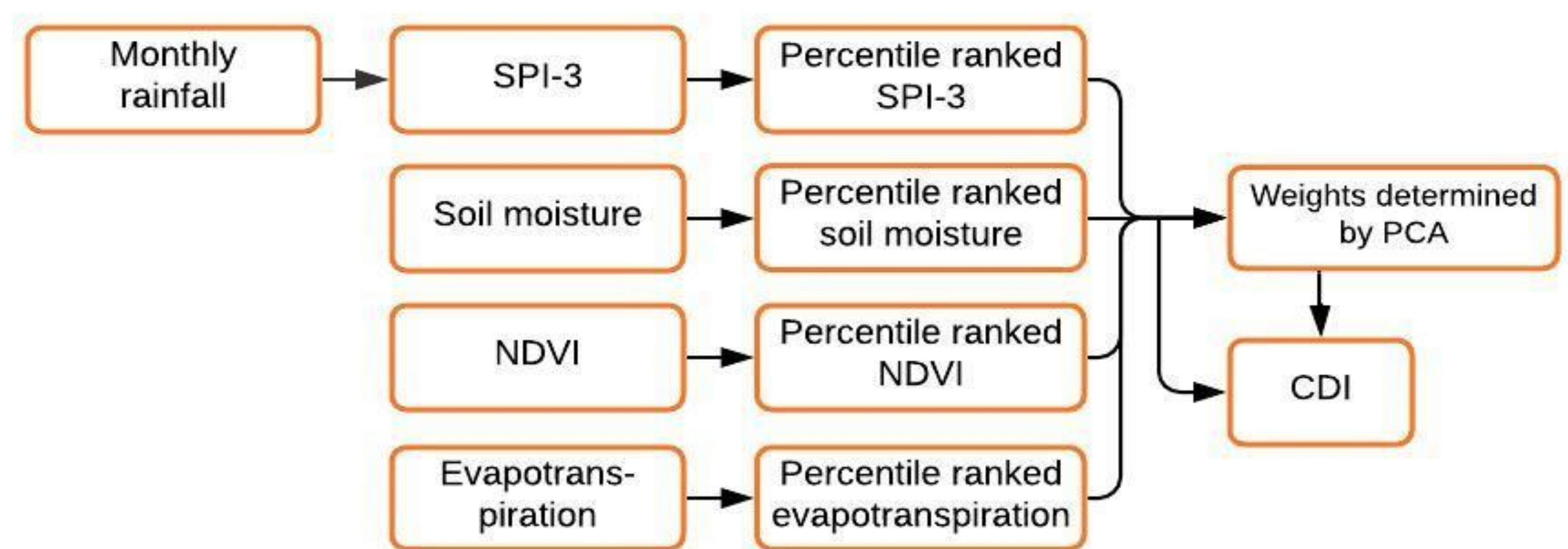
To calculate the CDI, a weighting is applied to each index/indicator:

$$CDI = (a \times SPI) + (b \times SM) + (c \times NDVI) + (d \times ET)$$

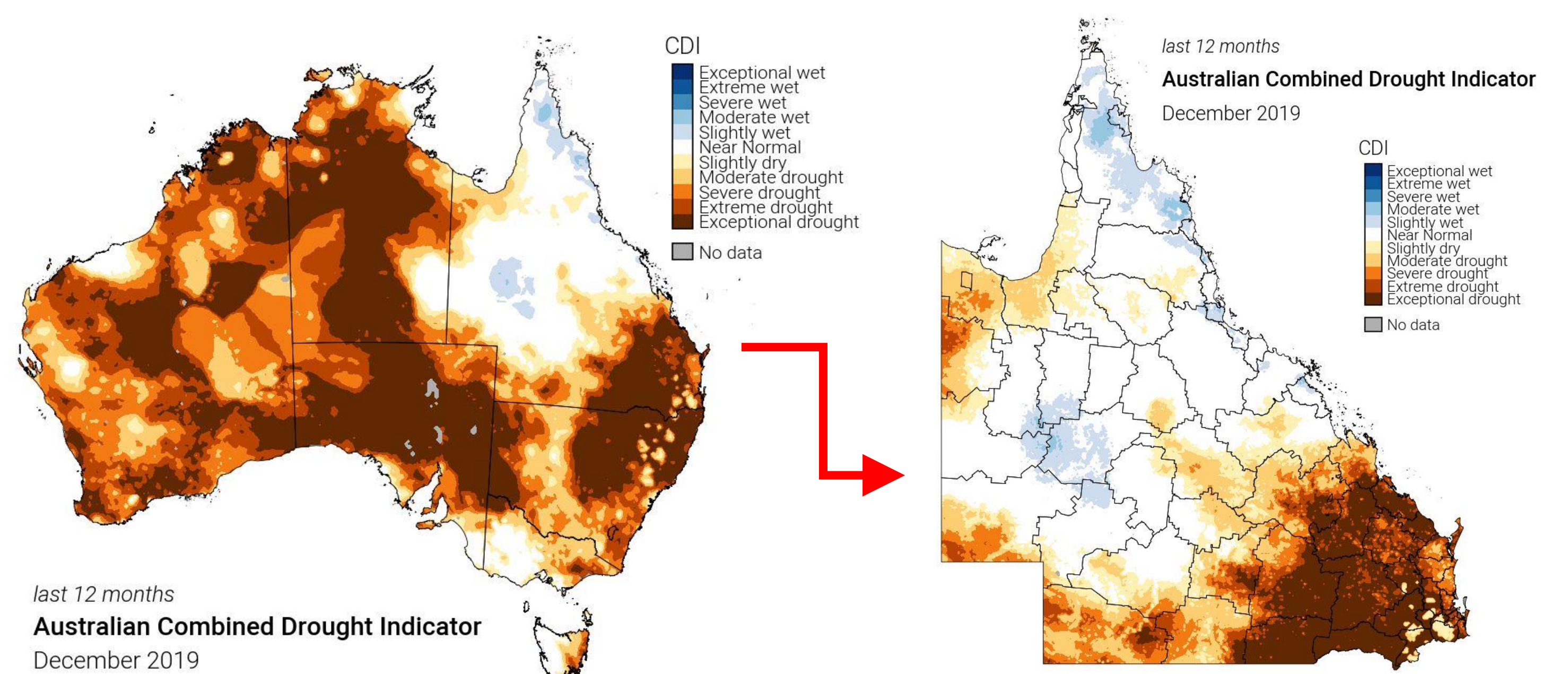
- a, b, c, d are respective weights assigned to each of the input data.

Validation and “Ground Truthing” of the CDI

- The Drought Monitor relies on field observations from extension officers, Climate Mates and other local experts to provide feedback to ground truth observational data and corresponding indices.
- A Drought Condition & Impact Reporting website is used to report drought-related conditions and impacts within Australia.
- Some of the categories:
 - How dry or wet is it?
 - Report crop production impact
 - Report livestock production impact
 - Report other business & industry impact
 - Report public & community health impact
 - Report fire impact



December 2019 CDI Map



South East Queensland - last 12 months

