



Supporting Information

Supplementary material

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.

Appendix to: Beggs PJ, Zhang Y, McGushin A, et al. The 2022 report of the *MJA–Lancet* Countdown on health and climate change: Australia unprepared and paying the price. *Med J Aust* 2022; doi: 10.5694/mja2.51742.

Appendix: The 2022 report of the *MJA-Lancet* Countdown on health and climate change: Australia unprepared and paying the price

This Appendix includes details of the data, methods, and caveats for each of the 26 indicators assessed in the 2022 *MJA-Lancet* Countdown. It also includes additional figures and tables that further illustrate some of the indicators. Finally, it includes, for several indicators, current thoughts regarding the potential future form of the indicator. This is provided in the context of this being the fifth *MJA-Lancet* Countdown annual report and the acknowledgement that its indicators, like those of the *Lancet* Countdown, will likely continue to develop in future annual assessments.

| | |
|----------------------------------|----|
| Data, methods, and caveats | 3 |
| Section 1 | 3 |
| Section 2 | 8 |
| Section 3 | 11 |
| Section 4 | 15 |
| Section 5 | 19 |
| Author contributions | 23 |
| References | 24 |
| Tables | 27 |
| Figures | 35 |

Section 1: Climate change impacts, exposures, and vulnerability

1.1 Exposure of vulnerable populations to heatwaves

Data

The heatwave dataset employed for this calculation is the Bureau of Meteorology's national Excess Heat Factor (EHF) heatwave analysis (Nairn and Fawcett 2013; Nairn and Fawcett 2015). The EHF is a measure of heatwave intensity, incorporating a measure of how hot a three-day period (TDP) is with respect to an annual temperature threshold at each particular location. If the daily mean temperature (DMT) averaged over the TDP is higher than the climatological 95th percentile for DMT, then the TDP and each day within it are deemed to be in heatwave conditions, but it is necessary to have three high DMTs in succession in order to form a heatwave according to this characterisation. The EHF also includes a measure of how hot the TDP is with respect to the recent past (specifically the previous 30 days), to take into account the impact of a sudden rise in temperature above that of the recent past (Nairn and Fawcett 2015).

Methods

0.25°-resolution national grids of EHF were extracted for three-day periods containing days during the heatwave seasons (November-March) of 1972-1973 to 2021-2022, with tapered down-weighting for the four three-day periods (two at each end) which are only partially within the November-March season. The data from each season were accumulated over the season to create grids of annual heat load. Only positive values of the EHF (positive values indicating the presence of heatwave, negative values its absence) are included in the accumulation. The annual grids were area-averaged to produce a time series of nationally averaged annual heat load. Ordinary least squares linear regressions were calculated over the last 50 heatwave seasons (1972-1973 to 2021-2022); and 20 heatwave seasons (2002-2003 to 2021-2022).

Additional calculations were performed, replacing the area weighting in the area averaging process with a population-weight matrix grid obtained from gridded population data released by the Australian Bureau of Statistics from its 2011 national census. The population weighting in the calculation assumes that the relative population distribution across the country remains unchanged, without assuming explicitly that the national-total population remains unchanged.

Future form of the indicator

No changes proposed at this time.

1.2 Heat impact on physical and sporting activities

Data

Hourly climate data used for this indicator were obtained from the European Centre for Medium-Range Weather Forecasts' ERA5 database, which provides global coverage at the resolution of 0.5x0.5 degree grid cells – Australian data were extracted. Reanalysis data from the years 1991 to 2021 were included. An overview of this global dataset can be found at:

<https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels?tab=overview> (April 2022).

Grid cell-based population data were obtained from NASA's Socioeconomic Data and Applications Center, hosted by the Center for International Earth Science Information Network (CIESIN) at Columbia University, New York (CIESIN 2017).

Methods

Data analysis applied the latest Sports Medicine Australia Extreme Heat Policy (Jay et al. 2021) released in February 2021, which provides a stratified heat stress risk estimation (moderate, high, extreme) based on combinations of ambient temperatures and relative humidity. The policy calculator provides five different risk estimation plots based on the activity or sport undertaken. Plot #1 (for leisurely walking) was used for the present analysis.

Caveats

Heat stress risk will be underestimated for people engaging in higher intensity activities and/or people wearing heavy clothing or protective equipment. Similarly, heat stress risk is estimated only for the average member of the population and does not represent risk in more vulnerable individuals, eg, elderly, pregnant women, people with co-morbidities that compromise thermoregulation.

Population data for 2020 and 2021 were not available, so population data for 2019 were repeated for these years. Accurate and complete 2021 numbers will be included in next year's version and the indicator will be updated to reflect the accurate population numbers.

Future form of the indicator

The future form of this indicator may include regional analysis.

1.3 Bushfires

Data

Data for this indicator are the same as those used for “Indicator 1.2.1 Wildfires” in Romanello et al. (2022). Note we are not including the exposure to wildfire smoke that is also included in the methods in Romanello et al. (2022).

Methods

Methods for this indicator are the same as those used for “Indicator 1.2.1 Wildfires” in Romanello et al. (2022). Note we are not including the exposure to wildfire smoke that is also included in the methods in Romanello et al. (2022).

Caveats

Caveats for this indicator are the same as those for “Indicator 1.2.1 Wildfires” in Romanello et al. (2022). Note that this indicator detects all landscape fire activity including bushfires and planned burns.

Future form of the indicator

This indicator may be developed in future years to enable improved assessment of bushfire exposure and risk in Australia. In Australia the major risk to human health and wellbeing is from escalating severe uncontrolled fires. Future refinements will aim to better capture this subset of destructive and highly polluting fires.

1.4 Drought and flood

Overview

The data and methods are the same as we reported in the 2021 *MJA-Lancet* Countdown report. The drought method follows that outlined in Watts et al. (2021). We used the Standardised Precipitation-Evapotranspiration Index (SPEI) calculated on 6-month timescale. In this year’s report we show that the SPEI can also be used to indicate extremely wet periods that may be associated with flooding (as it was in Eastern Australia during the first three months of 2022).

Data

We used monthly rainfall and temperatures, calculated using the Australian Water Availability Project (AWAP) gridded data January 1950 - March 2022 at 0.05×0.05 degree resolution (Australian Bureau of Meteorology 2020).

Methods

This indicator represents the area impacted by excess drought events compared to the 1950-2005 baseline. The drought method follows that outlined in Watts et al. (2021). We used the Standardised Precipitation-Evapotranspiration Index (SPEI) calculated on 6-month timescale. Due to lack of wind speed data, the potential

evapotranspiration (PET) was calculated using the Thornthwaite method rather than the FAO-56 Penman-Monteith method.

We used the algorithm provided in the R package “SPEI” (Santiago Beguería and Sergio M. Vicente-Serrano (2017). SPEI: Calculation of the Standardised Precipitation-Evapotranspiration Index. R package version 1.7). The SPEI is a multiscalar index, which takes into account both precipitation (using the basis of the more commonly used SPI index) and temperature, to estimate potential evapotranspiration. More information on this index and its calculation can be found here: <https://CRAN.R-project.org/package=SPEI>.

The average value of SPEI is 0, and the standard deviation is 1. Drought severity was defined according to three severity levels: < -1.3 severe drought; < -1.6 extreme drought; and < - 2.0 exceptional drought.

In order to detect excess drought events at the different severity levels, we defined years where the counts of months in drought for each grid cell exceeded 2 standard deviations above the mean of the yearly counts of months in drought for that grid cell over the baseline period (1950-2005). We then calculated the percentage of land area exposed to excess drought events at the different severity levels as shown in Figure A2 panel A.

The levels of excess drought were notably higher than usual in the years 2019 and 2020. However, there was then a significant increase in rainfall during 2021 and 2022 shown by SPEI levels in NSW and ACT above positive 1 (indicating a severe wet period). Annual averages of monthly SPEI are shown in Figure A2 panel B for each jurisdiction of Australia and the national average plotted as a thick black line. An important feature of the SPEI drought indicator is that it can be used to define anomalies in both dryness and wetness. Therefore, in Figure A2 panel B we have shaded the levels of both drought severity and wetness in shades of yellow, orange and red according to the levels stipulated above. We use the simple inversion of these levels to indicate the opposite levels and therefore added shading in light grey, light blue and blue to show levels of severity of excess wet periods.

The SPEI can also be used as a continuous measure of relative dryness/wetness and so the map displayed in Figure 4 shows the range of dry and wet conditions experienced across Australia in the three months between January and March 2022. It was considerably wetter than average in most of the eastern states (New South Wales, Australian Capital Territory, Victoria, Queensland) and also South Australia whereas it was drier than average in Western Australia, Northern Territory and parts of Tasmania.

Caveats

The SPEI is a measure of relative dryness/wetness of interannual climatic conditions often used to characterise droughts. While there is no consensus on an equivalent categorisation in the wetter end of the spectrum of SPEI we can use the simple inversion of the levels used for drought (eg, -1.3) to indicate the opposite levels of excess wet (eg, +1.3) and therefore we added shading in light grey, light blue and blue in Figure A2 panel B to show levels of severity of excess wet periods.

As explained in the previous *MJA-Lancet* Countdown reports, this indicator does not reflect population exposure adequately. It is not clear how to improve the exposure measure because droughts and floods can affect human populations in a variety of ways both in proximity to their residence (especially at the location of farms, for example) or at a large distance (through the impact on fresh food availability felt at urban locations).

Future form of the indicator

Future improvements of this indicator include the development of a more specific flood indicator and development of the SPEI drought indicator to align with other measures of agricultural drought (such as Government Drought Declarations).

1.5 Migration, displacement, and rising sea levels

Data

Data for this indicator are the same as those used for “Indicator 1.9 Migration, displacement and environmental change” in Beggs et al. (2021) except the population dataset by Chambers (2022) has been used instead of the LandScan population distribution.

Methods

Methods for this indicator are the same as those used for “Indicator 1.9 Migration, displacement and environmental change” in Beggs et al. (2021). Weather-related displacement in Australia has been presented as an annual number, and displacement per 100,000 of population.

Caveats

Caveats for this indicator are the same as those for “Indicator 1.9 Migration, displacement and environmental change” in Beggs et al. (2021).

Future form of the indicator

As newer and higher spatial resolution and more precise datasets become available, methods will be updated to produce more robust estimates of population exposure to Sea Level Rise and weather-related displacement.

Section 2: Adaptation, planning, and resilience for health

2.1 Health adaptation plans and assessments

Data

Data for this indicator are largely the same as those used for “Indicator 2.1 Australian adaptation plans for health” in Beggs et al. (2021), with additional reference to state and territory assessments, to reflect the broader scope of the indicator this year and to recognise that assessment may be the first step on eventual progress towards an adaptation plan.

Methods

Methods for this indicator are the same as those used for “Indicator 2.1 Australian adaptation plans for health” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those for “Indicator 2.1 Australian adaptation plans for health” in Beggs et al. (2021), the key one being that only readily searchable public facing documents are assessed.

Future form of the indicator

As the scale of climate catastrophes in Australia is increasing and requires a national approach to planning for and responding to increasing risk to protect population health, future versions of this indicator will focus on the progress of a national health and climate change adaptation plan.

2.2 Climate information services for health

Data

Data for this indicator are the same as those used for “Indicator 2.4 Climate information services for health” in Beggs et al. (2021).

Methods

Methods for this indicator are the same as those used for “Indicator 2.4 Climate information services for health” in Beggs et al. (2021).

Future form of the indicator

The Bureau of Meteorology is improving its capability to provide information relevant to the public health sector, and additional services may be possible in future.

2.3 Detection, preparedness and response to health emergencies

Data

Data for this indicator are the same as those used for “Indicator 2.3.1 Detection, preparedness, and response to health emergencies” in Romanello et al. (2021). Data obtained from the World Health Organization International Health Regulations Capacity Progress website (World Health Organization 2019).

Methods

Methods for this indicator are the same as those used for “Indicator 2.3.1 Detection, preparedness, and response to health emergencies” in Romanello et al. (2021).

Caveats

Caveats for this indicator are the same as those for “Indicator 2.3.1 Detection, preparedness, and response to health emergencies” in Romanello et al. (2021).

Future form of the indicator

The future form of this indicator is the same as that for “Indicator 2.3.1 Detection, preparedness, and response to health emergencies” in Romanello et al. (2021).

2.4 Bushfire adaptation

Data

This indicator reports two sets of data related to bushfire adaptation, as detailed below.

Number of Australian National Aerial Firefighting Centre (NAFC) aircraft contracts/Services per year on behalf of state and territory governments. Data for the period 2007-08 to 2021-22 were obtained from NAFC Annual Reports, a NAFC Booklet, and a NAFC Poster via the NAFC website (NAFC 2020), the Parliament of Australia (2020), as well as through a direct request to NAFC which provided the datum for a missing year (2017-18) and confirmation of the data from all other years. NAFC aircraft Services represent the number of aircraft in Australia available to fight bushfires. It should be noted that some aircraft double up for the north and south of the country, so for example an aircraft may run in Queensland then move to Tasmania as a separate Service. A Service is usually exclusive to NAFC’s use, mostly for 84 or 96 days each summer (some Services run longer).

The number of volunteer firefighters and support staff in Australia per year from 2009-10 to 2020-21 were obtained from the Australian Government Productivity Commission’s Report on Government Services 2022 (Productivity Commission 2022). Specifically, data were obtained from Part D (Emergency management), Section 9 (Emergency services for fire and other events), Table 9A.3 (Fire service

organisations human resources). Volunteer data were used because bushfire fighting and bushfire mitigation are primarily conducted by volunteers in Australia.

Methods

To track progress on bushfire adaptation in Australia this indicator analyses aerial and terrestrial firefighting capacity.

Caveats

While the two areas examined in this indicator are important with regard to bushfire adaptation in Australia, there are many other important aspects of bushfire adaptation in Australia, including those described and recommended in the Royal Commission into National Natural Disaster Arrangements Report (Royal Commission into National Natural Disaster Arrangements 2020).

Future form of the indicator

The indicator could evolve through the development of a bushfire adaptation index which integrates the two separate aspects considered here into a single annual number.

Section 3: Mitigation actions and health co-benefits

3.1 Carbon intensity of the energy system

Data

Data for this indicator are the same as those used for “Indicator 3.1 Carbon intensity of the energy system” in Beggs et al. (2021).

Methods

Methods for this indicator are the same as those used for “Indicator 3.1 Carbon intensity of the energy system” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those used for “Indicator 3.1 Carbon intensity of the energy system” in Beggs et al. (2021).

Future form of the indicator

The indicator can be further developed to show a more detailed analysis of changes in the composition of primary energy supply over time. The impacts of COVID-19 will have to be monitored in subsequent years.

3.2 Coal phase-out

Data

Data for this indicator are the same as those used for “Indicator 3.2 Coal phase-out” in Beggs et al. (2021).

Methods

Methods for this indicator are the same as those used for “Indicator 3.2 Coal phase-out” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those used for “Indicator 3.2 Coal phase-out” in Beggs et al. (2021).

Future form of the indicator

International Energy Agency data may be impacted by the reporting methodology used by individual countries. Forecasted data are subject to uncertainties.

3.3 Zero carbon emission electricity

Data

Updated data have been retrieved from the Clean Energy Council (2022).

Methods

The definitions for zero, low carbon and renewable energy are the same as those used for “Indicator 3.3 Zero carbon emission electricity” in Beggs et al. (2021).

Caveats

Data have been sourced from Clean Energy Council (2022) and have been compiled according to the methods and data sources as cited in this source.

Future form of the indicator

The indicator can be further developed to track the corresponding impacts on air pollutants. Again, we note a lack of data for Indigenous and remote communities.

3.4 Clean household energy

Data

Data for this indicator are the same as those used for “Indicator 3.4 Clean household energy” in Beggs et al. (2021).

Methods

Methods for this indicator are the same as those used for “Indicator 3.4 Clean household energy” in Beggs et al. (2021). However, note that we cite updated information from other sources in the text.

Caveats

Caveats for this indicator are the same as those for “Indicator 3.4 Clean household energy” in Beggs et al. (2021).

Future form of the indicator

The indicator can be further developed to track the corresponding impacts on air pollutants. Again, we note a lack of data for Indigenous and remote communities.

3.5 Sustainable and healthy transport

Data

The State of Electric Vehicles 2021 - The Electric Vehicle Council (2020).

VFACTS 2021 - The Federal Chamber of Automotive Industries (FCAI 2022).

Australian Energy Update 2021 – Australian Government Department of Industry, Science, Energy and Resources.

Methods

Methods for this indicator are the same as those used for “3.7 Sustainable and healthy transport” in Beggs et al. (2021).

Caveats

- Data of transport energy consumption by fuel types include road transport, rail transport, water transport, air transport and other transports.
- Electric vehicle sales figures except for 2021 do not include the electric vehicle sales from Tesla because Tesla did not disclose local sales figures before 2021.

Future form of the indicator

As the electric vehicle fleet begins to grow over the next decade, there is the potential to stratify this indicator further (ie, by examining proportions of plug-in hybrid electric vehicles and full battery electric vehicles) and to add electric vehicles that do not require registration like electric bikes and scooters. Other valuable data could include details of trip exposure specific to electric vehicles (eg, average km travelled per trip, total km per year, the share of total km driven, etc.).

3.6 Emissions from agricultural production and consumption

Data

Data for this indicator are the same as those used for “Indicator 3.5.1 Emissions from agricultural production and consumption” in Romanello et al. (2022).

Methods

Methods for this indicator are the same as those used for “Indicator 3.5.1 Emissions from agricultural production and consumption” in Romanello et al. (2022).

Caveats

Caveats for this indicator are the same as those used for “Indicator 3.5.1 Emissions from agricultural production and consumption” in Romanello et al. (2022).

Future form of the indicator

The indicator could be improved by incorporating emissions from transportation. Further details are provided in Romanello et al. (2022).

3.7 Diet and health co-benefits

Data

Data for this indicator are the same as those used for “Indicator 3.5.2 Diet and health co-benefits” in Romanello et al. (2022).

Methods

Methods for this indicator are the same as those used for “Indicator 3.5.2 Diet and health co-benefits” in Romanello et al. (2022).

Caveats

Caveats for this indicator are the same as those for “Indicator 3.5.2 Diet and health co-benefits” in Romanello et al. (2022).

3.8 Mitigation in the health care sector

Data

Data for this indicator are the same as those used for “Indicator 3.6 Mitigation in the healthcare sector” in Romanello et al. (2022).

Methods

Methods for this indicator are the same as those used for “Indicator 3.6 Mitigation in the healthcare sector” in Romanello et al. (2022).

Caveats

Caveats for this indicator are the same as those for “Indicator 3.6 Mitigation in the healthcare sector” in Romanello et al. (2022).

Future form of the indicator

The indicator could be improved by incorporating sector-level detail on Scope 3 impacts of healthcare.

Section 4: Economics and finance

4.1 Economic losses due to climate-related extreme events

Data

Reported data is based on figures on total insured economic losses from disaster events provided in the Historical Catastrophe Data of the Insurance Council of Australia (ICA, 2022). The database includes recorded data from the ICA on disaster events that have occurred over the last 50 years in Australia.

Cumulative annual insured losses arising from bushfires, cyclones, flooding, hail storms, storm flooding, tornados and other climate-related extreme events are considered. Extreme events related to earthquakes, arson, gas disruptions, etc. (that are also reported in the ICA database), have been excluded.

Methods

Methods for this indicator are the same as those used for “4.1 Economic losses due to climate-related extreme events” in Zhang et al. (2020).

Caveats

Caveats for this indicator are the same as those used for “4.1 Economic losses due to climate-related extreme events” in Zhang et al. (2020).

Future form of the indicator

An ideal form of this indicator would allow attribution of economic losses to events induced by climate change. However, such attribution is unlikely to be feasible. As such, it is not envisaged that this indicator will significantly alter.

4.2 Coal and clean energy investment

Data

The data for this indicator are sourced from the annual State of the Energy Market reports by the Australian Energy Regulator (AER 2021) and the Australian Energy Market Operator (2022) Generation Information Page. Numbers are reported as generation of MW capacity and not as investment in AUD.

Methods

Methods for this indicator are the same as those used for “Indicator 4.2 Investment in new coal capacity” and “Indicator 4.3 Investments in zero carbon energy and energy efficiency” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those for “Indicator 4.2 Investment in new coal capacity” and “Indicator 4.3 Investments in zero carbon energy and energy efficiency” in Beggs et al. (2021).

Future form of the indicator

It is not envisaged that the form of this indicator will change over time.

4.3 Employment in low carbon and high carbon industries

Data

Data for this indicator are provided by the Australian Bureau of Statistics (ABS).

Data for full-time equivalent (FTE) employment in renewable energy activities are sourced from:

<https://www.abs.gov.au/statistics/labour/employment-and-unemployment/employment-renewable-energy-activities-australia/latest-release>.

FTE employment in mining operations is taken as a proxy for employment in high-carbon industries. The data for FTE employment in mining operations are sourced from:

<https://www.abs.gov.au/statistics/industry/industry-overview/australian-industry/latest-release#data-download>

This indicator includes the sub-categories 06 Coal mining, 07 Oil and gas extraction, 08 Metal ore mining, 09 Non-metallic mineral mining and quarrying, 10 Exploration and other mining support.

Methods

Methods for this indicator are the same as those used for “Indicator 4.4 Employment in low carbon and high carbon industries” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those for “Indicator 4.4 Employment in low carbon and high carbon industries” in Beggs et al. (2021).

Future form of the indicator

It is not envisaged that the form of this indicator will change over time.

4.4 Funds divested from fossil fuels

Data

The data for the first indicator are collected from 350.org and <https://gofossilfree.org.au>. Organisations are committed to divestment if they fall into any of the following five categories:

Fossil Free: An institution or corporation that does not have any investments (direct ownership, shares, commingled mutual funds containing shares, corporate bonds) in fossil fuel companies (coal, oil, natural gas) and committed to avoid any fossil fuel investments in the future.

Full: An institution or corporation that made a binding commitment to divest (direct ownership, shares, commingled mutual funds containing shares, corporate bonds) from any fossil fuel company (coal, oil, natural gas).

Partial: An institution or corporation that made a binding commitment to divest across asset classes from some fossil fuel companies (coal, oil, natural gas), or to divest from all fossil fuel companies (coal, oil, natural gas), but only in specific asset classes (eg, direct investments, domestic equity).

Coal and Tar Sands: An institution or corporation that made a binding commitment to divest (direct ownership, shares, commingled mutual funds containing shares, corporate bonds) from any coal and tar sands companies.

Coal only: An institution or corporation that made a binding commitment to divest (direct ownership, shares, commingled mutual funds containing shares, corporate bonds) from any coal companies.

More details on the list of organisations, including banks, pension funds, local governments, universities, and corporations is available from the following website: <https://gofossilfree.org.au/>

Data for the second indicator is sourced from the annual State of the Energy Market reports by the Australian Energy Regulator (AER 2021) and the Generation Information Page of the Australian Energy Market Operator (2022). Numbers are reported in MW of generation that have been retired, placed into cold storage or mothballed.

Methods

Methods for this indicator are the same as those used for “Indicator 4.5 Funds divested from fossil fuels” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those for “Indicator 4.5 Funds divested from fossil fuels” in Beggs et al. (2021).

Future form of the indicator

Future forms of this indicator should report the actual value of funds divested from fossil fuels by the organisations. The ideal future form of this indicator would have two elements. The first element would track the value of institutional investments in fossil fuels assets, both in absolute terms and as a proportion of their total portfolios. This would also allow for tracking of associated funds that are moved out of fossil fuels, but are not explicitly advertised as ‘divesting’. However, such data are unlikely to be available in the near future. The second element of this indicator would more explicitly track the value of funds divested from fossil fuels by for profit organisations and educational, government, healthcare etc. institutions.

It is not envisaged that the form of the second indicator (historical and announced withdrawals of coal- and gas- fired power plants) will change over time.

4.5 Net value of fossil fuel subsidies and carbon prices

Data

Data for this indicator are the same as those used for “Indicator 4.6 Net value of fossil fuel subsidies and carbon prices” in Beggs et al. (2021) except that the data available are taken only for the more recent year of 2019 and are reported in AUD. The CO₂ emissions data are taken from the Australian Greenhouse Emissions Information System compiled by the Australian Government Department of Industry, Science, Energy and Resources.

Methods

Methods for this indicator are the same as those used for “Indicator 4.6 Net value of fossil fuel subsidies and carbon prices” in Beggs et al. (2021).

Caveats

Caveats for this indicator are the same as those for “Indicator 4.6 Net value of fossil fuel subsidies and carbon prices” in Beggs et al. (2021).

Future form of the indicator

Updates in the World Bank Dashboard information for Australia would be beneficial to improve this indicator.

Section 5: Public and political engagement

5.1 Media coverage of health and climate change

Data

Data for this indicator are the same as those used for “Indicator 5.1 Media coverage of health and climate change” in Beggs et al. (2021).

Methods

Methods for this indicator are the same as those used for “Indicator 5.1 Media coverage of health and climate change” in Beggs et al. (2021). The search methods for the major Australian newspapers and ABC online programs were the same as we did for our previous annual report (Beggs et al. 2021), except for adding new data up to the end of 2021.

Caveats

Caveats for this indicator are the same as those for “Indicator 5.1 Media coverage of health and climate change” in Beggs et al. (2021).

Future form of the indicator

Analysis of the social media online engagement (eg, Twitter, Facebook) on climate change and health topics may be added.

5.2 Coverage of health and climate change in scientific journals

Data

Data for this indicator are the same as those used for “Indicator 5.2 Coverage of health and climate change in scientific journals” in Beggs et al. (2021).

Methods

Methods for this indicator are the same as those used for “Indicator 5.2 Coverage of health and climate change in scientific journals” in Beggs et al. (2021). The search methods were the same as for our previous annual report (Beggs et al. 2021), except for adding the data between 1 January 2021 and 31 December 2021.

Caveats

Caveats for this indicator are the same as those for “Indicator 5.2 Coverage of health and climate change in scientific journals” in Beggs et al. (2021).

Future form of the indicator

No change is expected for next year.

5.3 Government engagement in health and climate change

Data

This indicator sought to identify the extent to which Australian governments were working on climate change as a health issue, and/or health was being addressed as an issue affected by climate change. The data used for this report were derived from the Parliamentary websites of the Commonwealth of Australia and its eight States and Territories as detailed in the following table.

| Jurisdiction | Parliamentary website |
|------------------------------|-------------------------------------------------------------------------------------|
| Commonwealth of Australia | https://www.aph.gov.au |
| Queensland | https://www.parliament.qld.gov.au/ |
| New South Wales | https://www.parliament.nsw.gov.au/ |
| Australian Capital Territory | https://www.parliament.act.gov.au/ |
| Victoria | https://www.parliament.vic.gov.au/ |
| Tasmania | https://www.parliament.tas.gov.au/ |
| South Australia | https://www.parliament.sa.gov.au/ |
| Western Australia | https://www.parliament.wa.gov.au/ |
| Northern Territory | https://nt.gov.au/ |

The data collected were as follows: for the Commonwealth of Australia, we looked for Bills and Legislation, Committees and Inquiries, and Chamber documents that included a consideration of health and climate change. For the States and Territories, we looked for relevant Bills and Legislation, Committees and Inquiries and overall Hansard records. Hansard is the report of proceedings and verbatim record of what was said in Parliament.

Methods

National

The datasets of the Parliament of Australia public website were searched (https://www.aph.gov.au/Parliamentary_Business) for records from 1 January 2021 to 31 December 2021.

Bills & legislation were searched by whole document and included all current and previous Bills sponsored by Government and Private Members/Senators. Committees & inquiries were searched using titles and summary and included all Senate, House and Joint committees, inquiries and hearings. Chamber documents were searched by whole document and included notice papers, tabled papers, votes and proceedings from the House and journals of the Senate.

Datasets were searched using each key search term for (a) climate change and for (b) health, as listed below. Searches were then conducted for (c) climate change AND health.

(a) climate change:

“climate change”, “global warming”, “temperature”, “extreme weather”, “global environmental change”, “climate variability”, “greenhouse”, “low carbon”, “ghge”, “renewable energy”, “carbon emission”, “co2 emission”, “climate pollutant”, “air pollution”, “drought”, “flood”, “bushfire”, “heat”, “cyclone”.

(b) health:

“malaria”, “dengue”, “diarrhoea”, “infection”, “disease”, “pneumonia”, “epidemic”, “pandemic”, “public health”, “health care”, “epidemiology”, “healthcare”, “health”, “mortality”, “morbidity”, “nutrition”, “illness”, “infectious”, “ncd”, “non-communicable disease”, “noncommunicable disease”, “chronic disease”, “communicable disease”, “malnutrition”, “mental disorder”, “mental health”, “depression”, “suicide”, “obesity” “death”, “injury”, “food”.

(c) climate change AND health

“climate health”, “‘climate change’ AND ‘health’”

Any Bills & legislation identified through searches (a) and (b) were further analysed for overlap between climate change and health by key word searching within the legislation and explanatory memorandum. Documents identified through (a) climate change were searched using the term “health” and documents identified through (b) health were searched using the term “climate change”.

States and Territories

Parliamentary websites were searched for records from 1 January 2021 to 31 December 2021 using the datasets *Bills & Legislation* and *Committees & Inquiries*, as well as a total Hansard search. State and territory websites were only searched using terms (c): ie, “climate health”, “climate change” AND “health”. Documents identified were hand searched for relevance.

Caveats

We have used a number of new health terms that were not used in the *MJA-Lancet Countdown 2020*, as follows: obesity, death, injury, food.

Documents that did not use health in the context of human health (eg, ecosystem, ecological or reef health) were excluded.

Due to time constraints, we only used terms in category (c) for the states and territories.

State and territory websites search tools are quite variable and some do not have advanced search functionality, thereby requiring hand searching.

At the national level, search (c) did not yield many results (Tables A2 and A5). As such, (a) and (b) results for Bills were hand searched to identify documents that referenced climate change and health.

Due to the large number of search results, we did not hand search chamber documents from the Parliament of Australia to remove duplicates.

5.4 Health and climate change research funding

Data

The Australian National Health and Medical Research Council's (NHMRC's) Research Grants Management System (RGMS) was analysed by NHMRC personnel for research funding applications with a focus on health and climate change over the years 2000 to 2021.

Methods

The indicator tracks the annual number of health and climate change grant applications that are funded and not funded, and the corresponding success rate.

Caveats

The number of applications is likely to be an underestimate due to the choice of category descriptors for areas of research in the RGMS (NHMRC 2019).

Future form of the indicator

There is potential to develop this indicator by also reporting the annual dollar amounts funded and not funded, funding by funding program, funding by broad research area, funding by field of research, and other more detailed analysis of the data.

Author contributions

PJB and YZ Co-Chair the *MJA-Lancet* Countdown. SV leads Section 1; HB leads Section 2; MKL leads Section 3; ST leads Section 4; and AGC leads Section 5. Author contributions of indicators were as follows: AMa, 3.6, 3.8; CM, 1.5; DG, 4.5; FHJ, 1.3; HB, 2.1; ICH, 1.4; MH, 5.3; MKL, 3.1-3.4; MS, 3.5; OJ, 1.2; PJB, 2.3, 2.4, 3.7, 5.4; SF, 3.7; ST, 4.1-4.4; YZ, 5.1, 5.2. FC contributed Box 1 and AJW contributed Box 2. PJB drafted the manuscript and all authors contributed to revising it critically for important intellectual content. All authors provided final approval of the version to be published and agreement to be accountable for all aspects of the work. PJB, MBR, and YZ made substantial contributions to the overall conception and design of the work.

References

Australian Bureau of Meteorology. Australian Water Availability Project. Melbourne: BOM, 2022. <http://www.bom.gov.au/jsp/awap/> (viewed April 2022).

Australian Energy Market Operator. Generation Information. Melbourne: AEMO, 2022. <https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information> (viewed April 2022).

Australian Energy Regulator. State of the Energy Market 2021. Melbourne: AER, 2021. <https://www.aer.gov.au/publications/state-of-the-energy-market-reports/state-of-the-energy-market-2021> (viewed April 2022).

Beggs PJ, Zhang Y, Bambrick H, et al. The 2019 report of the *MJA-Lancet* Countdown on health and climate change: a turbulent year with mixed progress. *Med J Aust* 2019; 211: 490–491.e21. <https://www.mja.com.au/journal/2019/211/11/2019-report-mja-lancet-countdown-health-and-climate-change-turbulent-year-mixed>

Beggs PJ, Zhang Y, McGushin A, et al. The 2021 report of the *MJA-Lancet* Countdown on health and climate change: Australia increasingly out on a limb. *Med J Aust* 2021; 215(9): 390-392.e22. <https://www.mja.com.au/journal/2021/215/9/2021-report-mja-lancet-countdown-health-and-climate-change-australia>

Center for International Earth Science Information Network. Gridded Population of the World (GPW). New York: CIESIN, Columbia University, 2017. <https://sedac.ciesin.columbia.edu/data/collection/gpw-v4> (viewed May 2022).

Chambers J. Hybrid gridded demographic data for the world, 1950-2020 0.25° resolution [Dataset]. Zenodo, 2022. <https://doi.org/10.5281/zenodo.6011021> (viewed April 2022).

Clean Energy Council. Clean Energy Australia: Report 2022. Melbourne: CEC, 2022. <https://assets.cleanenergycouncil.org.au/documents/resources/reports/clean-energy-australia/clean-energy-australia-report-2022.pdf> (viewed April 2022).

Electric Vehicle Council. State of Electric Vehicles: August 2021. Sydney: EVC, 2021. <https://electricvehiclecouncil.com.au/reports/state-of-electric-vehicles-2021/> (viewed April 2022).

Federal Chamber of Automotive Industries. FCAI releases VFACTS 2021 new vehicle sales figures, 06 Jan 2022. Kingston ACT: FCAI, 2022. <https://www.fcai.com.au/news/index/view/news/750> (viewed March 2022).

Insurance Council of Australia. Data Hub, Historical Catastrophe Data – March 2022. Sydney: ICA, 2022. <https://insurancecouncil.com.au/industry-members/data-hub/> (viewed April 2022).

Jay O, Broderick C, Smallcombe J. Extreme Heat Policy: Issued by Sports Medicine Australia, v1.0, February 2021. Melbourne: SMA, 2021. <https://sma.org.au/sma-site-content/uploads/2021/02/SMA-Extreme-Heat-Policy-2021-Final.pdf> (viewed April 2022).

Nairn J, Fawcett R. Defining heatwaves: heatwave defined as a heat-impact event servicing all community and business sectors in Australia (CAWCR Technical Report No. 060). CSIRO and Australian Government Bureau of Meteorology, 2013. https://www.cawcr.gov.au/technical-reports/CTR_060.pdf (viewed April 2022).

Nairn JR, Fawcett RJB. The excess heat factor: a metric for heatwave intensity and its use in classifying heatwave severity. *Int J Environ Res Public Health* 2015; 12: 227–253.

National Aerial Firefighting Centre. Fleet. Melbourne: NAFC, 2022. http://www.nafc.org.au/?page_id=168 (viewed Mar 2022).

National Health and Medical Research Council. Background paper: NHMRC’s role in addressing health implications of environmental change. Canberra: NHMRC, 2019.

Parliament of Australia. 2019–20 Australian bushfires—frequently asked questions: a quick guide. Canberra: Parliament of Australia, 2020. https://www.apf.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/Quick_Guides/AustralianBushfires (viewed May 2022).

Productivity Commission. Report on Government Services 2022. Part D, Section 9: Released on 28 January 2022. 9 Emergency services for fire and other events. Canberra: Australian Government, Productivity Commission, 2022. <https://www.pc.gov.au/research/ongoing/report-on-government-services/2022/emergency-management/emergency-services> (viewed March 2022).

Romanello M, McGushin A, Di Napoli C, et al. The 2021 report of the *Lancet* Countdown on health and climate change: code red for a healthy future. *Lancet* 2021; 398(10311): 1619–1662.

Romanello M, ..., et al. The 2022 report of the *Lancet* Countdown on health and climate change: *Lancet* 2022; (): —.

Royal Commission into National Natural Disaster Arrangements. Royal Commission into National Natural Disaster Arrangements: Report. Canberra: Commonwealth of Australia, 2020.

Watts N, Amann M, Arnell N, et al. The 2020 report of the *Lancet* Countdown on health and climate change: responding to converging crises. *Lancet* 2021; 397(10269): 129–170.

World Health Organization. IHR Capacity Progress. Geneva: WHO, 2019. <https://extranet.who.int/e-spar/Home/Capacity> (viewed May 2022).

Zhang Y, Beggs PJ, McGushin A, et al. The 2020 special report of the *MJA–Lancet* Countdown on health and climate change: lessons learnt from Australia’s “Black

Summer”. *Med J Aust* 2020; 213: 492.e2–492.e10.
<https://www.mja.com.au/journal/2020/213/11/2020-special-report-mja-lancet-countdown-health-and-climate-change-lessons>

Tables

Table A1. Bills before the national Parliament of Australia identified under searches for (a) climate change and (b) health, with hand searching for climate and health relevance

| Topic | Key words | Bill title | Sponsor* |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------|
| Bills referencing climate change and health (identified by hand searching) | climate change, greenhouse, health, pandemic | Climate Change (National Framework for Adaptation and Mitigation) (Consequential and Transitional Provisions) Bill 2021 | Independent |
| | climate change, zero emissions, health, food | Climate Change (National Framework for Adaptation and Mitigation) Bill 2021 | Independent |
| | air pollution, injury | Hazardous Waste (Regulation of Exports and Imports) Amendment Bill 2021 | Government (LP/NP) |
| | renewable energy, health | Offshore Electricity Infrastructure Bill 2021 | Government (LP/NP) |
| | greenhouse, health, public health | Ozone Protection and Synthetic Greenhouse Gas (Import Levy) Amendment Bill 2021 | Government (LP/NP) |
| | greenhouse, health, public health | Ozone Protection and Synthetic Greenhouse Gas (Manufacture Levy) Amendment Bill 2021 | Government (LP/NP) |
| | greenhouse, health, public health | Ozone Protection and Synthetic Greenhouse Gas Management Amendment (Miscellaneous Measures) Bill 2021 | Government (LP/NP) |
| | Climate change, greenhouse, death, injury, illness, health | Liability for Climate Change Damage (Make the Polluters Pay) Bill 2021 | Minor party (GRN) |
| Bills with only explanatory memorandum referencing climate change and health (identified by hand searching) | greenhouse | Offshore Petroleum and Greenhouse Gas Storage (Regulatory Levies) Amendment Bill 2021 | Government (LP/NP) |
| | greenhouse | Offshore Petroleum and Greenhouse Gas Storage Amendment (Fight for Australia's Coastline) Bill 2021 | Minor party (GRN) |
| | greenhouse | Offshore Petroleum and Greenhouse Gas Storage Amendment (Stopping PEP11) Bill 2021 | Independent |
| | greenhouse | Offshore Petroleum and Greenhouse Gas Storage Amendment (Titles Administration and Other Measures) Bill 2021 | Government (LP/NP) |
| | drought | COVID-19 Disaster Payment (Funding Arrangements) Bill 2021 | Government (LP/NP) |

| | | | |
|--|-------|---------------------------------------------------------|--------------------|
| | flood | Treasury Laws Amendment (2021 Measures No. 3) Bill 2021 | Government (LP/NP) |
|--|-------|---------------------------------------------------------|--------------------|

* LP: Liberal Party; NP: National Party; GRN: Greens Party.

Table A2. Total number of national Parliament of Australia documents related to climate change, health and climate change and health

| | | (a) Climate change | (b) Health | (c) Climate change AND health |
|-----------------------------------|-------------------|-----------------------|-----------------------|-------------------------------|
| Bills & legislation | Passed | 6 | 18 | 0 |
| | Not passed | 4 | 2 | 0 |
| | Before parliament | 7 | 12 | 0 |
| | Sub-total | 17 | 32 | 0 |
| Committees & inquiries | Committees | 0 | 4 | 0 |
| | Inquiries* | 3 | 11 | 0 |
| | Hearings* | 10 | 52 (incl 1 cancelled) | 0 |
| | Sub-total | 13 | 67 | 0 |
| Chamber documents* | | 2800 (118 title only) | 8938 (601 title only) | 363 (1 title only) |

* Note: 17 separate issues were discussed in the included inquiries and hearings. The number of chamber documents may contain duplicates across different search terms.

Table A3. Total number of bills, committees and inquiries, and Hansard results related to climate change and health in Australian State and Territory Parliaments

| Jurisdiction | Bills | Committees & Inquiries | Total Hansard results |
|------------------------------|--------------|-----------------------------------|------------------------------|
| Queensland | 0 | 2 | 47 |
| New South Wales | 4 | 1 | 60 |
| Australian Capital Territory | 2 | 3 | 40 |
| Victoria | 2 | 1 | 181 |
| South Australia | 1 | 2 | 31 |
| Tasmania | 0 | 1 | 83 |
| Western Australia | 1 | 3 | 71 |
| Northern Territory | 0 | 0 | 21 |

Table A4: Climate health related bills and inquiries before Australian State and Territory Parliaments

| Jurisdiction | Key words | Bill or Inquiry title | Sponsor/Committee* |
|------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Queensland | Health, climate change, temperature, drought, cyclone, flood, disease, pandemic, food | Inquiry - Environmental and Other Legislation (Reversal of Great Barrier Reef Protection Measures) Amendment Bill 2021 | Health and Environment Committee |
| New South Wales | Climate change, health, greenhouse | Climate Change (Emissions Targets) Bill 2021 | Opposition (ALP) |
| | Health, pollution, food | Plastic Reduction and Circular Economy Bill 2021 | Government (LP/NP) |
| | Pollution, health, food, illness | Waste Avoidance and Resource Recovery Amendment (Plastics Reduction) Bill 2021 | Minor party (GRN) |
| | Climate change, injury, death | Energy Legislation Amendment Bill 2021 | Government (LP/NP) |
| | Health, mental health, illness, flood, bushfire, drought | Inquiry into health outcomes and access to health and hospital services in rural, regional and remote New South Wales | Portfolio Committee no 2- Health |
| Australian Capital Territory | Health, greenhouse | City Renewal Authority and Suburban Land Agency Amendment Bill 2021 | Government (ALP/GRN) |
| | Health, greenhouse | Statute Law Amendment Bill 2021 | Government (ALP/GRN) |
| | Climate change, health | Inquiries into annual and financial reports 2019-2020 and ACT budget 2020-2021 | Standing Committee on Environment, Climate Change and Biodiversity |
| | Climate change, health | Inquiry into Renewable Energy Innovation in the ACT | Standing Committee on Environment, Climate Change and Biodiversity |
| | Climate change, health | Inquiry into ACT Budget 2021–22 | Standing Committee on Environment, Climate Change and Biodiversity & Standing Committee on Health and Community Wellbeing |
| Victoria | Climate change, health | Circular Economy (Waste Reduction and Recycling) Bill 2021 | Government (ALP) |
| | Climate change, health | Zero and Low Emission Vehicle Distance-Based Charge Bill 2021 | Government (ALP) |

| | | | |
|-------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| | Climate change, health, air pollution | Inquiry into the Health Impacts of Air Pollution in Victoria | Environment and Planning Committee |
| South Australia | Bushfire, injury | Criminal Law Consolidation (Bushfires) Amendment Bill | Government (LP) |
| | Health, climate change, heat | Inquiry into Urban Green Space | Natural Resources Committee |
| | Climate change, health | Inquiry - Review of the South Australian Public Health Act 2021 | Social Development Committee |
| Tasmania | Climate change, health, temperature, flood, mental health | Rural Health Services Inquiry | Legislative Council Sessional Committee Government Administration A - Sub-Committee |
| Western Australia | Climate change, greenhouse, health, illness | Climate Change and Greenhouse Gas Emissions Reduction Bill 2021 | Minor party (GRN) |
| | Climate change, health, mental health, food, renewable energy | Inquiry into the response of Western Australian schools to climate change Inquiry | Education and Health Standing Committee |
| | Health, climate change, renewable energy, food | Inquiry into intergenerational challenges and opportunities for the Western Australian economy Inquiry | Economics and Industry Standing Committee |
| | Climate change, mental health, health | 2021-22 Budget Estimates Inquiry | Estimates and Financial Operations Committee |

* ALP: Australian Labor Party; LP: Liberal Party; NP: National Party; GRN: Greens Party.

Table A5. Summary of key word searches on Parliament of Australia website

| Theme | Key word | Bills & Legislation | Committees | Chamber docs | |
|-------------------|-------------------------------|---------------------|------------|--------------|------------|
| | | | | Full text | Title only |
| Climate health | “climate change” + “health” | 0 | 0 | 362 | 1 |
| | “climate health” | 0 | 0 | 1 | 0 |
| Climate change | “climate change” | 3 | 3 | 419 | 25 |
| | “global warming” | 0 | 0 | 39 | 0 |
| | “temperature” | 0 | 0 | 103 | 0 |
| | “extreme weather” | 0 | 0 | 60 | 0 |
| | “global environmental change” | 0 | 0 | 1 | 0 |
| | “climate variability” | 0 | 0 | 17 | 0 |
| | “greenhouse” | 11 | 3 | 380 | 36 |
| | “low carbon” | 0 | 0 | 93 | 0 |
| | “ghge” | 0 | 0 | 0 | 0 |
| | “renewable energy” | 3 | 0 | 281 | 17 |
| | “carbon emission” | 1 | 0 | 132 | 2 |
| | “co2 emission” | 0 | 0 | 16 | 0 |
| | “climate pollutant” | 0 | 0 | 0 | 0 |
| | “air pollution” | 0 | 0 | 20 | 0 |
| | “drought” | 1 | 1 | 241 | 11 |
| | “flood” | 1 | 0 | 270 | 15 |
| | “bushfire” | 0 | 6 | 375 | 10 |
| | “heat” | 0 | 0 | 201 | 0 |
| | “cyclone” | 0 | 0 | 152 | 2 |
| Health | “malaria” | 0 | 0 | 62 | 1 |
| | “dengue” | 0 | 0 | 4 | 0 |
| | “diarrhoea” | 0 | 0 | 2 | 0 |
| | “infection” | 0 | 0 | 93 | 0 |
| | “disease” | 2 | 1 | 381 | 14 |
| | “pneumonia” | 0 | 0 | 11 | 0 |
| | “epidemic” | 0 | 0 | 94 | 0 |
| | “pandemic” | 3 | 26 | 898 | 21 |
| | “epidemiology” | 0 | 0 | 30 | 0 |
| | “public health” | 5 | 43 | 1132 | 16 |
| | “health care” | 7 | 3 | 1077 | 29 |
| | “healthcare” | 0 | 0 | 314 | 4 |
| | “health” | 28 | 53 | 1448 | 400 |
| | “mortality” | 0 | 0 | 95 | 1 |
| | “morbidity” | 0 | 0 | 28 | 0 |
| | “nutrition” | 0 | 0 | 88 | 0 |
| | “malnutrition” | 0 | 0 | 12 | 0 |
| | “obesity” | 0 | 0 | 79 | 0 |
| | “illness” | 1 | 0 | 257 | 0 |
| | “infectious” | 0 | 0 | 112 | 2 |
| | “ncd” | 0 | 0 | 4 | 0 |
| | “non-communicable disease” | 0 | 0 | 52 | 0 |
| | “noncommunicable disease” | 0 | 0 | 1 | 0 |
| “chronic disease” | 0 | 0 | 129 | 3 | |

| | | | | | |
|--|------------------------|---|----|-----|----|
| | “communicable disease” | 0 | 0 | 55 | 0 |
| | “mental disorder” | 0 | 0 | 108 | 0 |
| | “mental health” | 1 | 20 | 625 | 18 |
| | “depression” | 0 | 0 | 99 | 0 |
| | “suicide” | 0 | 20 | 374 | 10 |
| | “food” | 0 | 0 | 470 | 38 |
| | “death” | 2 | 2 | 503 | 44 |
| | “injury” | 1 | 0 | 301 | 0 |

Figures

Figure A1. Annual person-days exposed to landscape fire in Australia, 2001-2021 (blue dots), showing the trend with 95% confidence intervals (grey lines) and the average (dashed red line) for the entire period

Annual person-days exposed to landscape fire in Australia, 2001-2021, showing the trend with 95% confidence intervals and the average for the entire period

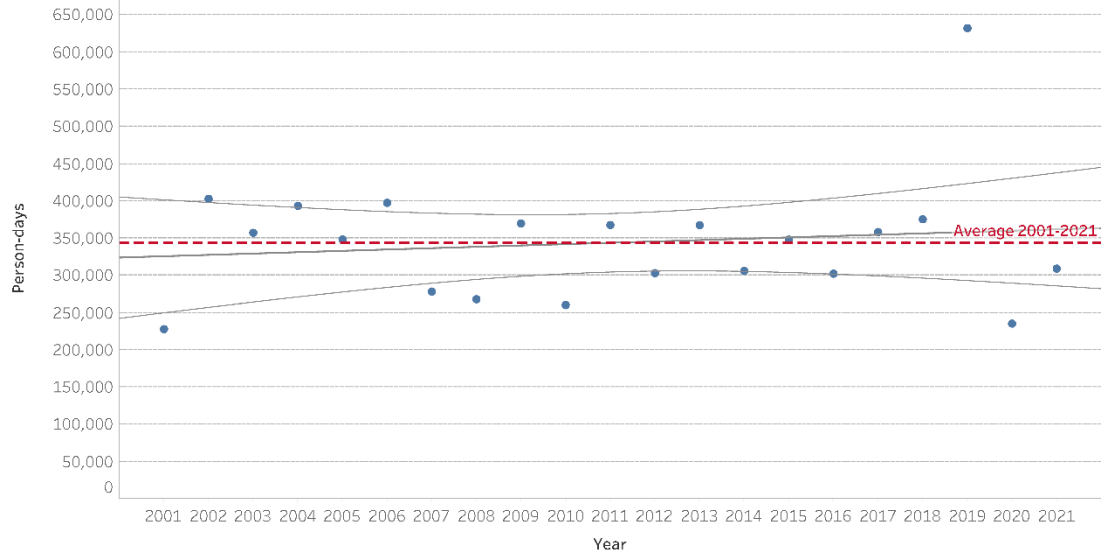


Figure A2. Annual time-series plot of drought affected area in Australia shown as A) percentage of area in “excess severe drought”, “excess extreme drought” and “excess exceptional drought” where an excess event is classified as exceeding 2 standard deviations above mean annual counts (1950-2005 baseline); and B) annual average Standardised Precipitation-Evapotranspiration Index (SPEI) showing hotter/drier months as scores below zero and cooler/wetter months as scores above zero

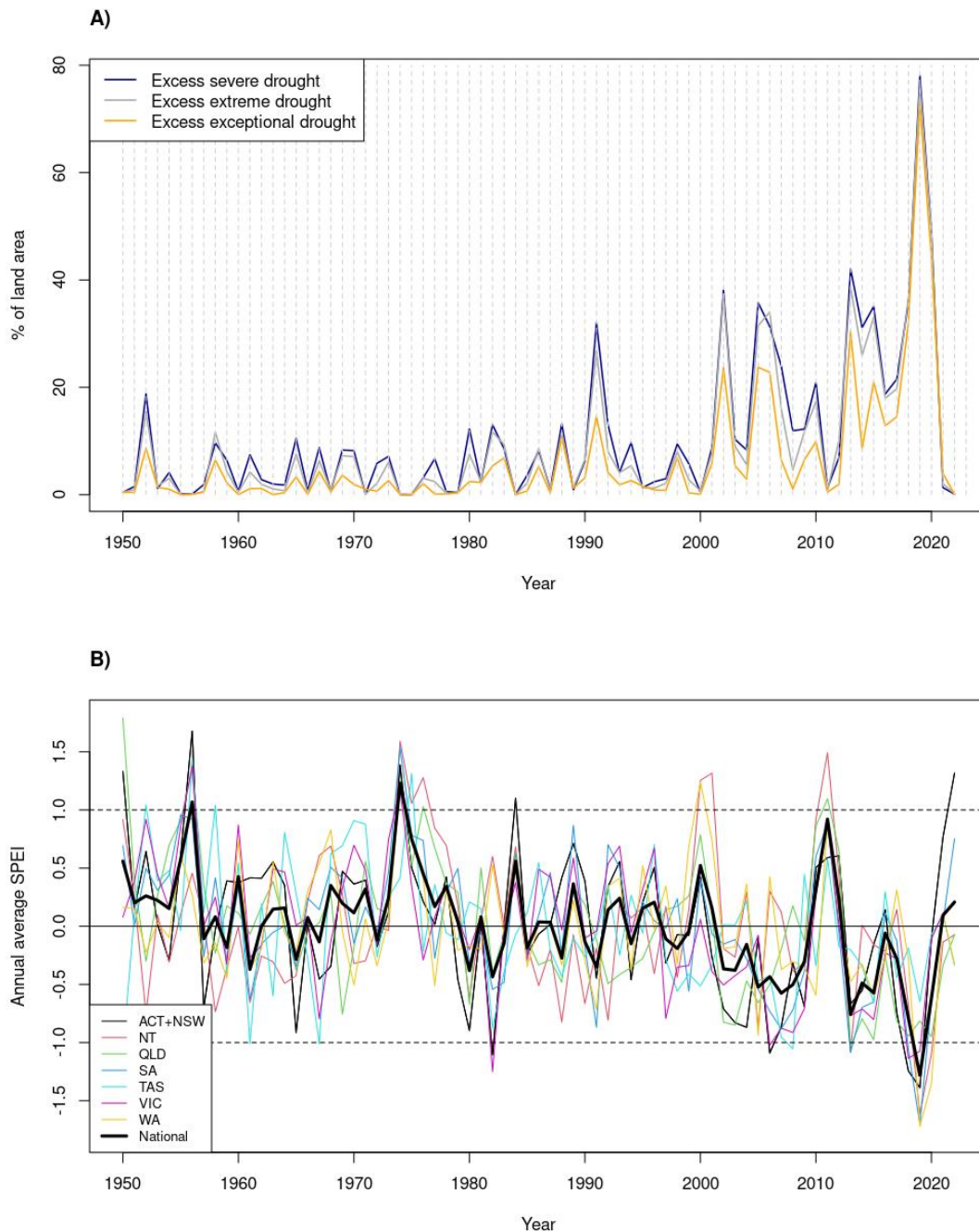


Figure A3. Per-capita greenhouse gas emissions from agri-food production in Australia – trends from 1995 – 2019

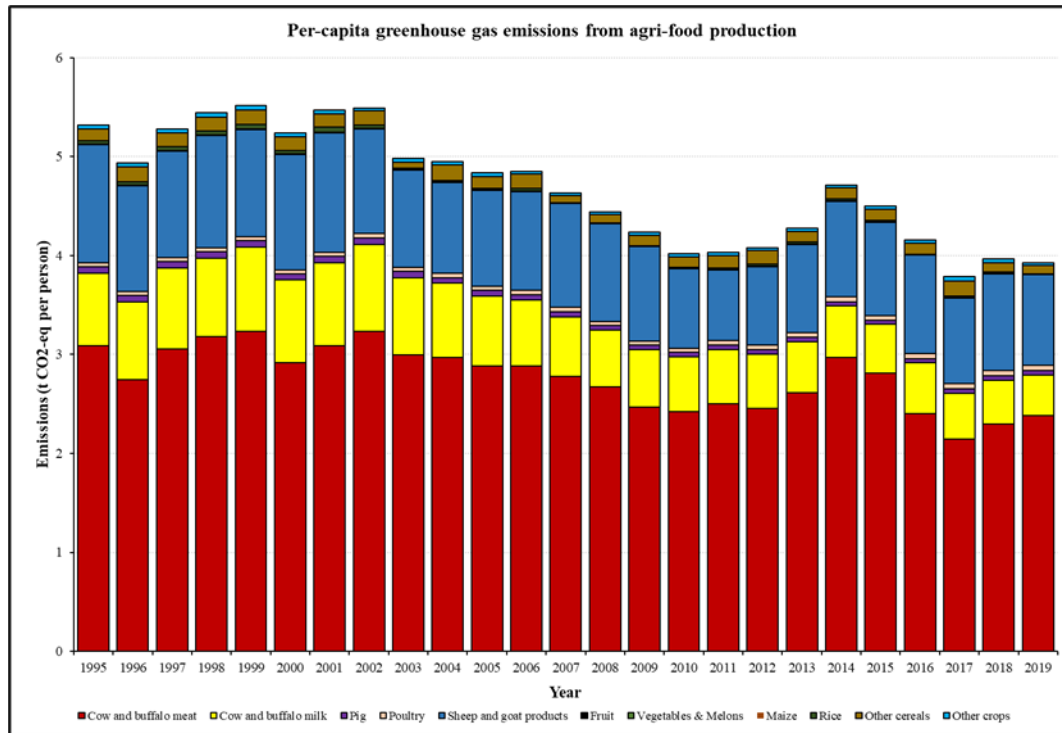


Figure A4. Greenhouse gas emissions from agri-food consumption in Australia – trends from 1995 – 2019

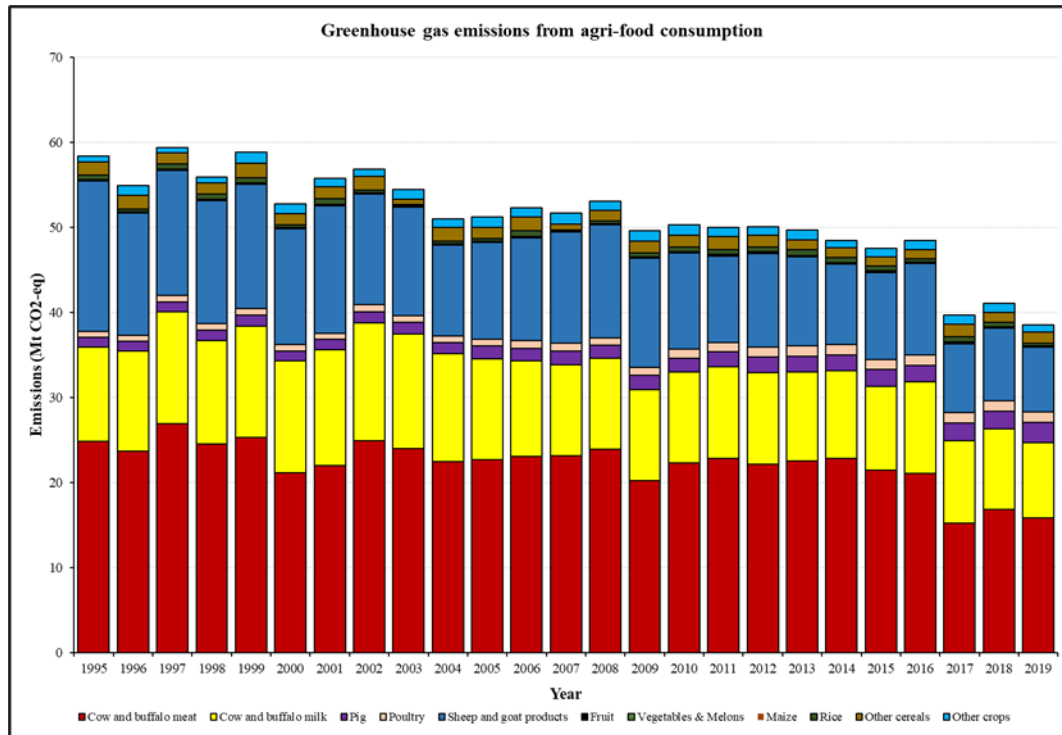


Figure A5. Per-capita greenhouse gas emissions from agri-food consumption in Australia – trends from 1995 – 2019

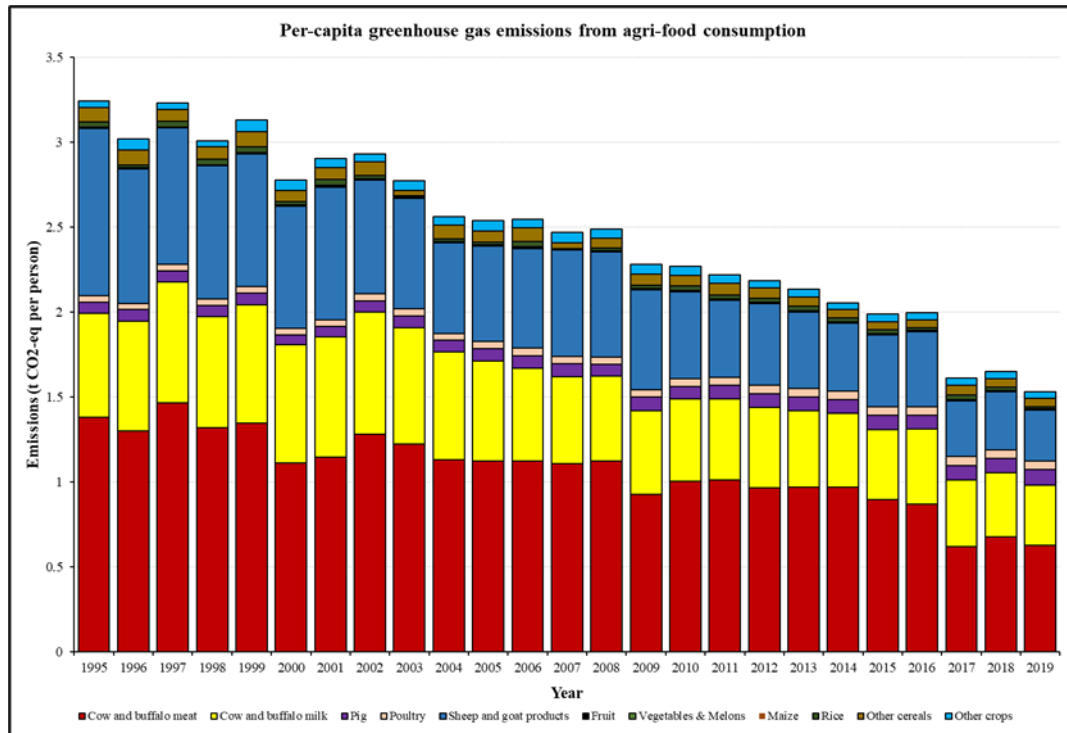


Figure A6. Annual greenhouse gas emissions for Australian healthcare – trends from 2007 – 2019

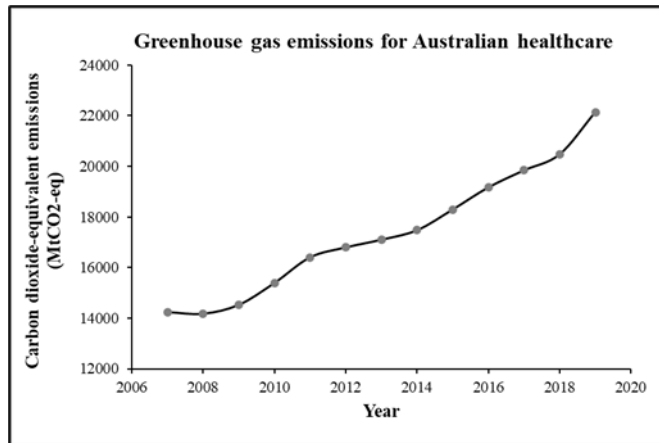


Figure A7. Annual ABC online coverage of health and climate change topics, 2008-2021

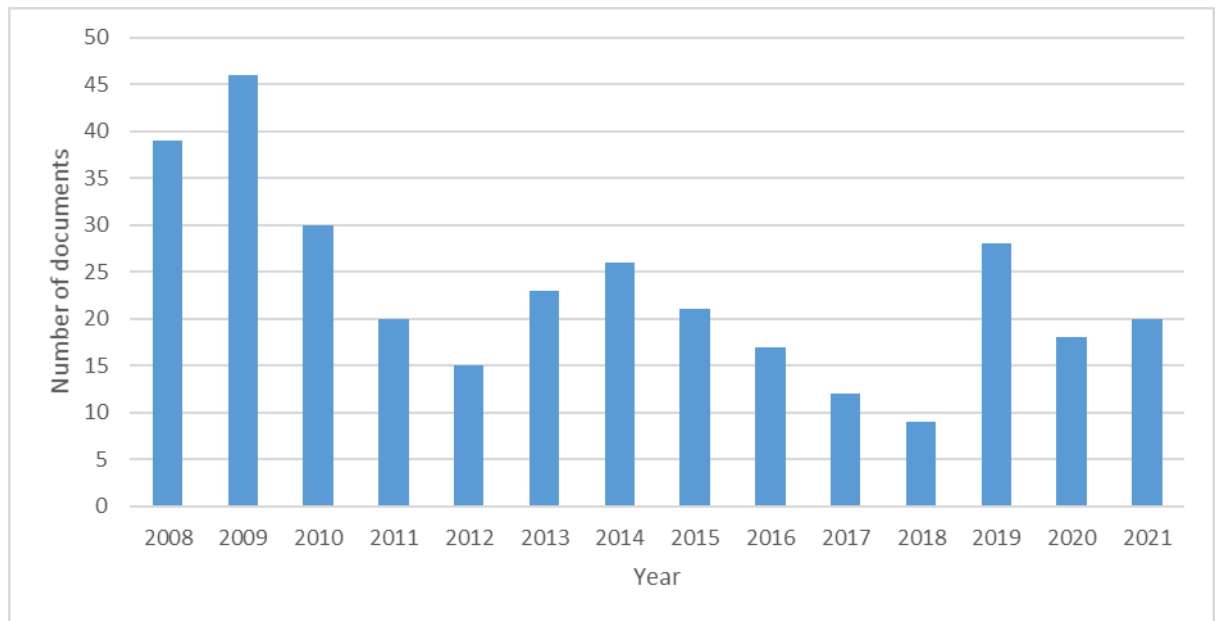


Figure A8. Number of bills introduced, and inquiries held annually, 2008-2021, on climate change and health in the Parliament of Australia. (Beggs et al. 2019; Zhang et al. 2020).

