Australia is already a net zero CO_2 emitter

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Australia is already delivering net zero CO_2 emissions (in terms of current UNFCCC, IPCC and Australian NGGI guidelines) – and well before 2050! Consider:

In 2020 DISER stated that "for the Paris Agreement all net CO_2 emissions from all lands (in Australia) will be accounted for – without restriction" (cf. only c.1% of the land mass included in our Kyoto Protocol accounts) [Link: https://www.aph.gov.au/Parliamentary_Business/Committees/House/Environment_and_Energy/ClimateBills2020/Submissions #588, p.13].

The only practical means to rigorously sample all net emissions at a continental scale (769 M ha) is via inversions, based on satellite retrievals of the column averaged dry air mole fraction of CO_2 (XCO_2) measured from the top of the Earth's atmosphere to its surface. The OCO-2 satellite provides c. 65,000 worldwide observations per day that pass quality screening (https://doi.org/10.5194/amt-10-549-2017) – making it possible to estimate the distribution and magnitude of CO_2 in regions that have sparse *in situ* surface atmospheric monitoring (e.g. Australia) [See: https://doi.org/10.5194/acp-21-6663-2021 and http://adsabs.harvard.edu/abs/2015EGUGA..1712580M for more insights].

Detmers et al. (2015 – updated 23 Jan 2017) (https://doi.org/10.1002/2015GL065161) and Chevallier et al. (2019) (https://doi.org/10.5194/acp-19-14233-2019), *inter alia*, have used these techniques and respectively revealed a natural ('managed land') flux in Australia of 770 ± 110 M t CO_2/yr (net sink c.366 Mt CO_2 after subtracting fossil fuel emissions in 2011) and a natural flux of c.697 Mt CO_2/yr (net sink c.282 Mt CO_2 after subtracting fossil fuel emissions in 2017) [See: https://ourworldindata.org/co2/country/australia for fossil fuel emissions]. [The inferred natural flux for 2017 is scaled from the OCO-2 inversion in Chevallier et al. (2019) Fig. 3].

The proximity in value of these net sinks***** for Australia is surprising - given 2010-11 experienced a strong La Niña and 2015-16 was a strong El Niño period. It is posited that the former led to mass regeneration of perennial vegetation, with surviving recruits entering rapid sigmoid growth by 2017. Rising CO_2 levels in the world's atmosphere (CO_2 concentration at Cape Grim increased by 3.6% from Jan 2011 to Jan 2017; 3.8% at Mauna Loa) also improve the water use efficiency of vegetation. Further, northern wet season (October–April) rainfall deciles for the 20 years (1998–99 to 2017–18) show wet season rainfall was very much above average for the 20 year period 1998-99 to 2017-18. [See: https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate/previous/state-of-the-climate-2018/australias-changing-climate]. Most woody vegetation is located in the northern half of the continent.

The two inversion studies cited above suggest we are currently a net sink of c.320 Mt CO_2 per year – after averaging the La Niña and El Niño year results and deducting all fossil fuel emissions for each respective year from the natural flux. No doubt an improved ground station (e.g. TCCON) calibration network (presently Darwin, Wollongong) would reduce uncertainties associated with this figure. [N,B. consistent with IPCC Guidelines, emissions from the combustion of fossil fuel exports in importing countries are included in the latter's national inventories – not in the inventory of the country of origin].

Australia is the 6th largest nation in area in the world (and in the main has a land mass covered by CO_2 absorbing perennial vegetation), yet it has far fewer people than live in a single world mega city (e.g. Tokyo). Yearly fossil fuel emissions generated by anthropogenic sources within this country (https://ourworldindata.org/co2/country/australia) are more than offset by the capacity of our LULUC&F sector ('landscape') to absorb them******. Net zero? QED!

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*****All things being equal, when native vegetation is a C sink it suggests a response to imposed management. If the vegetation was a true remnant, little yearly fluctuation in its C store and flux would be expected.

******Presumes BAU. Sometime post 2050, current vegetation will reach a new equilibrium after responding to changed burning regimes - introduced when new practices supplanted indigenous management.