

Sampling the Australian landscape for net zero emissions under the Paris Agreement

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Australia has adopted the position that “for the Paris Agreement (PA) all net carbon dioxide equivalent (CO₂-e) emissions from **ALL** lands (in Australia) will be accounted for – without restriction - using the independent monitoring systems of the national inventory. (So) through the national inventory there is complete coverage of the land sector in the Government’s target acquittal” [See: [DISER](#) Submission #588, p.13]. The only practical way of sampling these emissions over the whole continent (769 M ha), with acceptable accuracy and precision, is via spectral sensors positioned on satellite based platforms (e.g. GOSAT, OCO-2, TanSat).

Published data (Table 1) are collated for four different studies which together cover sampling ‘years’ from 2011 to 2017-18. [The sampling periods include strong La Niña and El Niño years]. The natural (managed land) CO₂ flux (withdrawal from the atmosphere above the Australian land mass over all retrieval platforms and sampling years, n=6) averaged c. 700 Mt CO₂-e per year. This average land sink is approximately 140% of total human sourced emissions released into the atmosphere in 2020 (≈ 500 Mt CO₂-e). [By way of contrast, the equivalent managed land sink in the conterminous USA (766 M ha) only corresponds to c.12% of that nation’s fossil fuel emissions].

Table 1 **Natural CO₂ flux (withdrawal from the atmosphere above the Australian land mass) – expressed in common units (Mt CO₂-e/year) and based on retrievals from three different satellite platforms, combined with inversion procedures [See reference links for methods and uncertainty estimates employed].**

<u>Reference</u>	<u>GOSAT</u>	<u>OCO-2</u>	<u>TanSat</u>	<u>Retrieval Year</u>
Detmers et al. 2015	770	-	-	2011
Wang et al. 2019	958	806	-	2015
Chevallier et al. 2019	-	697	-	2017
Yang et al. 2021	-	205	770	2017-18

GRAND MEAN (over all retrieval platforms and sampling years, n=6) ≈ 700 Mt CO₂-e /year

It has been suggested that any flux recorded in these lands cannot be included in our NGGI and PA accounts because this huge landscape area is not identified or congruent with IPCC guidelines. This is not in accord with Ogle *et al.* (2018 - <https://doi.org/10.1186/s13021-018-0095-3>). These authors clearly show how the ‘managed land’ concept has now replaced (become a proxy for) the anthropogenic definitions associated with the Kyoto Protocol (First Commitment Period accounting). Hence:

“Governments are not required to mention this concept (of their managed land base – BB) in their national communication to the UNFCCC unless they have delineated a portion of the country as unmanaged, although application of the managed land proxy should be discussed based on IPCC Guidance

[<https://cbmjournals.biomedcentral.com/articles/10.1186/s13021-018-0095-3#ref-CR9> ;

*<https://cbmjournals.biomedcentral.com/articles/10.1186/s13021-018-0095-3#ref-CR18>]. **Regardless, all***

***governments using the later guidance from the IPCC are implicitly using the managed land proxy, and many of these governments may consider their entire territory as managed land”.** [My emphasis – BB. For*

example, what is considered to be ‘managed’ and ‘unmanaged’ land in the USA. See:

<https://doi.org/10.1186/s13021-018-0095-3> (Fig.4) and the title (read carefully) of this 2018 paper is:

‘Delineating managed land for reporting national greenhouse gas emissions and removals to the United Nations Framework Convention on Climate Change’.].

Finally, Ogle *et al.* (2018) on “*Defining managed land*”:

Among the governments providing information about application of the managed land proxy to subdivide forest land, grassland and wetlands into managed and unmanaged land, several have classified managed land simply by considering some land uses as managed and others as unmanaged. For example, Australia and Belarus consider all forest land, grasslands and wetlands as managed, while land in the ‘other land’ category (e.g., rock outcrops, glaciers, barren areas) is considered unmanaged.” [Note: The UNFCCC/IPCC definition of a ‘forest’ is in effect inclusive of all vegetation classified as forest, woodland and medium/tall shrubland in the Australian context].

According to the Climate Council ‘Net zero emissions’ refers to achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere. Clearly, by following its stated sampling intentions for the PA, Australia will well exceed this goal, while the USA is a long way from achieving it. [Even though both nations have similar land areas the USA has c.13 times Australia’s population and a very much larger industrial base.]

Note that as the sinks are determined via information retrieved from satellites the landholder does not know his/her contribution to the total land sink that is being captured. The satellite information is validated/calibrated against ground station records. There is increasing confidence in the methodology and results obtained* - although enhanced ground station coverage (e.g. adding TCCON stations at Alice Springs etc.) over the continent would clearly be beneficial [See: [essd-11-935-2019.pdf](#)].

For the Kyoto Protocol only about 1% of the Australian continent was actually sampled [See: [DISER Submission #588](#), p.12]. However, because this new methodology samples the whole continent it gives a much more accurate and precise result from a national reporting perspective, compared with ground based methods that are impractical to apply at scale with the same level of accuracy and precision. And when this is (inevitably) done routinely, we will find that we are, and always have been, a net zero emitter as defined by the Climate Council – irrespective of COP26 or any other machination.

*Where satellite measurements are spatially filtered to include only data recorded near surface calibration sites (30+ located worldwide, including in Australia) the resultant fluxes are found to converge to those based on surface measurements alone. A single OCO-2 footprint covers c.290 ha (c. 2,650,000 potential sampling points for the Australian land mass) with a 16-days revisit cycle. Spatial filtering of geo-referenced “agricultural land” could also be instigated if required for targeted auditing (of CEAs/ACCUs and to avoid double counting sinks in national PA accounts). However as a general principle no managed land should be excluded (‘cherry picked’) from any PA accounting to determine Australia’s net CO₂ flux – ‘all for one, and one for all’!

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ACCU – Australian Carbon Credit Unit

CEA – Carbon Estimation Area

DISER – Australian Government Department of Industry, Science, Energy & Resources

TCCON – Total Carbon Column Observing Network

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<https://www.keepandshare.com/doc22/112736/sampling-the-australian-landscape-for-net-emissions-under-the-pa-pdf-757k?da=y>