



# The contribution of historical methane emissions to present-day warming

## Summary document

The Parliamentary Commissioner for the Environment has been conducting research since 2018 into biogenic methane and its warming effects, in an effort to foster better-informed debate on New Zealand's climate change action. In a newly commissioned report, *The contribution of historical methane emissions to present-day warming*, Dr Andy Reisinger answers a fundamentally important question: how much have individual sources of methane emissions – such as agriculture – contributed to present-day warming globally?<sup>1</sup>

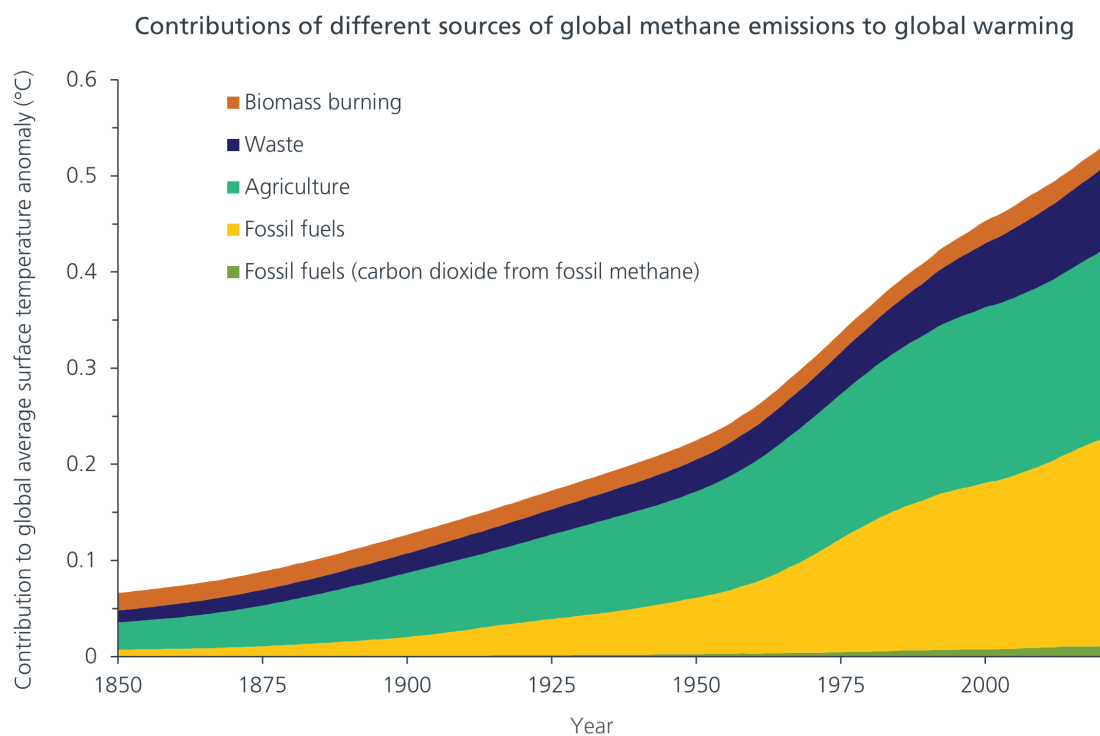
In the most recent assessment report from the Intergovernmental Panel on Climate Change, it was estimated that the warming attributable to global methane emissions from all human activities was 0.5 °C (using a range of atmospheric chemistry models and radiative forcing studies).<sup>2</sup> This 0.5 °C was not further disaggregated into the warming from fossil, as opposed to biogenic, sources of methane.

Dr Reisinger's report finds that globally, of the 0.5 °C of present-day warming caused by methane emissions, about 60% was due to biogenic methane (from agriculture, waste and biomass burning) and about 40% was due to fossil methane (from fugitive emissions and incomplete combustion of coal, oil and gas). Biogenic methane emissions from agriculture specifically contributed roughly 0.19 °C or about 40% of the 0.5 °C of present-day warming caused by methane emissions.

<sup>1</sup> Reisinger, 2024. *The contribution of historical methane emissions to present-day warming*. Wellington: Parliamentary Commissioner for the Environment.

<sup>2</sup> See [https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGL\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGL_SPM.pdf) p.7. Figure SPM.2.





**Figure 1: Contributions of different sources of global methane emissions to global warming over the period 1850 to 2020.**

Between 1850–1900 and 2010–2019 global average surface temperature has increased by about 1.06 °C, with virtually all of this warming caused by human activities, mainly emissions of greenhouse gases. As stated above, agricultural methane emissions have contributed approximately 0.19 °C to this warming. In other words, 18% of total warming from all human influences is due to methane emissions from agriculture.

The observed increase in Earth's surface temperature has been mediated by aerosols such as sulphur dioxide, which have had a cooling effect through their action in reducing the amount of solar radiation reaching the lower atmosphere. Warming attributed to changes in greenhouse gas concentrations alone, excluding the cooling influences of aerosols and other factors such as albedo, is estimated to be as much as 1.5 °C.<sup>3</sup>

This means that approximately 13% of warming reached during the last decade due to changes in greenhouse gas concentrations is from global methane emissions from agriculture.

Importantly, the report also found that most of the warming from methane comes from the methane molecule itself<sup>4</sup> – rather than the additional carbon dioxide that results from the decay of fossil methane. This source of carbon dioxide is estimated to contribute only about 2% to overall present-day warming from all methane emissions.

<sup>3</sup> See [https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGL\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGL_SPM.pdf), p.7, Figure SPM.2.

<sup>4</sup> Estimates of warming attributed to methane included warming caused by tropospheric ozone and stratospheric water vapour that are generated when methane decays naturally in the atmosphere. These indirect effects add to the direct warming caused by every methane emission.



Understanding the international situation gives context to New Zealand's position. Research has shown that livestock methane emissions account for 55% of New Zealand's contribution to current warming from its greenhouse gas emissions (excluding the effect of historical deforestation).<sup>5</sup> Further research from the New Zealand Agricultural Greenhouse Gas Research Centre has found that methane will remain New Zealand's largest single contributor to global warming for the next six decades, assuming greenhouse gas emissions continue at observed rates.<sup>6</sup>

New Zealand's contribution to global warming in general (about 0.003 °C),<sup>7</sup> and specifically from livestock methane emissions, is relatively large for a country of our size, even when emissions from deforestation are excluded. Research commissioned by DairyNZ, Beef + Lamb New Zealand and Federated Farmers notes that the "the reduction of agricultural methane represents the greatest opportunity to reduce New Zealand's contribution to warming".<sup>8</sup>

As New Zealand continues to discuss its approach to reducing biogenic methane emissions, the Commissioner hopes that this research will provide useful context to inform consideration of what is a fair contribution for New Zealand to make towards the global goal of limiting warming to 1.5 °C.

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<sup>5</sup> See <https://pce.parliament.nz/media/03nipnwn/how-much-forestry-would-be-needed-to-offset-warming-from-agricultural-methane-summary-document.pdf>.

<sup>6</sup> NZAGRC-Report-Scientific-aspects-of-2050-methane-targets.pdf ; for a recent break down of New Zealand's contribution to global warming from historic and projected greenhouse gas emissions see <https://www.climatecommission.govt.nz/public/Uploads/Targets/supporting-docs/Temperature-modelling-full-results.xlsx>.

<sup>7</sup> See <https://www.climatecommission.govt.nz/public/Uploads/Targets/supporting-docs/Temperature-modelling-full-results.xlsx>.

<sup>8</sup> See <https://beeflambnz.com/knowledge-hub/PDF/full-report-agriculture-emissions-and-warming-aotearoa-new-zealand-2050-insights>, p.29.

