Cutting methane emissions can make a major contribution to the goal of limiting climate change

Methane gas emissions from human activities have made a sizeable contribution to the changes in climate observed so far. This new scientific study finds that the benefits from reducing methane emissions are larger than many previous studies have estimated.

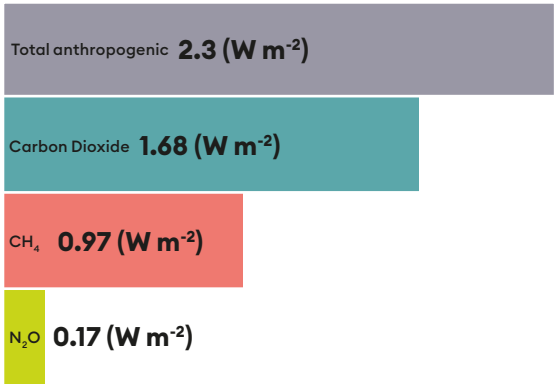
Rapidly reducing methane emissions means that it becomes more feasible to limit warming to lower levels.

What this research is about

Nations around the world have agreed that it is necessary to limit the global average warming, occurring since pre-industrial times, to well below 2°C in order to avoid unacceptable climate damages. Achieving this goal will require deep and rapid reductions of greenhouse gas emissions. Whilst carbon dioxide has the largest source of emissions there is scope to achieve an overall cut in greenhouse gases by reducing another greenhouse gas, methane. Human emissions of methane are produced when fossil fuels are extracted and used e.g. natural gas leakage, from agricultural processes including from livestock and rice production. Methane is also produced from wetlands and other natural processes.

This research provides new estimates of the potential contribution to limiting future warming by reducing methane emissions. It considers a range of alternative methane reduction scenarios. The findings are expressed as a change in the allowable global carbon budget, which is the total emissions of carbon dioxide from human sources that correspond to a particular warming target.

The impact of reduced methane emissions can have additional benefits through improved air quality. Considering these co-benefits would increase the cost effectiveness of methane mitigation options.



Components of radiative forcing. RF bar chart for the period 1750-2011 (Source. IPCC 5th assessment).

Study findings

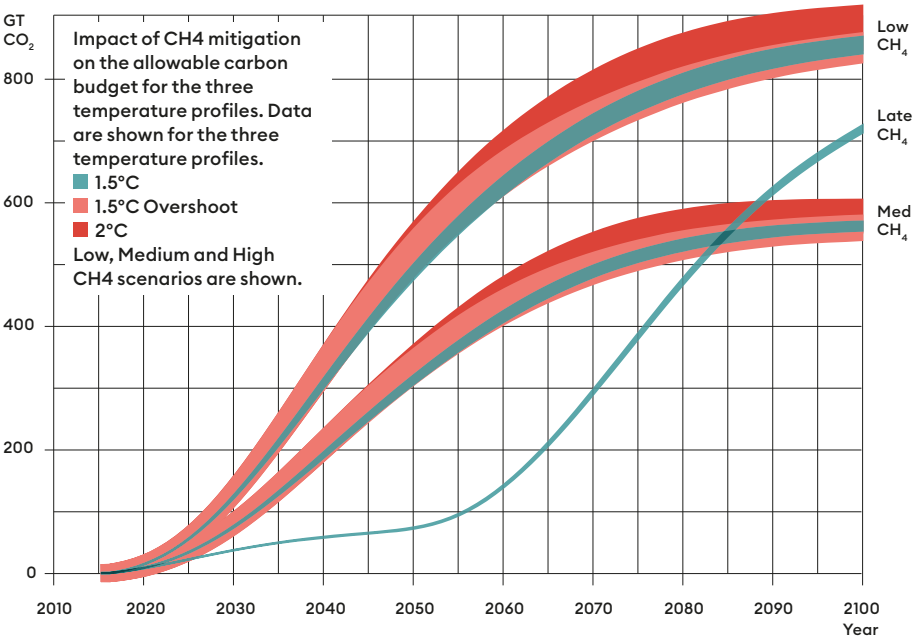
First, this study quantifies the potential climate benefit reducing methane emissions makes to limiting future warming in terms of increasing the allowable carbon budget. Second, it finds that in addition to this direct effect there is an indirect benefit of lower concentrations of ozone gas in the atmosphere, which is harmful to plants, resulting in the vegetation being able to take more carbon dioxide out of the atmosphere.

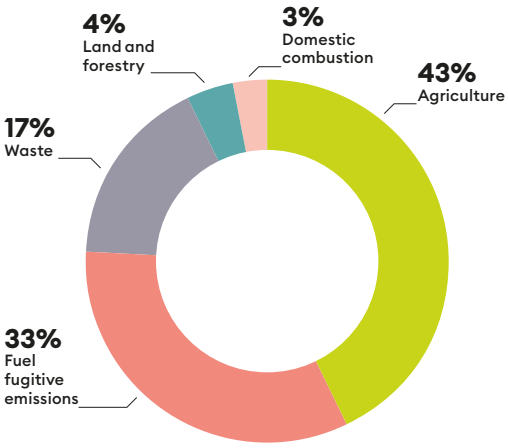
The methane reductions provide up to an extra 920 $GtCO_2$ of allowable carbon dioxide budget. The indirect benefit to the vegetation of reduced ozone damage accompanying reduced methane emissions contributes 33-103 GtC (4%-12%) depending on the assumed sensitivity of vegetation to ozone. Standard scenarios for future emissions, such as many of those from integrated assessment models typically considered in many policy discussions, often include some methane mitigation but do not include the full range of methane mitigation options. Furthermore, they underestimate the level of cost-effective mitigation as they do not account for non-climate benefits, such as on health or crops through air quality improvements.

This research finds a simple robust relationship between extra allowable carbon emissions and change in the final (year 2100) methane concentrations in the atmosphere of 1 extra allowable Gt of CO_2 for every ppb reduction in the final methane concentration). This assumes early methane mitigation, as later mitigation of methane reduces the benefit.

CAVEATS AND LIMITATIONS

› Assumptions are made in this study about the rate at which carbon is taken up by vegetation. Different assumptions would change the benefit in allowed carbon emissions. The results show a benefit of early methane mitigation rather than late, but do not assess how early "early" needs to be, or how late they can be before significantly reducing their impact.





Distribution of global CH_4 emissions in 2005 by major source type (source. EDGAR v4.1).

Policy relevance

This new research provides a clear indication of the potential of methane emission reductions towards limiting future warming. It updates previous numbers by taking account of both the direct and indirect effects of methane mitigation. The results imply that by reducing methane emissions rapidly it may be possible to either achieve lower levels of warming, or for a given warming level it means that whilst carbon dioxide emissions reductions from fossil fuels are still needed, the rates of reduction might be slightly lower and more feasible. The importance of considering methane mitigation alongside that of carbon dioxide is greater for lower temperature targets, such as 1.5°C or well below 2°C. Mitigation of methane emissions has co-benefits for human and ecosystem health.

TO FIND OUT MORE SEE

Collins, W. J., Webber, C., Cox, P., Huntingford, C., Lowe, J. A., Sitch, S., Chadburn, S. E., Comyn-Platt, E., Harper, A., Hayman, G. and Powell, T. (2018) Increased importance of methane reduction for a 1.5 degree target. Environmental Research Letters, 13 (5). 054003. ISSN 1748-9326 doi: https://doi.org/10.1088/1748-9326/aab89c

PARTNERS

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