Understanding the role of methane on the climate system

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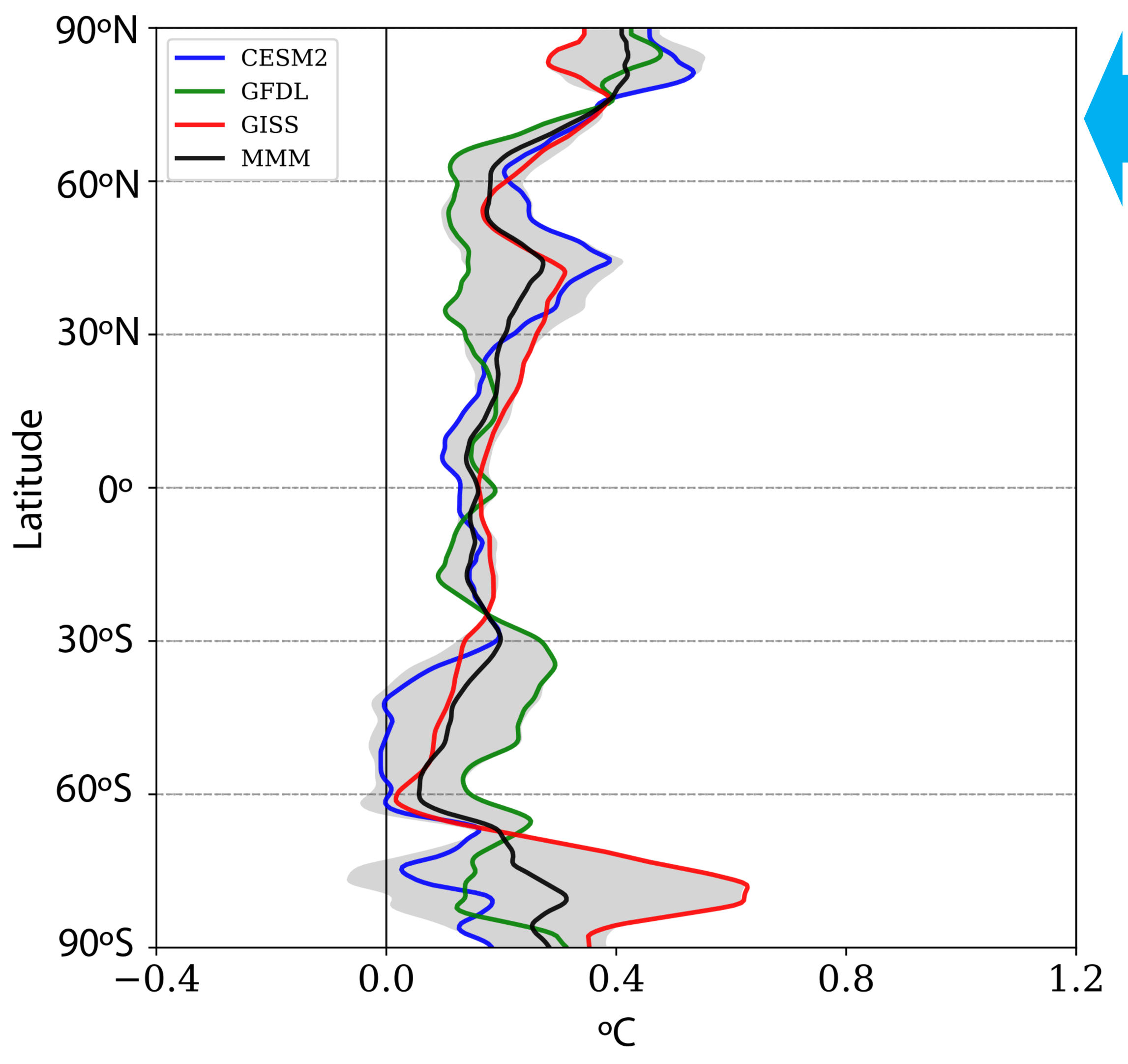
Introduction

This assessment seeks to better characterize the impacts of methane reductions with state-of-the-art modelling, and to document the multiple benefits that could be realized through methane reductions with an examination of near-term targeted mitigation measures and additional measures which contribute to other development priority goals while also reducing methane emissions.

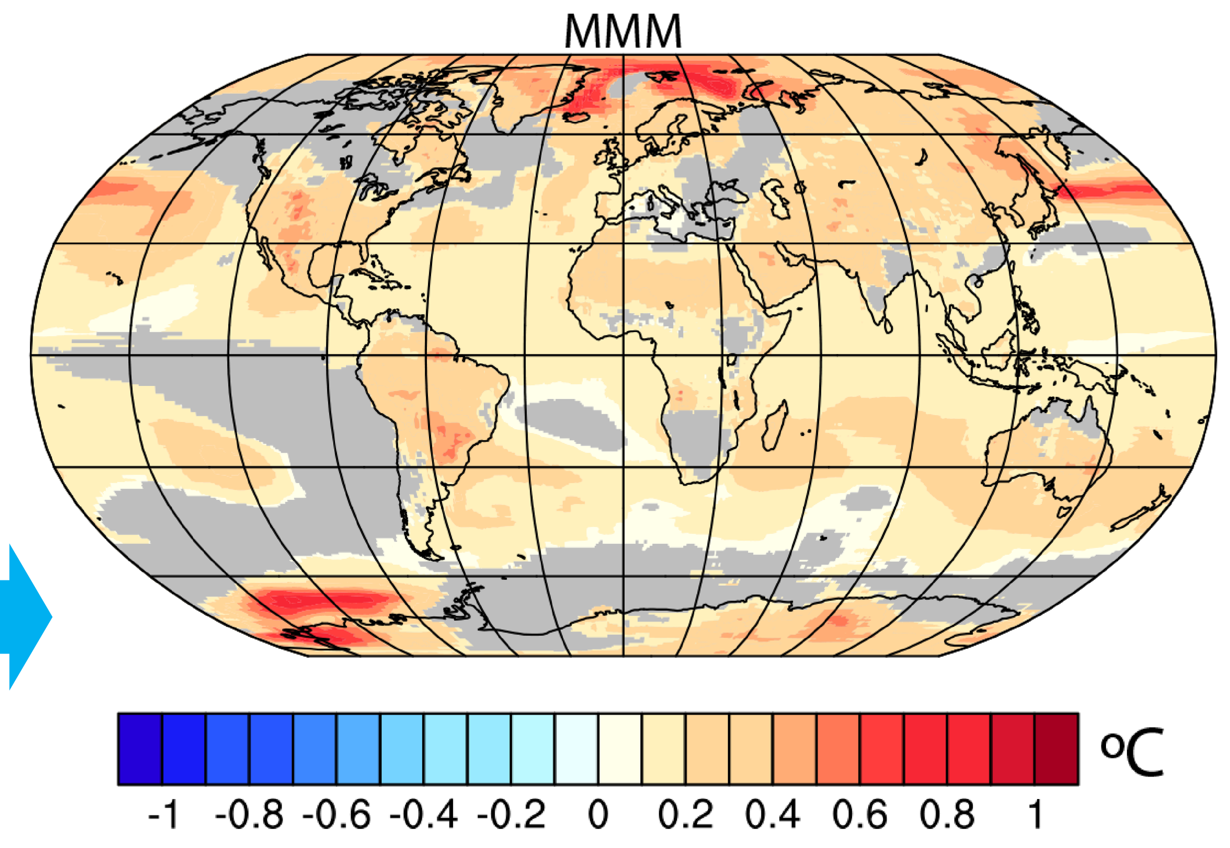
Methods

Coordinated modelling of both composition and climate responses to methane changes was carried out for this assessment by five teams using the models developed by the National Center for Atmospheric Research (NCAR; CESM2; US); the Met Office and academia (UKESM1; UK); the National Oceanic Atmospheric Administration Geophysical Fluid Dynamics Laboratory (NOAA GFDL) (ESM4.1; US); the National Institute for Environmental Studies (NIES), University of Tokyo and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) (MIROC: Japan); and the National Aeronautics and Space Administration (NASA) (GISS E2.1; US). This provides improved characterization of responses of ozone and climate and their uncertainties.

Results



Zonal mean annual average temperature repones to methane increases from one-half present methane to present value, along with the ozone and stratospheric water vapor responses to that methane increase, degrees centigrade



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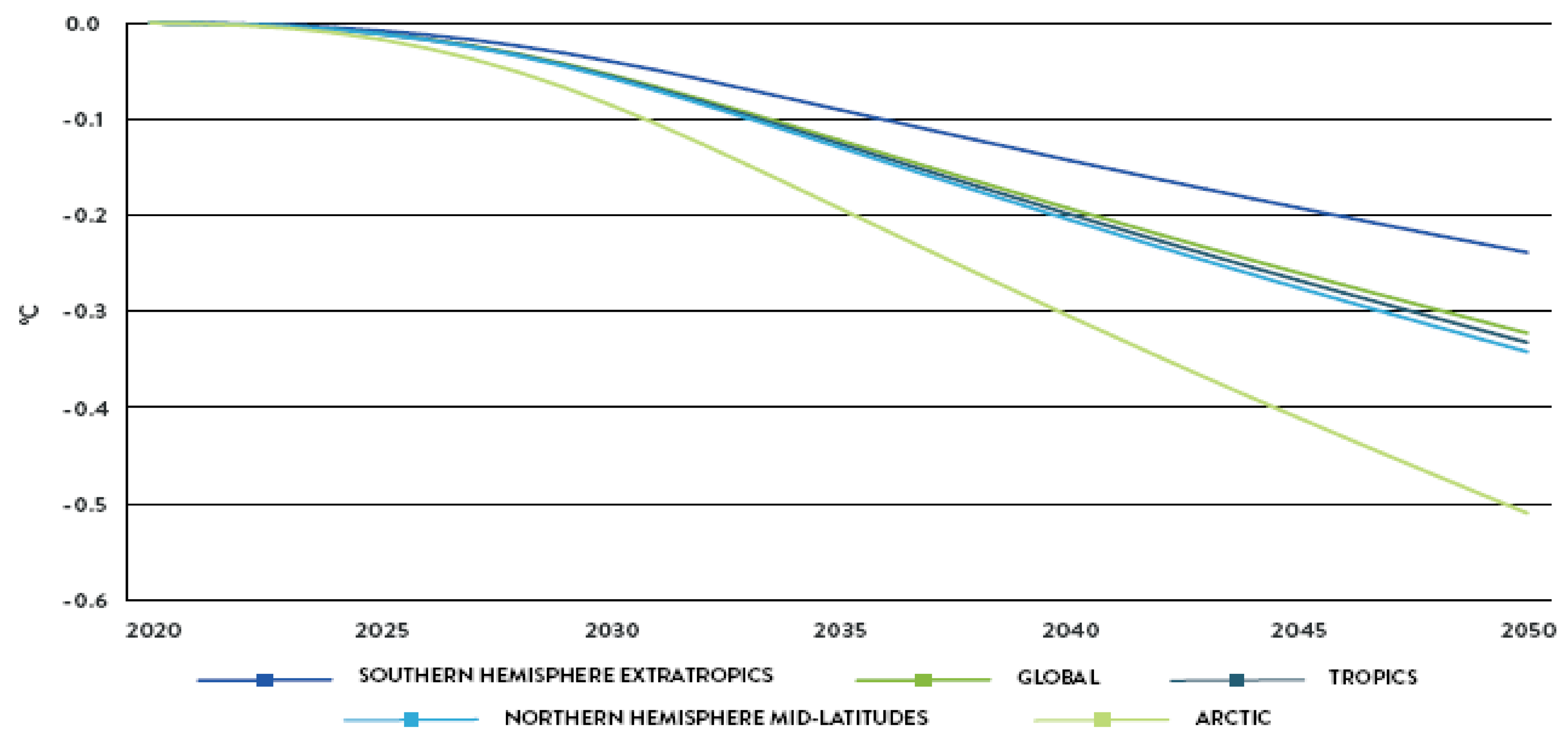
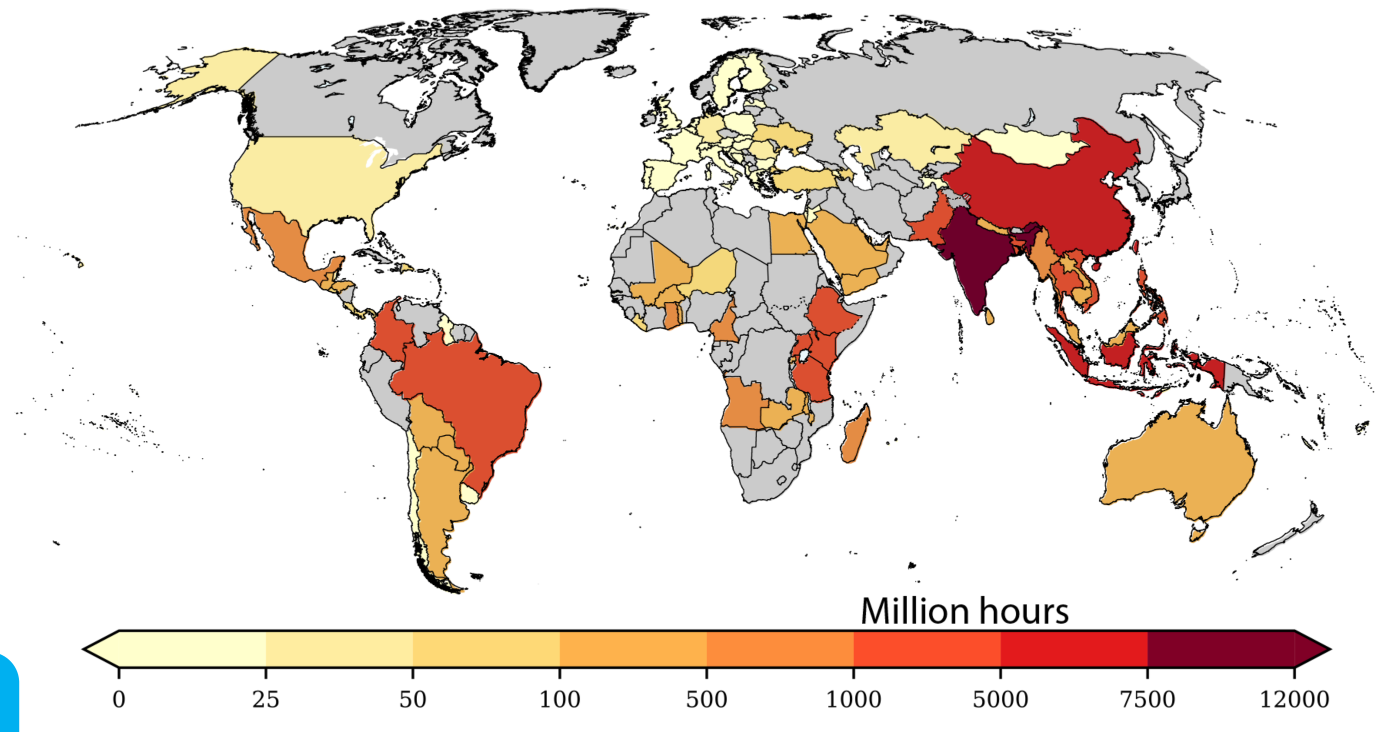
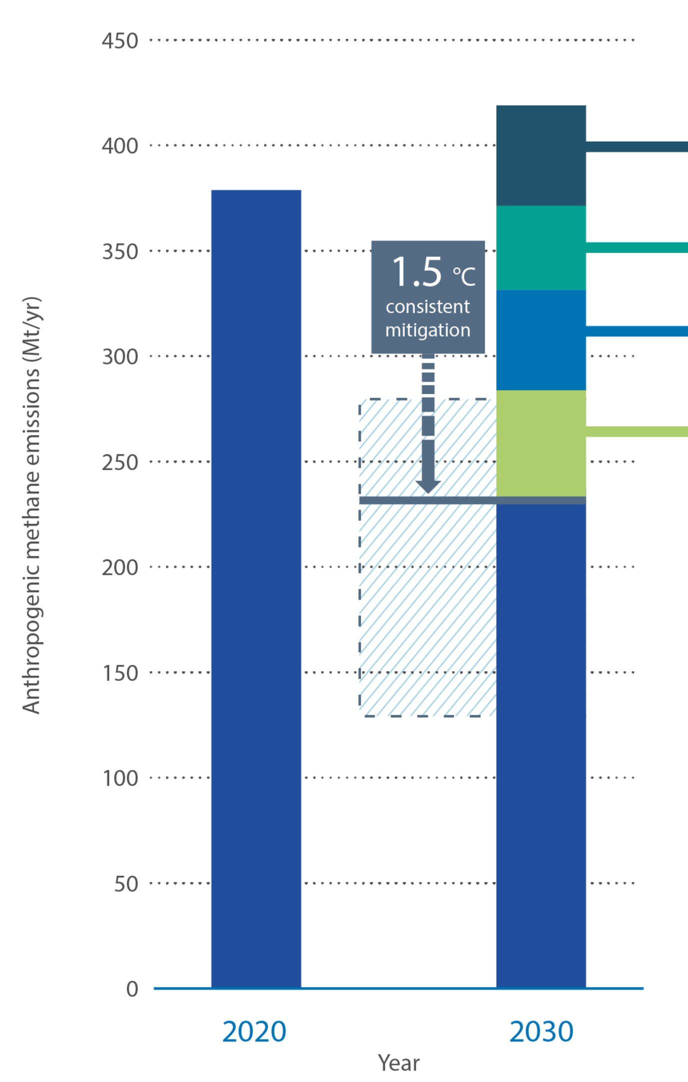


Temperature response to methane abatement from 2020-2050 based on mitigation levels consistent with 1.5º C scenarios, 2020–2050, degrees centigrade

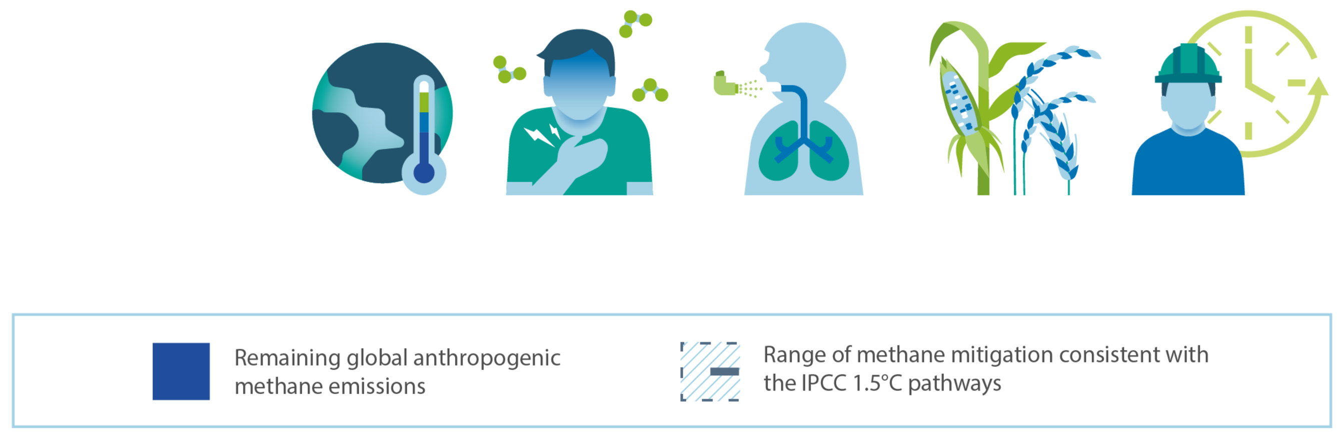
Change in lost labour hours due to heat exposure resulting from a 134 Mt increase in methane emissions, selected countries, million hours



Conclusions



	Avoided warming (C) 2040-2070	Avoided deaths ozone (per year)	Avoided asthma-related ER visits (per year)	Avoided crop losses (Mt/yr)	Lost work hours avoided (billion hrs/yr)
NEGATIVE COST	0.06	55 000	170 000	6	16
LOW COST	0.05	45 000	145 000	4	14
ALL COST	0.07	65 000	190 000	7	18
ADDITIONAL	0.10	90 000	270 000	9	25
TOTAL	0.28	255 000	775 000	26	73



Current and projected anthropogenic methane emissions and the identified sectoral mitigation potential in 2030 along with several benefits associated with sectoral-level methane emissions mitigation.

Available targeted methane measures, together with additional measures that contribute to priority development goals, can simultaneously reduce human-caused methane emissions by as much as 45 per cent, or 180 million tonnes a year (Mt/yr) by 2030. Of those, about 60 Mt/yr come from targeted measures in the fossil fuel sector, ~30 Mt/yr each in the waste and agriculture sectors, and 60 Mt/yr from “additional” measures that have other primary goals and also reduce methane including switch to renewables, energy efficiency, reduced food waste, healthy diets, and sustainable consumption/waste sorting.

UN environment programme 50 1972-2022

CLIMATE & CLEAN AIR COALITION TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

Reference: United Nations Environment Programme and Climate and Clean Air Coalition (2021). Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. Nairobi: United Nations Environment Programme.