



GLOBAL METHANE ASSESSMENT: 2030 BASELINE REPORT

WHY ACT NOW: A NEW ERA FOR ACCELERATED IMPLEMENTATION

SUMMARY FOR POLICYMAKERS



© 2022 United Nations Environment Programme

ISBN No: 978-92-807-3978-7

Job No: DTI/2476/PA

This publication may be reproduced in whole or in part and in any form for educational or non-profit services without special permission from the copyright holder, provided acknowledgement of the source is made. The United Nations Environment Programme would appreciate receiving a copy of any publication that uses this publication as a source.

No use of this publication may be made for resale or any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme. Applications for such permission, with a statement of the purpose and extent of the reproduction, should be addressed to the Director, Communication Division, United Nations Environment Programme, P. O. Box 30552, Nairobi 00100, Kenya.

DISCLAIMERS

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory or city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of a commercial company or product in this document does not imply endorsement by the United Nations Environment Programme or the authors. The use of information from this document for publicity or advertising is not permitted. Trademark names and symbols are used in an editorial fashion with no intention on infringement of trademark or copyright laws.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations Environment Programme. We regret any errors or omissions that may have been unwittingly made.

Photography: ©Shutterstock

SUGGESTED CITATION

United Nations Environment Programme/Climate and Clean Air Coalition (2022). Global Methane Assessment: 2030 Baseline Report Summary for Policymakers. Nairobi.

PRODUCTION

Climate and Clean Air Coalition (CCAC) convened by United Nations Environment Programme (UNEP).

ACKNOWLEDGMENTS

The United Nations Environment Programme (UNEP) would like to thank the authors, reviewers and the secretariat for their contribution to the preparation of this assessment report. Authors and reviewers have contributed to the report in their individual capacities. Their affiliations are only mentioned for identification purposes.

AUTHORS

Drew Shindell* (Duke University, USA), Lena Höglund-Isaksson^o (International Institute for Applied Systems Analysis, Austria), A.R. Ravishankara* (Colorado State University, USA), Ben Poulter (NASA Goddard Space Flight Center, USA), Marielle Saunio* (Laboratoire des Sciences du Climat et de l'Environnement, France), Shaun Ragnauth (US Environmental Protection Agency, USA), Jared Creason (US Environmental Protection Agency, USA), Jameel Alsalam (US Environmental Protection Agency, USA), Christophe McGlade (International Energy Agency, France), Mathijs Harmsen (PBL Netherlands Environmental Assessment Agency, Netherlands), Steve Hamburg^o (Environmental Defense Fund, USA), Daniel Zavala-Araiza (Environmental Defense Fund, USA), Stefan Schwietzke (Environmental Defense Fund, USA), Ilse Aben* (Netherlands Institute for Space Research, Netherlands), Nathan Borgford-Parnell (UN Environment Programme/Climate and Clean Air Coalition, France)

* CCAC Scientific Advisory Panel member

^o IMEO Scientific Oversight Committee member

GRAPHIC DESIGN AND LAYOUT: Katharine Mugridge

A photograph of an industrial facility at sunset. Two tall smokestacks in the foreground are emitting thick plumes of white smoke that rise into the sky. The sky is a mix of blue and orange, with large, billowing clouds. In the distance, several smaller structures or stacks are visible on the horizon. The overall atmosphere is hazy and dramatic.

SUMMARY FOR POLICYMAKERS

KEY FINDINGS

- **The amount of methane in the atmosphere is increasing at record rates.** 2021 saw the largest annual increase recorded since global monitoring began four decades ago. Current concentrations are now 260 per cent of pre-industrial levels. These increases are overwhelmingly caused by human activity.
- The Intergovernmental Panel on Climate Change (IPCC)'s Sixth Assessment shows that **human-driven methane emissions are responsible for nearly 45 per cent of current net warming.** The IPCC has continuously emphasized the critical urgency of reducing anthropogenic emissions – from methane and from other climate pollutants – if the world is to stay below 1.5° and 2°C targets.
- Achieving methane emissions reductions in the next decade will keep the planet significantly cooler than attempts to cut carbon dioxide emissions alone, largely because CO₂ emission reductions also remove cooling aerosols (Fig ES1). Since near-term deep decarbonization will generate greater temperature reductions after 2050, immediate methane reduction policies such as the Global Methane Pledge (GMP) **must be implemented alongside net-zero CO₂ efforts.**
- Evaluating the progress of efforts to reduce methane, including the Global Methane Pledge, requires characterization of what would likely happen in the absence of such efforts, which we refer to as 'baseline scenarios'. This report examines baseline projections of methane emissions over the coming decade and the implications for the Global Methane Pledge target.

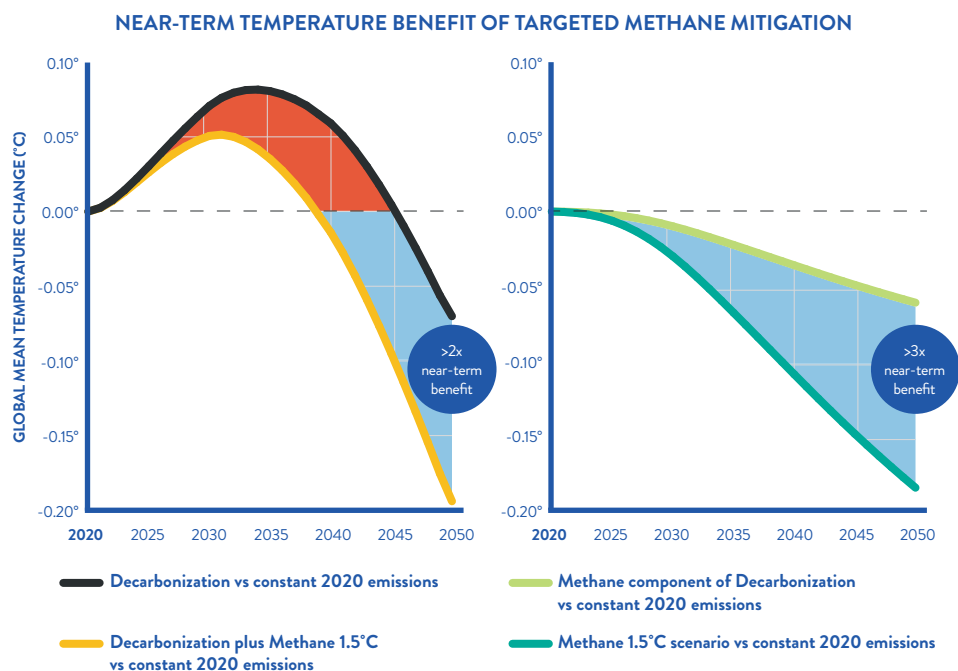


Figure ES1. (Left) The climate response under a decarbonization scenario that phases out unabated fossil fuel use (black) compared to a decarbonization scenario plus targeted methane measures consistent with a 1.5°C scenario (orange). Note that the decarbonization scenario reduces all pollutants including some methane. (Right) The climate response to only the change in methane emissions under a decarbonization scenario (light green) compared to decarbonization plus targeted methane reductions consistent with 1.5°C (turquoise), all relative to constant 2020 emissions. Values are averages across IPCC Shared Socioeconomic Pathways (SSP) scenarios 1, 2 and 5.

CURRENT ANTHROPOGENIC EMISSIONS ESTIMATES

- Today, methane emissions from human activity total between 350-390 million tonnes annually. Emissions from the agriculture and fossil fuel energy sectors are comparable, at around 120-140 million tonnes per year, roughly twice the emissions of the waste sector (Figure ES2).

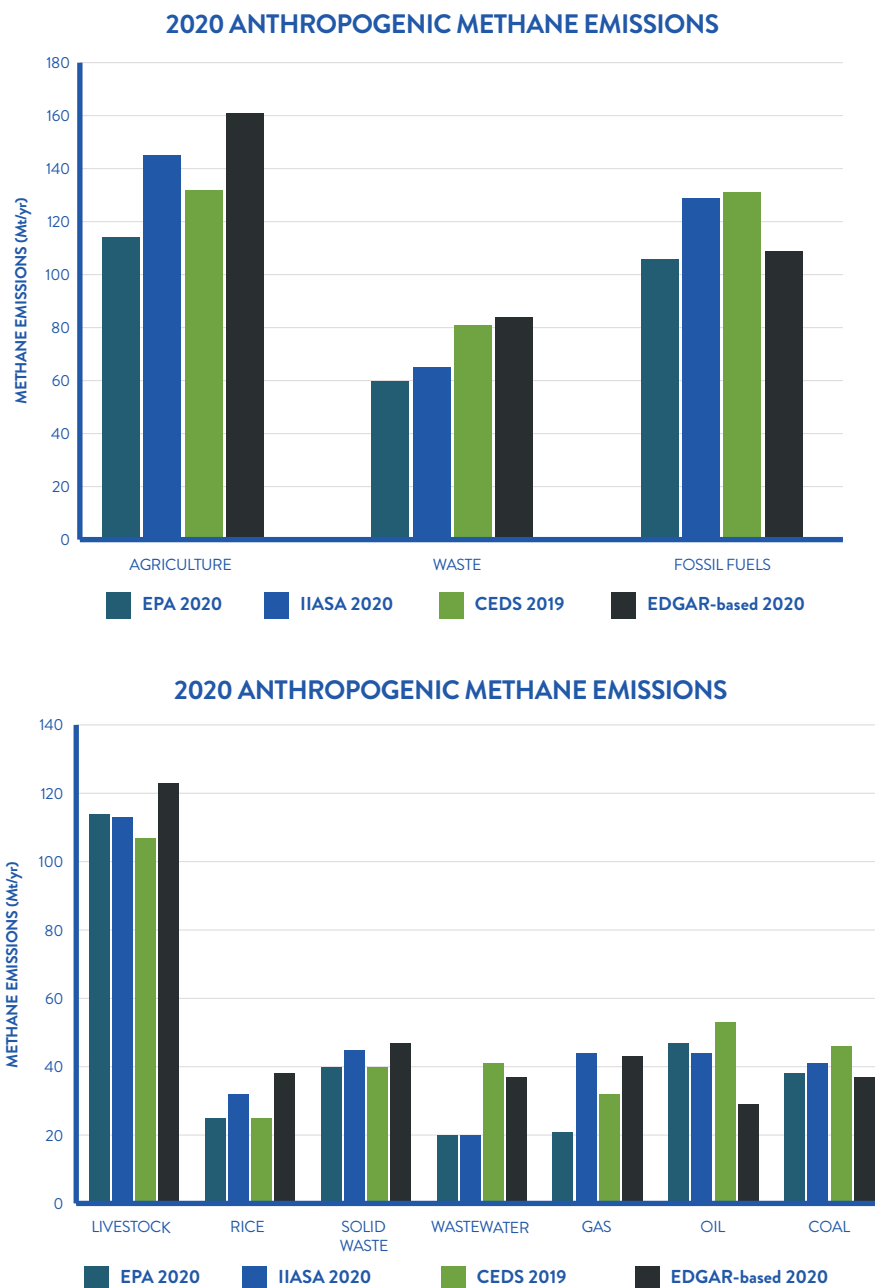


Figure ES2. Estimated anthropogenic emissions by sector (top) and subsector (bottom) from the indicated inventories (2019 for CEDS, 2020 for others) for the major sectors/subsectors.

- The magnitude of estimated emissions from major methane-producing sectors is clear, though substantial uncertainties remain in attributing emissions to specific sub-sectors (such as livestock or oil). (Figure ES2). Recent technological advances, including in airborne, ground-based, and satellite-based remote sensing, as well as collecting more emissions per activity data, will help improve our understanding of emissions from different sources. This will guide mitigation efforts more effectively and will help us track changes in emissions over time as methane reduction policies are implemented.

2030 PROJECTED BASELINE EMISSIONS

- **Without serious reduction efforts, global baseline methane emissions will continue increasing through 2030.** By 2030, methane emissions are projected to increase by between 20-50 million tonnes per year above current levels, equivalent to a 5-13 per cent increase from 2020 levels (Figure ES3).
- Emissions in the agricultural sector are expected to increase over the decade to about 11 million tonnes per year by 2030 ranging between 6 and 23 million tonnes. This is equivalent to an 5-16 per cent increase from 2020 levels. This is almost entirely due to livestock, with minimal growth (or perhaps even a decrease) in the rice sector (Figure ES4).
- Emissions in the fossil fuel sector are expected to increase over the decade to 10 million tonnes per year by 2030 (ranging between 4 and 23 million tonnes) within the oil and gas sector (especially gas), whereas methane emissions associated with coal are expected to stay roughly constant or decrease slightly. This is equivalent to an 3-17 per cent increase from 2020 levels. Coal is the only major subsector where emissions are expected to decrease over the decade (Figure ES4).
- Emissions associated with both solid waste and wastewater are projected to grow over the decade to about 9 million tonnes per year by 2030, ranging between 4- 13 million tonnes. This is equivalent to an 6-18 per cent increase from 2020 levels. Emissions from solid waste are expected to increase more rapidly in both million tonnes per year and in per cent of current emissions compared to wastewater.

ESTIMATED 2020 EMISSIONS AND EMISSIONS IN 2030 UNDER BASELINE PROJECTIONS AND WITH THE GLOBAL METHANE PLEDGE (GMP).

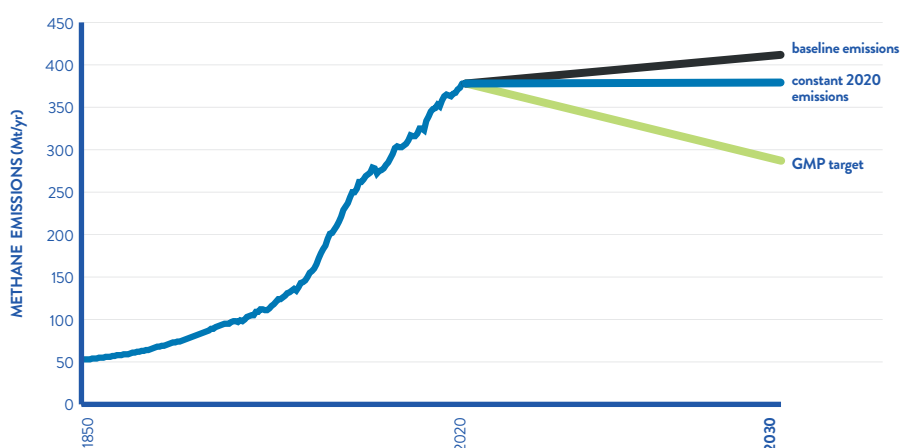


Figure ES3. Estimated 2020 emissions and emissions in 2030 under baseline projections and with the Global Methane Pledge (GMP).

METHANE MITIGATION PATHWAYS IN THE GLOBAL METHANE ASSESSMENT

- The 2021 Global Methane Assessment found that least-cost scenarios for limiting warming to 1.5°C require methane emissions reductions of about 60% from fossil fuels, 30-35% from waste, and 20-25% from agriculture by 2030, relative to 2020 emissions.
- Currently available targeted and behavioral measures could reduce emissions from these major sectors by approximately 180 Mt/yr, or as much as 45 per cent, by 2030.
- **Roughly 60 per cent**, around 75 Mt/yr, of available targeted measures **have low mitigation costs, and just over 50 per cent of those have negative costs**. Low-cost abatement potentials range from 60–80 per cent of the total for oil and gas, from 55–98 per cent for coal, and approximately 30–60 per cent in the waste sector.

PROJECTED EMISSIONS CHANGE, 2030 VS 2020

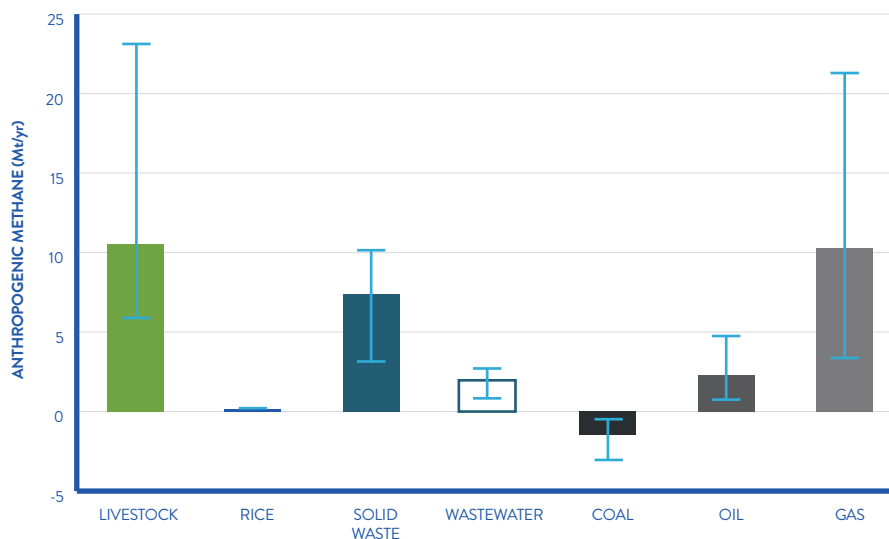


Figure ES4. Projected change in methane emissions over the decade between 2020 and 2030 by subsector.

- At the regional level, the Middle East/Africa and Asia are expected to see the largest growth in baseline annual emissions, with large increases in all sectors in the Middle East/Africa, but primarily in the agriculture and waste sectors in Asia (Figure ES5).

PROJECTED METHANE EMISSIONS CHANGE, 2030 VS 2020 BY REGION

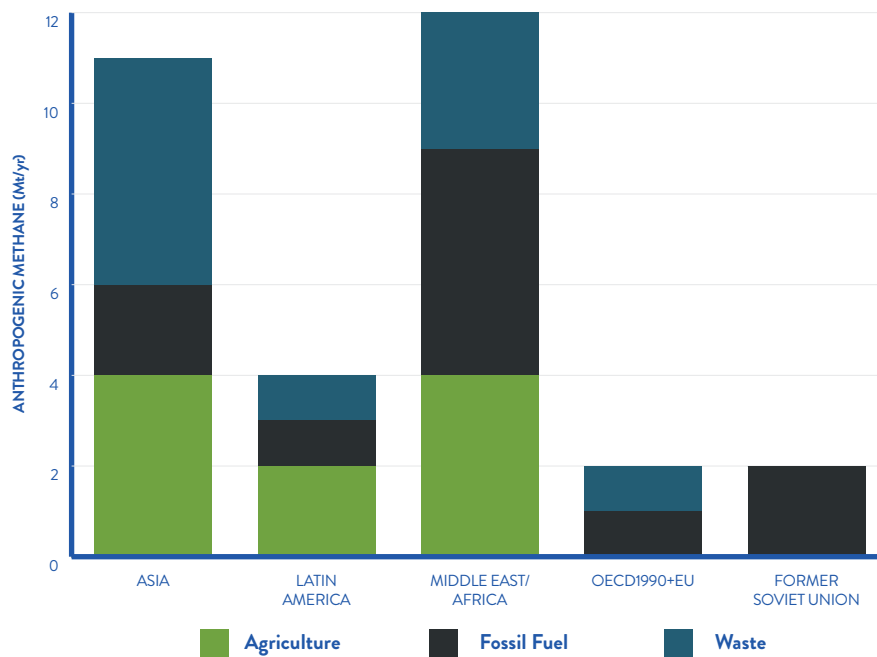


Figure ES5. Projected change in methane emissions by region and sector over the decade.

- On a per capita basis, however, the increases are much larger in the former Soviet Union than in any other region. These are almost entirely attributable to the fossil fuel sector.



THE GLOBAL METHANE PLEDGE (GMP)

- The Global Methane Pledge targets at least a **30 per cent reduction in human-caused methane emissions below 2020 levels by 2030**. Achieving the GMP target would require a decrease in annual emissions from approximately 380 million tonnes in 2020 to less than 270 million tonnes in 2030—a drop of at least 110 million tonnes. Compared to baseline methane emissions in 2030, this represents a 36% reduction in methane emissions, equivalent to at least 150 million tonne reduction, by 2030 from baseline levels.
- The Global Methane Pledge target is within the range of reductions needed to keep methane levels consistent with 1.5C scenarios (30-60 per cent by 2030 from 2020 levels). Given the record pace of rising methane levels and the projected continued increase demonstrated in this report, **the world must implement methane reduction policies covering all three main anthropogenic sectors immediately to avoid the worst impacts of climate change.**

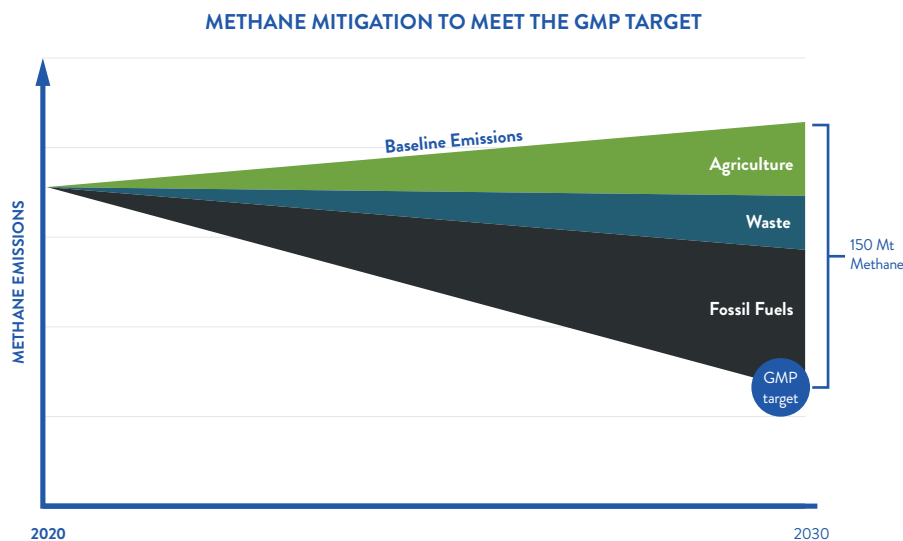


Figure ES6: **Illustrative example of the GMP-consistent methane emissions reduction pathway to 2030.** Mitigation in all three main anthropogenic sectors is required to achieve the GMP target in 2030 with slightly more than half of the mitigation expected to come from the fossil fuels sector.

- **Achieving the Global Methane Pledge target would reduce warming by at least 0.2°C between 2040 and 2070** as compared with the baseline projected methane increase identified in this report.
- Using the results from the 2021 Global Methane Assessment, we calculate that Global Methane Pledge would provide additional benefits worldwide through 2050, beyond keeping the planet cool, including:
 - Prevention of roughly 5.6 million premature deaths due to ozone exposure
 - Avoidance of ~580 million tonnes of yield losses to wheat, maize (corn), rice and soybeans
 - Avoidance of ~\$500 billion (2018 US\$) in losses per year due to non-mortality health impacts, forestry and agriculture
 - Avoidance of ~1,600 billion lost work hours due to heat exposure
- The Global Methane Pledge complements broader carbon dioxide reduction efforts which will reduce some methane, but not enough to align with 1.5°C scenarios. Methane reductions from decarbonization (mostly reduced fossil fuel use) make up a little less than one-third of the total methane mitigation required to meet IPCC 1.5°C scenarios (Fig ES1).
- The global monetized benefits for all market and non-market impacts are approximately US\$ 4 300 per tonne of methane reduced¹. When accounting for these benefits **nearly 85 per cent of the targeted measures have benefits that outweigh the net costs**. The benefits of the annually avoided premature deaths alone from achieving the GMP target is approximately US\$ 380 billion per year.

1. US\$ 4 300 per tonne of methane reduced corresponds to ~US\$ 150 per tonne of carbon dioxide equivalent if converted using the IPCC Sixth Assessment Report's GWP-100 value of ~29.



**A PICTURE OF THE WORLD
WITHOUT NEW METHANE ACTION
AND WHAT TO DO ABOUT IT.**

