Mitigating Methane

a Global Health Strategy — Overview

Produced by Abt Associates on behalf of the Global Climate and Health Alliance
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Abt ASSOCIATES

THE GLOBAL CLIMATE & HEALTH ALLIANCE

About GCHA

The Global Climate and Health Alliance (GCHA) is the leading global convenor of health professional and health civil society organizations addressing climate change. We are a consortium of health and development organizations from around the world united by a shared vision of an equitable, sustainable future, in which the health impacts of climate change are minimized, and the health benefits of climate solutions are maximized. GCHA works to elevate the influential voice of the health community in policy making to address the climate crisis.

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All interviewees were informed of the purpose of the interview and how the information from the interview would be used. Oral consent was given and no interviewees received compensation for their engagement with the research.

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Find all *Mitigating Methane: A Global Health Strategy* reports and supporting material at this link:

https://climateandhealthalliance.org/initiatives/methane-health/

1 Introduction

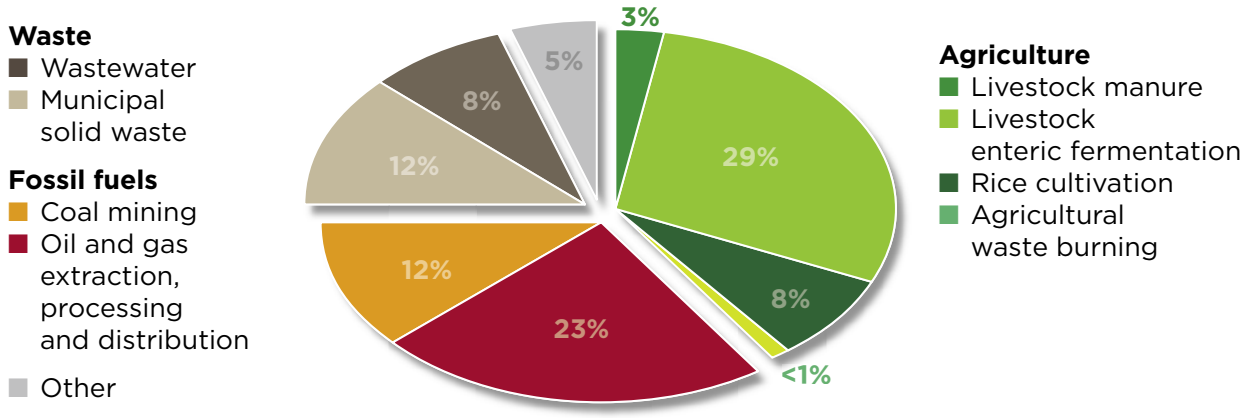
Methane affects human health through multiple, interconnected pathways. Methane is a powerful greenhouse gas (GHG) that is accelerating global warming and worsening air quality by contributing to the formation of ground-level ozone, a toxic air pollutant. Pollutants emitted along with methane — otherwise referred to as methane co-pollutants — contaminate the air, water, and soil humans depend on. Methane emitted today only remains in the atmosphere for 12 years, which means that while methane exerts health and climate effects for several years after being released into the atmosphere, cutting methane now can deliver immediate and substantial health benefits. Limiting global warming to 1.5C without overshooting cannot be achieved without deep cuts to methane emissions.

Currently, half of the methane in the atmosphere comes from human activities, while the remaining half is from natural sources like swamps, bogs, marshes, and wetlands. Around 95 percent of anthropogenic, or human-caused, methane is emitted from the energy, agriculture, and waste sectors, as shown in Figure 1. Recognizing the importance of a rapid and deep reduction in methane emissions as a key component of limiting global warming, the United States and European Union launched the Global Methane Pledge (GMP) in 2021 at the United Nations climate negotiations, COP26, in Glasgow. To date 150 countries have signed the pledge.

The largest source of anthropogenic methane emissions is the agriculture sector, encompassing over 40% of methane emissions. Around 33 percent of methane from the agriculture sector comes from livestock production from the digestive process of livestock — also known as enteric fermentation — and the decomposition of organic material in livestock manure under anaerobic (oxygen-free) conditions such as manure lagoons and pits. Rice cultivation, which involves flooded rice paddies, creates hospitable conditions for methanogenic organisms to thrive and produce methane. Agricultural land clearing practices, which involve cutting or burning plants and trees to make space for farming or livestock, release methane stored in the soil and roots.

The energy sector is the second largest source of methane emissions, responsible for 35 percent of emissions. In the oil and gas sector, the leakages, venting, and flaring of natural gas — a fossil fuel made of 70 to 90 percent methane — contribute a significant proportion of energy sector methane emissions. During coal mining, methane from coal deposits deep underground is released into the atmosphere. Finally, the waste sector, which encompasses wastewater and municipal solid waste, accounts for 20 percent of methane emissions. Methane from the waste sector comes from the decomposition of organic waste under anaerobic conditions at landfills, open dumpsites, or wastewater systems.

Figure 1: Global Anthropogenic Methane Emissions by Sector



Source: 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

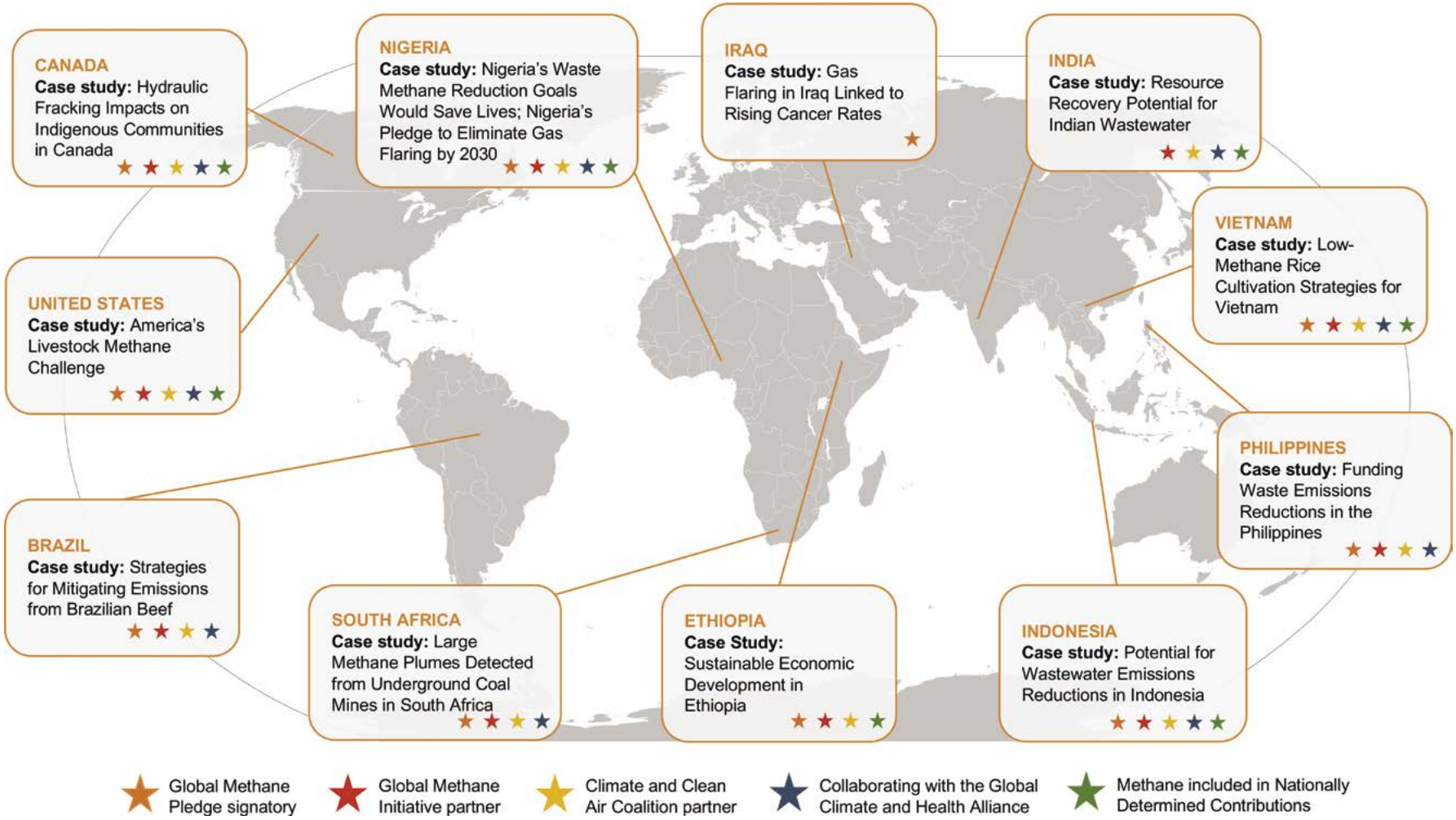
The impacts of methane on health and health benefits of methane mitigation strategies are not widely recognized, leaving root causes of poor health unaddressed. There are significant opportunities to advocate for strategies that reduce methane emissions and improve public health. Furthermore, increased understanding of the potential health benefits could have a powerful influence on the views and behaviors of the public and on the actions of policymakers and decisionmakers that could drive transformational system changes in the way we produce and utilize energy, produce and consume food, and manage waste. These transformations would ultimately result in reduction of methane emissions and associated health risks and offer the potential for significant health benefits.

The *Mitigating Methane: A Global Health Strategy* report series aims to close the knowledge gap on the intersection of methane and human health. This overview report provides a high-level discussion of how methane impacts human health, and is companion to the below sector-specific reports:

1. *Mitigating Methane from the Energy Sector, A Global Health Strategy*
2. *Mitigating Methane from the Food and Agriculture Sector, A Global Health Strategy*
3. *Mitigating Methane from the Waste Sector, A Global Health Strategy*

Each sector-specific report includes information on methane sources, methane reduction strategies at the local, national, and international level, and relevant case studies. The map below, Figure 2, includes all the countries that were included as case studies in the sector-specific reports. The map includes information on whether the countries are signatory to the GMP, partner with organizations actively working in methane mitigation — such as the Global Methane Initiative (GMI) or Climate and Clean Air Coalition (CCAC), have methane included in their Nationally Determined Contributions (NDC) under the Paris Agreement, and are collaborating with the Global Climate and Health Alliance (GCHA). This information could indicate potential countries for deeper engagement on methane and health.

Figure 2: Map of Country Case Studies for Sector-Specific Reports



2 How Methane Impacts Human Health

Methane and Climate Change

Methane is a powerful greenhouse gas (GHG) responsible for 45 percent of global temperature increases since the industrial revolution[1]. Despite its comparatively short atmospheric lifetime, one ton of methane can trap 25 times more heat in the atmosphere than one ton of carbon dioxide over a century, accelerating climate change at a rate that threatens global health[2]. Methane's short atmospheric lifetime, combined with its high global warming potential, means cutting methane today will immediately slow the pace of climate change to complement longer term action, while providing long-lasting human health co-benefits. The Intergovernmental Panel on Climate Change (IPCC) found that all pathways with the potential to limit warming to 1.5C with little or no overshoot require significant reduction in methane emissions[3].

Climate change has been linked to various direct and indirect health impacts, from vector and water-borne disease incidence to downstream health risks due to food insecurity and migration (refer to GCHA's Climate and Health Briefing for more information). Climate-related health risks disproportionately impact vulnerable groups, including lower-income groups, young children, the elderly, pregnant women, Indigenous Peoples, and those with pre-existing conditions[4]. Extreme heat is particularly detrimental to human health. Extreme heat can aggravate cardiovascular, cerebrovascular, and respiratory diseases, as well as diabetes-related conditions[5]. Hot and humid conditions could increase the spread of communicable diseases such dengue and malaria[6]. In countries with limited clean drinking water, dry conditions can deplete clean water supplies, increasing the risks of waterborne diseases[7]. High heat stress can negatively affect mental health, reduce physical work capacity, and increase the risk of occupational health problems[8]. Overall, the IPCC found with high confidence that climate change can lead to an excess of 250,000 deaths per year by 2050, compared to 1961-1990; under a high emissions scenario, 9 million climate-related deaths per year are predicted by 2100[9].

Methane and Air Quality

Methane emissions are directly detrimental to human health by contributing to the formation of tropospheric, or ground-level ozone, an air pollutant and GHG. Tropospheric ozone can damage airways, trigger asthma attacks, and aggravate lung diseases. Long-term exposure to tropospheric ozone can lead to premature mortality from respiratory illnesses, cardiovascular diseases, and cancer[10]. The 2022 Global Methane Assessment identified a linear relationship in tropospheric ozone responses to methane concentrations — as methane concentrations increase, so does ozone.[11] An estimated 1.04 to 1.23 million respiratory deaths in adults over 30 years old are associated with exposure to ground-level ozone[12].

Methane is typically emitted with other co-pollutants that directly lead to negative health outcomes[13]. For example, in the energy sector, the venting and flaring of natural gas releases methane along with volatile organic compounds (VOCs) that can cause cancer, affect the nervous system, or cause birth defects[14]. The use of gas cookstoves in homes can leak methane along with nitrogen oxide (Nox), which can cause increased incidence of asthma and respiratory illnesses[15], and benzene, a known carcinogen[16]. In the agriculture sector, land clearing — the process of

removing trees and vegetation through fires — releases methane along with black carbon, particulate matter, and VOCs that exacerbate respiratory conditions and affect children's lung health[17]. In the waste sector, landfill fires — ignited by methane produced from the decomposition of organic waste — produces black carbon and carbon monoxide, which threaten the health and safety of surrounding communities. Co-pollutants emitted with methane can further contribute to the formation of other air pollutants such as NOx emitted with methane that can further contribute to the formation of tropospheric ozone.

Methane and Other Human Health Impacts

Under high concentrations, methane is highly flammable and explosive leading to injuries and loss of life due to activities in the fossil fuels sector. Methane leakages from natural gas pipelines have resulted in deadly fires and explosions. In the United States, for example, fossil fuel pipelines have resulted in more than 5,500 accidents, 800 fires, 300 explosions, 600 injuries, and 125 fatalities[18]. When methane is present in high concentrations and in poorly ventilated coal mines it can cause explosions, as in a 2022 incident in which ten coal miners were killed due to a coal mine explosion in Indonesia[19].

In the waste sector, improper solid waste management and wastewater treatment and sanitation can also have devastating health impacts. For example, infrequent waste collection can lead to a buildup of organic waste, which — under hot and humid conditions — can quickly decompose and produce methane, along with odors and leachate that attract disease-carrying pests and insects. Leachate can leak into groundwater and surface water, putting the health of surrounding communities that rely on these water sources at risk. In areas that lack appropriate sanitary sewage systems or managed household plumbing, pit latrines and open defecation lead to methane production, and contribute to increased rates of infection, disease, and pathogen transfer.

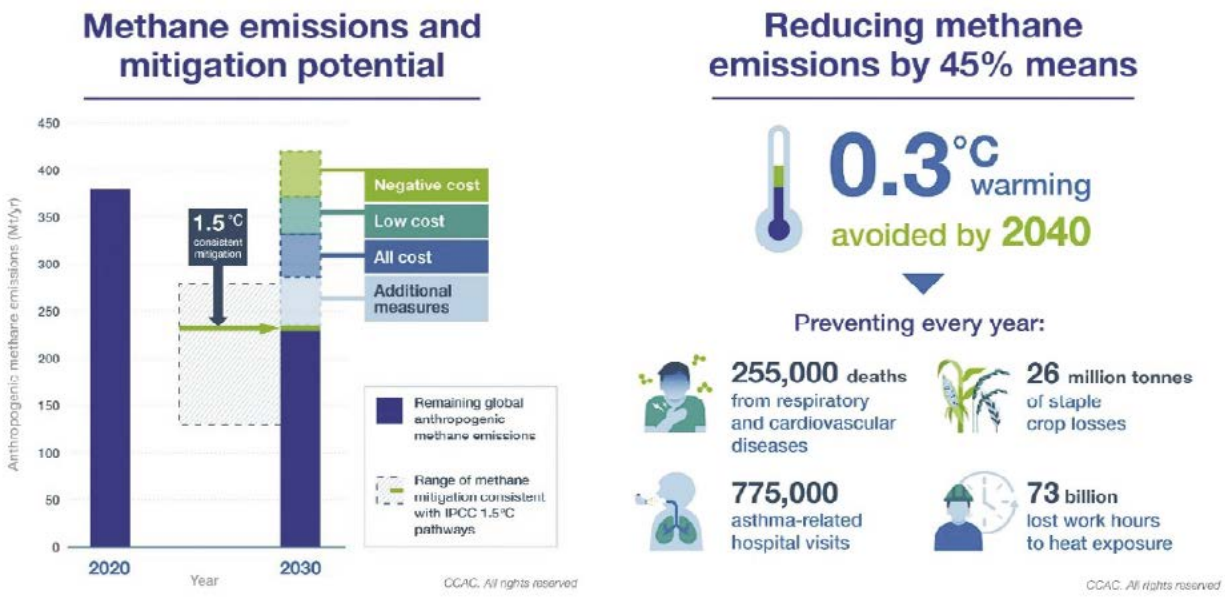
3 Solutions and the Way Forward

Today, there are opportunities to drive transformational system changes that could reduce methane emissions and associated health risks. In the energy sector, it is time to accelerate the phaseout of the production and consumption of fossil fuels, which is not only essential to control climate change, but will also improve public health by avoiding the health risks associated with climate change, methane emissions, and the myriad health impacts of fossil fuel production and use. Increasing access to more plant-rich diets grown in regenerative and equitable agricultural systems, would reduce emissions, abate deforestation, and land degradation, and improve health outcomes, in particular by significantly reducing non-communicable diseases. In the waste sector, improving solid waste management and sanitation would not only cut methane emissions, but also improve water quality, air quality, and reduce disease transmission.

While promoting transformational system changes is essential, targeted technical strategies to reduce methane emissions in the near-term are just as important. According to the Global Methane Assessment, cost effective solutions to mitigate methane in each sector are readily available to implement around the world[20]. These solutions may include leak detection and repair technologies to detect and capture methane from natural gas pipelines, methane-to-energy technologies that capture methane from landfills and agricultural activities to generate energy, or livestock feeding and care practices that improve animal health while reducing methane emissions.

Deploying readily available, near-term methane mitigation strategies alone could reduce human-caused methane emissions by 45 percent, equivalent to warding off about 0.3°C of global warming by 2045[21]. With technical and capacity building support, low-and-middle-income countries can deploy many of these methane mitigation measures at low cost with great benefit to public health, while high-income countries can invest in research, development, and demonstration of methane mitigation technologies that are more nascent and expensive. The 2022 Global Methane Assessment estimates that reducing methane emissions through readily available measures could avoid 255,000 deaths, 775,000 asthma-related emergency room visits, and 73 billion lost work hours per year (see Figure 3)[22].

Figure 3: The Projected Avoided Health Impacts from the 2022 Global Methane Assessment



Source: United Nations Environment Programme and Climate and Clean Air Coalition (2021).

Many countries are beginning to ramp up methane action, making this an opportune time to engage and advocate for change. Signatories to the GMP have committed to collectively reduce methane emissions by 30 percent by 2030 relative to 2020 levels[23]. To deliver on this pledge, more than 50 countries are developing or have developed national methane action plans and 95 percent of NDCs under the Paris Agreement reference methane[24]. Despite this momentum, the link between methane reduction and human health benefits are not adequately reflected in methane plans and NDCs, an essential gap that the health community can amplify in global and national fora.

Ongoing initiatives focused on reducing methane and improving public health provide a great opportunity for the health community to be immediately involved in methane action. The Global Methane Hub, Global Methane Initiative, Climate and Clean Air Coalition, and other organizations are deploying methane mitigation solutions across the energy, agriculture, and waste sectors.

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