IMPORTANCE OF METHANE In Addressing Climate Change

Methane, a short-lived climate pollutant (SLCP), is the second largest contributor to global climate change.[1] Increasingly under international scrutiny, atmospheric methane concentrations continue to rise (Figure 1).[2]

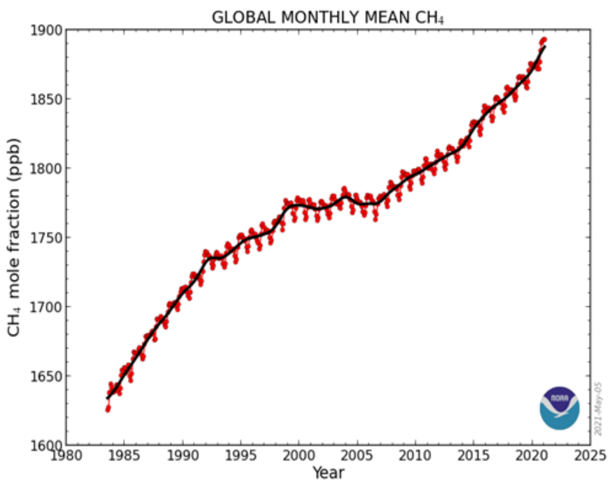

Figure 1. *Trends in global methane since 1983*

The largest anthropogenic sources of methane in the U.S. are oil and gas production and distribution, agriculture, and landfills (Figure 2).[3,4]

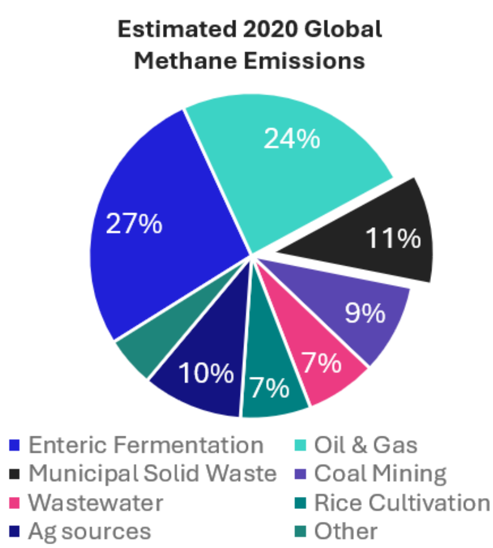

Figure 2. *Methane emissions estimates with landfills disposing municipal solid waste as the 3rd largest emitter of methane.*

What is methane?

Methane is a potent greenhouse gas (GHG). Its molecular structure allows it to absorb significant infrared energy on its way out of the Earth's atmosphere. While naturally occurring, human activity has led to increasing levels in the atmosphere - the current concentration of methane is 2.5x greater than pre-industrial levels.[5]

How does methane compare to CO_2 and what makes it so potent?

Methane's potency makes it a **major** contributor to climate change, responsible for about **30%** of the rise in global temperatures since the Industrial Revolution.[6]

Methane is a relatively short-lived gas in the atmosphere, with a half-life of around 12 years, but it is very strong. According to the IPCC's 6th Assessment Report, methane has a 20-year Global Warming Potential (GWP) of 80-83[7] and a 100-year GWP of 27-30. In other words, the global warming impact of one tonne of methane over 20 years is equal to that of 82 tonnes of CO_2.

Which GWP timeframe is most accurate?

The choice of the 100-yr timeframe commonly used for GWPs in GHG reporting, inventories, and even scientific studies is arbitrary and not based in science. Some have even called it "an accident of history."[8] According to the IPCC's 5th Assessment Report:

> "There is no scientific argument for selecting 100 years compared with other choices. The choice of time horizon is a value judgment because it depends on the relative weight assigned to effects at different times."[9]

Moreover, there is growing recognition that the 100-year GWP does not accurately capture the climate impacts of SLCPs, including methane. For years, climate scientists have been calling for reporting using 20-year GWP and the separate regulation of climate pollutants like methane due to its differences relative to CO_2, particularly its potency.[10-14]

Last Updated: September 2024

Climate change tipping points are also much sooner than we thought even a decade ago. To avoid the most significant impacts of climate change, we need to achieve significant reductions by 2050, less than 30 years from now. Picking one time-specific metric (i.e. GWP) for pollutants that have different potencies and lifetimes in the atmosphere is similar to "putting a sprinter and marathoner in the same race."

Climate authorities need to address the importance of non-CO_2 emissions and their role in avoided warming from methane reduction, "yet the 100-year CO_2e values remain ubiquitous in business and country commitments as well as key technology scenarios — discounting or disregarding the opportunity to cut emissions of other pollutants.[15]

> ***"Cutting methane is the strongest lever we have to slow climate change over the next 25 years."***
> Inger Andersen, Executive Director of UNEP[31]

Who is using the 20-year GWP?

California in its *Short-Lived Climate Pollutant Reduction Strategy*[16] concluded the 20-year GWP "gives a better perspective on the speed at which SLCP emission controls will impact the atmosphere relative to CO_2 emission controls."

Most recently, New York State has adopted the 20-year GWPs in its ambitious legislation to reach net zero GHG emissions by 2050,[17] and New Jersey now requires the use of the 20-year GWP in examining climate policies as well.[18]

In its *Policy and Action Standard*, the World Resources Institute (WRI) GHG Protocol recommends the use of the 20-year GWP in looking at the significant effects of policies or actions designed to reduce emissions of SLCPs;

> "Twenty-year GWP values may be used to focus on short-term climate drivers and should be used if the policy or action accessed is specifically designed to reduce emissions of short-lived greenhouse gases, such as methane."[19]

Why is it important to reduce methane and other SCLP emissions?

In the near-term, reducing emissions of SLCPs like methane is more effective than reducing CO_2.[20] The levels of GHG mitigation needed to keep warming to 1.5° C will not be achieved by broader decarbonization strategies alone. A United Nations Environment Programme (UNEP, 2021) report found that "we cannot achieve the Paris Agreement targets without immediately reducing methane along with carbon dioxide and all other climate forcing emissions."[21] Focused strategies specifically targeting methane need to be implemented to achieve sufficient methane mitigation alongside strategies for long term CO_2 reductions.[22,23]

The International Energy Agency (IEA) has called for a focus on methane reduction, calling it the "most impactful way to limit near-term climate change."[24]

The Biden administration's joint Press Release with the European Union announcing the Global Methane Pledge has focused the international community on this important issue. "Rapidly reducing methane emissions is regarded as the single most effective strategy to reduce global warming in the near term and keep the goal of limiting warming to 1.5 degrees Celsius within reach."[25]

Reducing methane also has important public health benefits.[26,27,28] Methane contributes to the formation of ground-level ozone, which can negatively affect mortality rates and have significant impacts on both respiratory and cardiovascular systems.[29] Cutting emissions by 3.7 million metric tons, roughly equal to U.S. landfill methane emissions,[30] would save nearly 5,500 asthma-related emergency department visits annually.[31]

> ***"Cutting human-caused methane emissions would have profound climate, health and economic benefits, but we have to start now."***
> Drew Shindell, Professor of Earth Science at Duke[28]

How can we achieve methane emissions reductions?

According to the Biden Administration's Methane Emissions Reduction Action significant opportunities also exist in the waste sector.[32] Landfills are a leading source of anthropogenic methane both globally and in the United States.[33,34] Even when gas collection systems are in place, they only collect **30 – 55%** of the gas over the lifetime, leaving roughly two thirds of methane uncollected and emitted.[35-42] Better collection of landfill gas can help reduce these emissions.

Even with better monitoring and regulation, landfills will still invariably leak methane, necessitating approaches to divert organics from landfills to prevent its generation in the first place. Despite stringent regulations in California, its landfills were identified on a list of the state's methane "super-emitters" in a recent study.[43]

The European Union has already made significant strides in diverting organics from landfills, resulting in significant GHG emission reductions from the waste sector. With over 250 million tons going into landfills every year, the U.S. has significant room to divert organics to reuse, recycling, and energy recovery. With a 35% reduction in waste generation and an overall 85% landfill diversion rate, the U.S. could reduce methane emissions by 8 million metric tons, equivalent to mitigating the methane emissions of the entire U.S. agricultural sector or entire U.S. oil & gas production and distribution segment.[44]

For more information, please e-mail us:
sustainability@reworldwaste.com

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