

Methane 101:

Methane, Climate Change, and A Call to Action



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Methane (CH₄) is a powerful greenhouse gas that is second only to carbon dioxide (CO₂) as a major contributor to climate change (Figure 1). The situation is dire; the concentration of methane in the atmosphere has doubled over the last two centuries. Most critically, *methane is over 25 times more potent than CO₂ at trapping heat.*¹

The good news is that we possess the technology, know-how, and capacity, to significantly decrease the amount of methane emitted into the atmosphere.

While some sources of methane occur naturally, a great deal is due to human activity (anthropogenic), particularly from oil and gas production and use. Therefore, if we can work together to decrease methane emissions from anthropogenic sources, we can significantly combat climate change.

The Greenhouse Effect in Brief

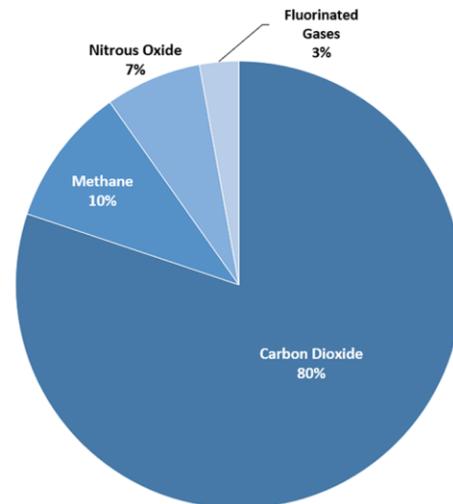
Our planet is in a global warming crisis due to “The Greenhouse Effect,” an over-abundance of gases in the atmosphere, such as methane, carbon dioxide, and others, that trap heat from the sun and prevent it from escaping back into space.

A certain amount of heat-trapping by the atmosphere is necessary, or else we would all freeze. Still, since the beginning of the industrial era, the concentrations of greenhouse gases in our atmosphere have been increasing steadily to the point of too much heat-trapping. The result is higher than normal global temperatures. Case in point is the record-breaking number of 100+°F temperatures in Phoenix, Arizona for 2020:

- 100°F days: 145
- 105°F days: 102
- 110°F days: 53
- 115°F days: 14 (!)²

Global warming has been a major factor in an increasing number of catastrophic environmental events because the warming of the atmosphere, land, and oceans

Overview of U.S. Greenhouse Gas Emissions in 2019



U.S. Environmental Protection Agency (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019

Figure 1. Greenhouse gas emissions in 2019

strongly affects weather. For example, wildfires due to drought, as well as tornadoes, hurricanes, and floods are all increasing in frequency and destructive capacity due to global warming. To learn more about greenhouse gases, see the *Together Colorado Fact Sheet: Intro to Global Warming*.

Methane: A Potent Greenhouse Gas

Because of its extreme effectiveness at trapping heat, methane has become a key agent of climate change in the 21st century.³ Methane comes from many sources. Natural sources include wetlands, geological events (such as volcanoes), termites, and wildfires.⁴

Anthropogenic sources of methane are of major concern to climate scientists. These include (Figure 2):

- Oil and natural gas production and use (methane is a primary component in natural gas).
- Coal mining (as coal bed methane).
- Landfills and other waste (decomposing organic matter generates methane)
- Agricultural systems (such as livestock and rice farms).
- Thawing permafrost (further explained below).^{5,6}

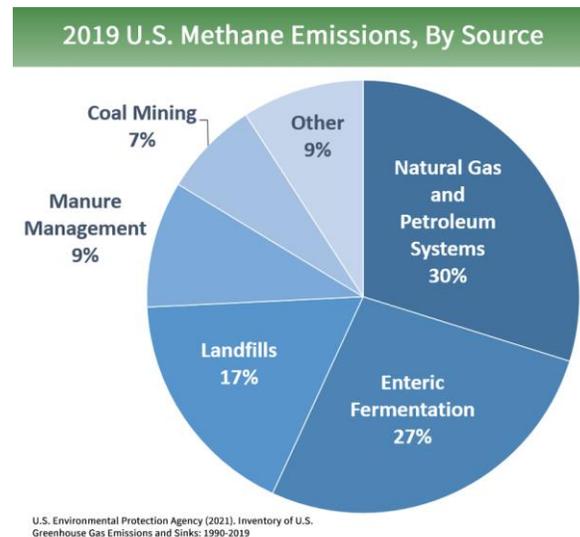


Figure 2. Sources of methane

Methane concentrations in the earth's atmosphere have risen by over 150% since 1750.⁷ Even though there are natural sources of methane that we can't do anything about, our human activity has put a critical strain on the earth's methane budget.

Thawing Permafrost

In the Arctic town of Chersky, Russia, climate researcher Sergei Zimov has been concerned about the thawing permafrost since the 1990s. Permafrost is a layer of frozen soil that covers nearly a quarter of the northern hemisphere. It can be hundreds of meters deep, and as global temperatures increase, the permafrost is thawing. This thawing has the potential to release billions of tons of carbon dioxide and methane into the atmosphere. Worse, thawing causes a vicious feedback loop that further warms the planet, thaws more permafrost, releasing more greenhouse gases with the cycle repeating.⁸

Our Responsibility and Opportunity

So, what can we do? How can we increase the global methane budget to help prevent our planet from falling to the ravaging effects of climate change?

Methane has a lifespan in the atmosphere of approximately 12 years.⁹ This relatively short lifetime means that the concentration of methane can be lowered if emissions are reduced. Researchers at NASA suggest that a significant reduction in atmospheric methane could be made in approximately ten years.⁹

There are ways to decrease methanogenesis (biological methane generation) in farming, livestock, and waste management. For example, many countries have started to use feed additives to decrease methane created by the digestive processes of livestock. In Australia, research has indicated that including a type of seaweed into cattle feed can result in a whopping 80% decrease of methane emissions from cattle!¹⁰

Reducing our use of fossil fuels would undoubtedly be the most effective strategy to minimize the release of methane. Therefore, an organized and systematic transformation to alternative forms of energy, such as water (hydroelectric), wind, and solar, is the true gold standard in decreasing greenhouse gas emissions.

Until alternative forms of energy come into routine use, natural gas production methods should be modified to decrease methane leakage. Standard methane-reducing processes can include the following:

- Improved leakage repair of old or damaged gas pipelines.
- More rigorous maintenance and inspection protocols.
- Modernization of old pipeline systems.¹¹

Conclusion

The solutions to the massive environmental challenge of climate change will require concerted, collaborative, and systematic efforts. We must act immediately and urgently by making demands of corporations and consumers; and similarly, to make demands of our state and local governments. We have the ability *now* to make an impact on decreasing our planet's methane emissions.

References

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