

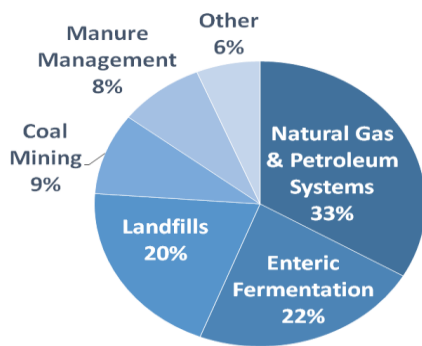


## Methane is a Greenhouse Gas (GHG) over 23x more global warming potential than CO2!

Per U.S. EPA, landfills are the 3<sup>rd</sup> largest source of CH4 in the United States.

Pound for pound, the comparative impact of CH4 on climate change is over 23 times greater than CO2!

### U.S. Methane Emissions, By Source



Note: All emission estimates from the [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014](#).

### The Issue & Reality

Ocean warming is affecting humans in direct ways and the impacts are already being felt, including effects on fish stocks and crop yields, more extreme weather events and increased risk from water-borne diseases, per what has been called the most comprehensive review available on the issue. (International Union for Conservation of Nature (IUCN) at the IUCN World Conservation Congress in Hawai‘i. Sept 2016).

*“Ocean warming is this generation’s greatest hidden challenge – and one for which we are completely unprepared”. “The only way to preserve the rich diversity of marine life, and to safeguard the protection and resources the ocean provides us with, is to cut greenhouse gas emissions rapidly and substantially.”*  
**IUCN Director General Inger Andersen (IUCN 2016)**

*“Most of the heat from human-induced warming since 1970s – staggering 93% - has been absorbed by our oceans, which acts as a buffer against climate change, but this comes at a price. We are surrounded by the scale and extent of ocean warming effects on entire eco systems” (Dan Laffoley, Marine Vice Chair of the World Commission on Protected Areas at IUCN, 2016)*

<https://www.iucn.org/news/secretariat/201609/latest-ocean-warming-review-reveals-extent-impacts-nature-and-humans>

*The environmental impact feedback loop currently being observed because of GHG (i.e. Methane / CO2) as summarized by Environmental Defense Fund (EDF) Oceans Program (2013).*

### **Coral bleaching**

Coral reef expert Tom Goreau and Rod Fujita, director of research and development for EDF's Oceans program pointed out that mass coral bleaching events observed during the 1980's were probably due to anomalously warm temperatures related to climate change. Mass coral bleaching results in the starvation, shrinkage and death of the corals that support the thousands of species that live on coral reefs. Additionally, rising sea levels, partly the result of heat (caused by GHG) absorbed by the ocean, is putting coral reefs and sea grass meadows in danger of "drowning" since they can only photosynthesize in relatively shallow water.

### **Ocean acidification**

The ocean has absorbed 93% of GHG produced since 1970. The trend in ocean acidification is about 30 times greater than natural variation, and average surface ocean pH, the standard measure of acidity, has dropped by 0.1 unit - a highly significant increase in acidity. *This is damaging many ocean species that use calcium carbonate to form their skeletons and shells. Studies have shown that calcium carbonate formation is disrupted if water becomes too acidic. (EDF 2013)*

Ocean acidification also appears to be affecting whole ecosystems, such as coral reefs, which depend on the formation of calcium carbonate to build reef structure, which in turn provides homes for reef organisms.

### **Fish migration**

In addition, many fish species have [moved toward the poles](#) in response to ocean warming, disrupting fisheries around the world. (*Fujita, EDF 2013*)

**Methane, in the short term, is a far more powerful greenhouse gas than CO2—34 times more potent over a century, but 84 times more over 20 years.** Atmospheric methane reached a new high of about 1,824 parts per billion (ppb) in 2013, because of increased emissions from human sources. (IUCN 2016)

Per researchers, methane and other rarer greenhouse gases contribute a lot of extra heat to water, which is much harder to cool down once it has been warmed up. "As the heat goes into the ocean, it goes deeper and deeper, giving you continued thermal expansion," (*Solomon, Massachusetts Institute of Technology, 2017*)

**It is estimated that marine plants produce between 70 and 80 percent of the oxygen in the atmosphere.**

<http://www.ecology.com/2011/09/12/important-organism/>