For many of us, trash is something we'd rather not think too much about—and when it's literally out of sight, buried underground in landfills, it's easy to push it out of our minds, too. Despite being unseen and often under the radar, organic waste and the greenhouse gas emissions it generates represent an enormous opportunity to press an emergency brake on climate change.

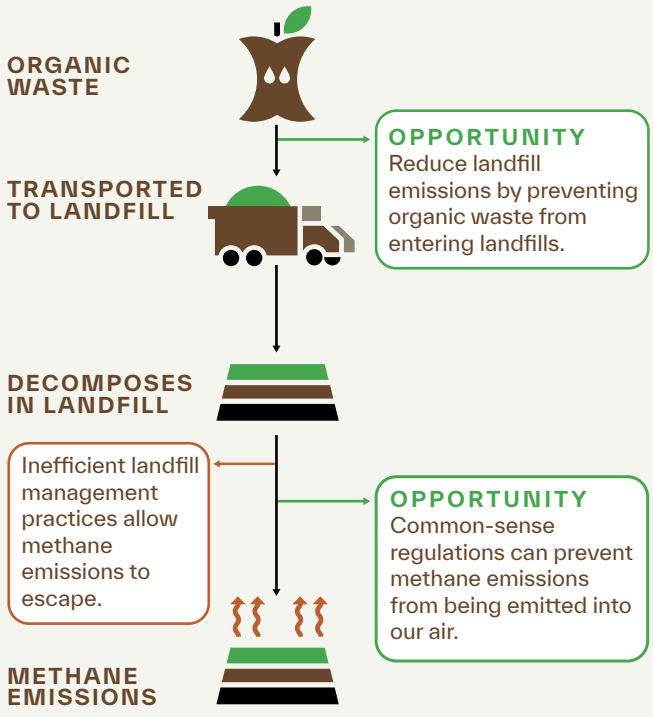
And we can do more than simply slash emissions. By reimagining our relationship to what we throw away, we can move away from our toxic "take-make-waste" cycle and toward a regenerative circular economy.

This primer offers an overview of landfills, one of the more significant industrial sources of emissions in the U.S. It details the primary problems with landfills, policy solutions and barriers, and the benefits of tackling emissions from landfills.

LANDFILL BASICS

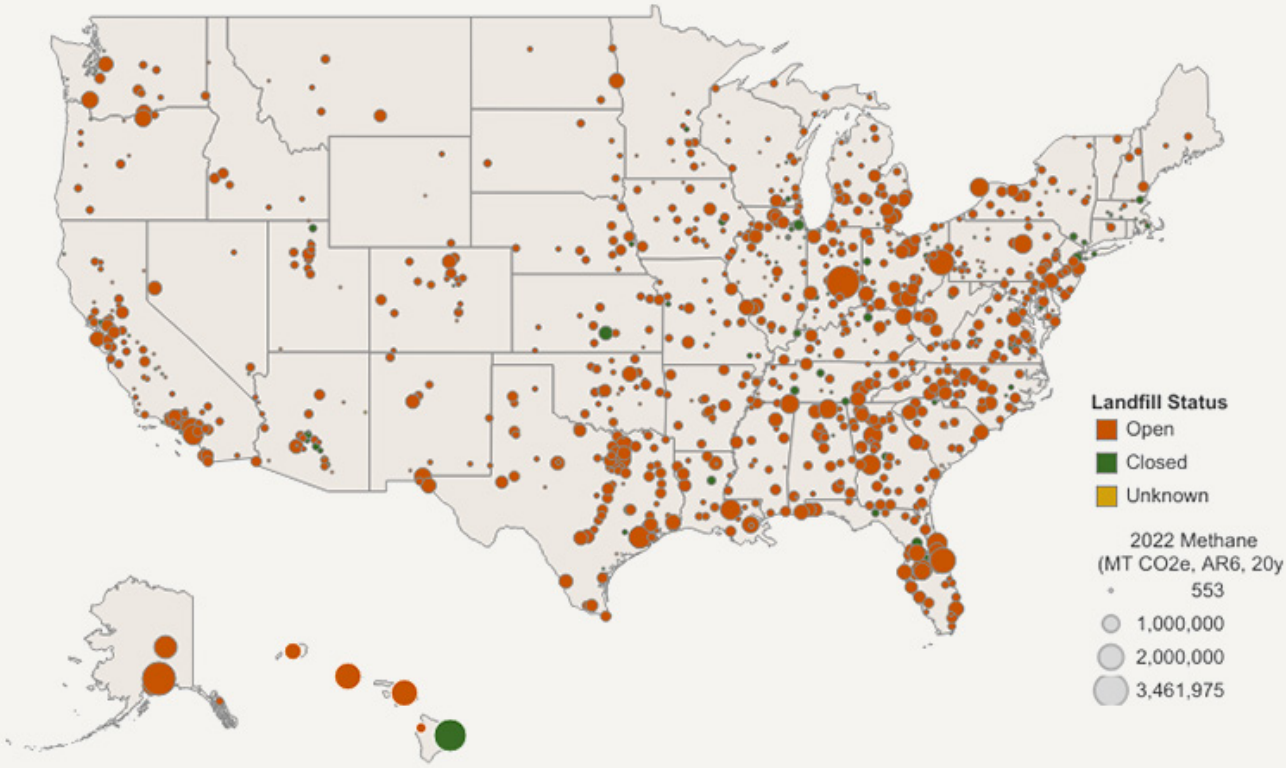
There are over 2,600 municipal solid waste (MSW) landfills in the United States. Landfills are not just inert piles of garbage but significant contributors to the climate crisis. When food, paper, and other organic waste decomposes in an oxygen-free environment, it creates methane, a super-pollutant with about 80 times the potency of carbon dioxide in its first 20 years in the atmosphere. In 2022, U.S. MSW landfills emitted 287 million metric tons of CO_2-equivalent of methane on a twenty-year warming potential time horizon. These emissions have the same climate impact as approximately 74 coal-fired power plants running for a year.[1]

Breaking the toxic cycle of landfilling



Circular Economy: Reducing methane emissions from landfills requires a two-pronged solution. First, we must embrace and advance policies like composting programs and organics diversion to prevent organic waste from entering landfills. Second, we must strengthen landfill management and regulations to clamp down on emissions from waste already in the ground.

Municipal Solid Waste Landfills in the United States



There are more than 1,200 active and 1,300 closed municipal solid waste landfills across the country.
SOURCE: EPA GHGRP 2022 Data & EPA LMOP July 2023 Data

This emissions estimate understates the scale of the problem. The Environmental Protection Agency (EPA) bases landfill methane estimates on outdated formulas. EPA's top emissions scientist Susan Thorneloe has stated publicly that the EPA has been understating methane emissions from landfills by a factor of two,[2] and independent research, satellite, and flyover measurements suggest that EPA's figures for methane are between two and four times too low. The latest research — led by the non-profit Carbon Mapper with EPA co-authors — used aerial surveys to map landfill methane emissions nationwide. The study observed visible methane plumes at more than half of the landfills surveyed and found the emissions rates were 40% higher than those reported to the EPA's Greenhouse Gas Reporting Program.[3]

The public health cost of landfilling is high. In addition to methane, landfill gas contains hazardous air pollutants (vinyl chloride, benzene, toluene), precursors to ozone and particulate matter, odor nuisance compounds, and other dangerous gasses that can impact air quality, human health, and quality of life. Communities near landfills bear the brunt of their environmental impacts, including air and water pollution, truck traffic, and groundwater contamination. People feel these impacts unequally. In the U.S., about 3.2 million people live within 1 mile of a landfill. Of that, 1.5 million — or 46% — are Black, Indigenous, or a Person of Color (BIPOC). 54% of landfills reporting to the EPA's Greenhouse Gas Reporting Program are within one mile of communities with a higher percentage of residents who are people of color or considered low-income than the national average.[4]

THE OPPORTUNITY

U.S. and global policymakers are scouring the policy arena for tools to reduce global methane levels. During the 2021 UN Climate Change Conference in Glasgow (COP26), President Biden joined 105 nations in committing the U.S.

to reduce methane by 30% from 2020 levels by 2030. Fortunately, there are proven, cost-effective practices and technologies that would significantly mitigate methane emissions from landfills. These solutions are simply missing from the EPA federal air emissions requirements currently in place for certain landfills, known as the New Source Performance Standards (NSPS) and Emissions Guidelines (EG) for MSW landfills. Stronger regulations would:

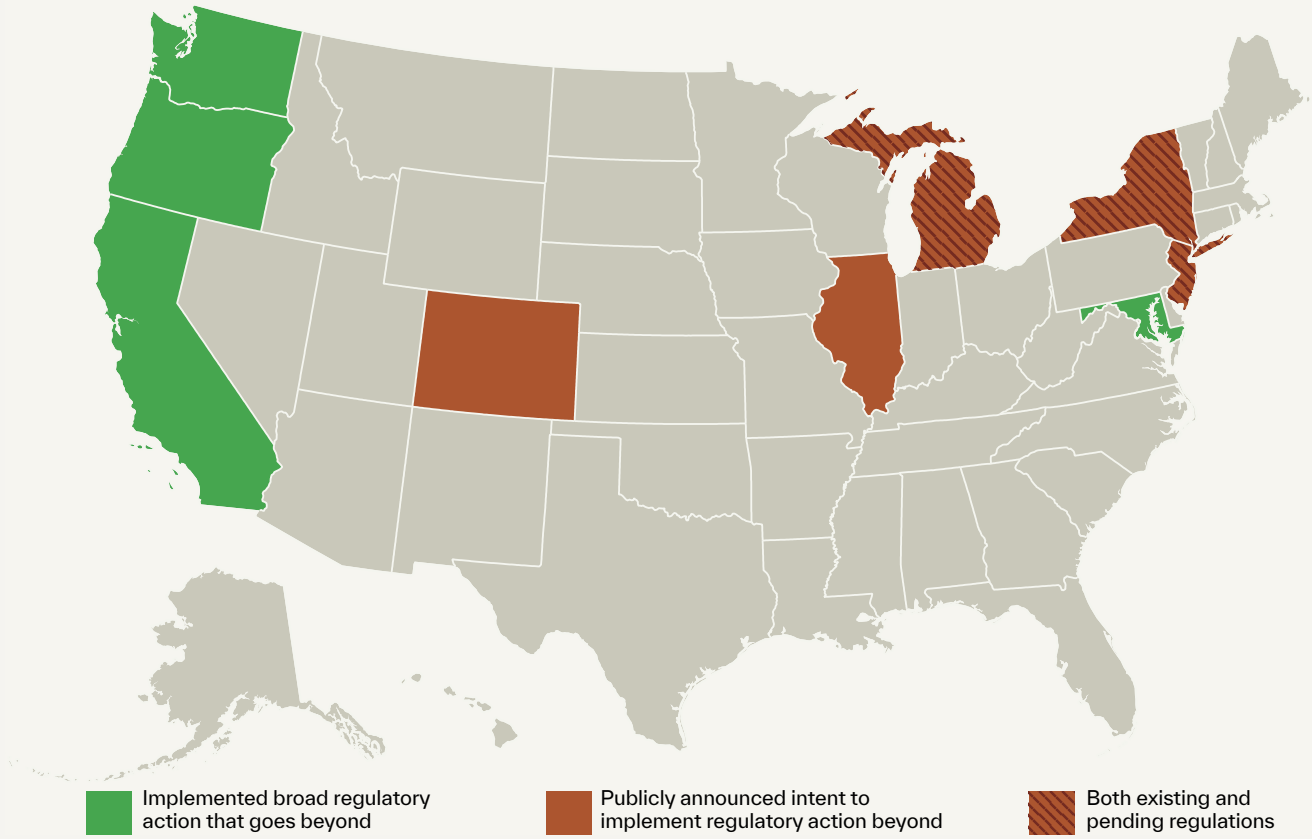
- **Require more effective, comprehensive monitoring for methane leaks using up-to-date technologies that make finding and fixing large methane leaks exponentially easier.** Strengthening surface emissions monitoring through improved walking patterns, integrated monitoring, and leveraging technologies like drones or other remote sensing techniques can enhance coverage and frequency of leak detection and ensure greater objectivity and transparency.
- **Institute lower thresholds for installing gas collection and control systems.** Current rules require landfills to install gas collection and control systems for sites that meet specific size or emissions thresholds but the threshold is currently set too high, meaning most landfills aren't regulated.
- **Require earlier installation of gas capture systems and leak detection.** According to EPA's research, 50% of the carbon in food waste degrades into methane within 3.6 years. Yet current EPA federal rules allow five years to pass before landfill operators are required to expand gas collection systems. As a result, 61% of methane generated by landfilled food waste is released into the atmosphere.
- **Require landfill cover design that minimizes air pollution.** The type of cover on a landfill is a factor that significantly affects surface methane emissions, and current regulations don't require that landfill operators use the most effective cover materials and minimize active cover.
- **Monitor and respond to super emitters.** No matter how large the methane emission found at a landfill site by a remote sensing device, landfills aren't required to take action to fix the super emitter—it's voluntary. The EPA's new oil and gas rules incorporate advanced methane monitoring technologies, including a program to identify significant emissions, recognizing that periodic or continuous monitoring provides more representative data than landfills' quarterly sampling. The EPA should take a page from these rigorous emissions detection and correction programs and require landfill owners and operators to investigate and mitigate exceptionally large emissions events from certified third parties once notified about the emissions.

A May 2024 report by Industrious Labs analyzed 29 EPA inspection reports across eight states and found that inadequate regulations are allowing poor management practices to continue undetected for years and methane leaks to fall through the cracks. Across just 29 landfills, inspectors observed 711 total methane exceedances over the federal limit of 500 parts per million (ppm). In many cases, there were significant discrepancies between what landfill operators reported and what was found by inspectors.[5]

As we strengthen landfill emissions regulations, we also need to address the root cause. State and local governments can provide the necessary resources and policies to catalyze the certainty and support required for reducing methane emissions from landfills, addressing hunger, boosting soil

> "Many people, especially people of color and low-income Americans, have suffered disproportionately from the damaging effects of pollution, including landfilled, dumped, or incinerated waste."
>
> — President Biden, November 15, 2023, America Recycles Day Proclamation.

States exceeding federal landfill regulations



9 states have enacted or are considering common sense policies to mitigate methane emissions.

quality, and creating local jobs. It's vital to enact laws requiring organics diversion from landfills to composting, food donation requirements, community composting, support for composting infrastructure development, and financial resources dedicated to outreach, education, and implementation.

Not surprisingly, strategies to prevent and divert organic waste also help reduce landfill odors, minimize leachate generation and associated groundwater pollution, and avoid landfill expansions that exacerbate harm. In a 2022 report, the EPA found that the benefits of less organic waste in landfills include lower emissions of methane and non-methane organic compounds and reductions in odor and leachate generation. Since organic waste accounts for a large portion of the municipal solid waste stream, the potential for realizing these benefits is significant.[6]

We can create more jobs and spur economic development when a community does more than use something and trash it. Organic waste must be hauled, facilities must be built, aluminum cans must be recycled, and farms need compost. Each of these products and services creates new family-supporting jobs. Gaia's 2021 report, Zero Waste and Economic Recovery: The Job Creation Potential of Zero Waste Solutions, studied jobs data from 16 countries and found that composting and recycling create many more jobs than burning or burying waste:

- Landfilling/incineration creates **1.8 average jobs** per year per 10,000 tons of material.
- Composting creates **6.6 average jobs** per year per 10,000 tons of material.
- Semi-mechanized recycling creates an average of **321 jobs per year** per 10,000 tons of material.[7]

The emissions reductions from these state actions are significant: The Maryland Department of Environment estimates a 25-50% reduction in emissions from the landfills that fall under the rule.

Even more states — including New York, Colorado, Michigan, and California — are poised to act comprehensively through regulation.

Job growth is just one benefit of waste diversion. By implementing food waste reduction solutions, including organic waste diversion, ReFed estimates that there is the potential to generate $73 billion in annual net financial benefit, recover the equivalent of 4 billion meals for food insecure individuals every year, and create 51,000 jobs over ten years.[8]

PROGRESS

At COP28, the U.S. State Department published a factsheet stating that the **EPA "is planning a rulemaking to review and, if appropriate, revise its Clean Air Act emission standards for new and existing MSW landfills, considering new monitoring technology, incentivization for organics waste diversion, and emissions controls at landfills not covered by current regulations."**[9] While the Clean Air Act mandates that the EPA review its landfill emissions standards in 2024, this is the first time the Biden Administration has publicly signaled that landfill methane rules are on their climate agenda, a promising indication that public pressure is having an impact.

Calls for federal action on landfill emissions have grown dramatically in recent months. In January, 25 members of the U.S. House submitted a letter to the EPA Administrator Regan, urging the agency to strengthen its landfill regulations under Section 111 of the Clean Air Act. The U.S. Senate Committee on the Environment and Public Works also held a hearing, where they heard expert testimony on the impacts of landfill methane and available solutions. Over 60 advocacy groups and 50 local elected officials have joined the call for the EPA to prioritize stricter landfill emissions rules and support communities in preventing and diverting organic waste.

Maryland, Oregon, California, and Washington have already implemented comprehensive updates to their state air emissions regulations for landfills that surpass the EPA's regulations in essential ways. Other states, like New York, have improved standards in simple yet effective ways. For example, New York requires a more substantial cover to be placed within 30 calendar days and horizontal gas lines installed in waste that decays rapidly, allowing methane to be collected rather than released into the atmosphere.

Breaking out of our flawed waste management system will require a comprehensive suite of solutions — but the good news is that we already know what many of them are. First, we must prevent new organic waste from entering landfills and generating the potent greenhouse gas methane. At the same time, the waste already buried in landfills across the country isn't going away. That's where stronger regulations come in. The EPA can dramatically curb harmful emissions with the stroke of a pen. By updating its landfill emissions regulations, the EPA can implement common-sense, widely available solutions to prevent and control methane emissions, slow climate change, and protect communities.

DRIVERS

What moves us from a "take-make-waste" economy to a circular one?

Regulation

Regulation is necessary to drive change that benefits all communities equitably. The good news is that we don't have to split an atom or launch a moonshot to solve this urgent problem. Proven approaches can mitigate landfill methane and keep new organic waste out of landfills. The federal government has an existing framework under Clean Air Act regulations to drive emissions reductions at the nation's 1,200 active municipal solid waste landfills. Today, states and the EPA could adopt even more proven, cost-effective emissions reduction strategies and encourage organics diversion, partly thanks to several leading states' regulations and technological advancements, such as drones.

Legislation

State, federal, and local lawmakers can also enact legislation to reduce waste and the emissions it generates. At the federal level, Congress could provide funding to states to deploy advanced monitoring for landfill methane emissions, using satellites, aircraft, and other advanced technologies to detect methane emissions at MSW landfills to mitigate those emissions. Washington and California are the latest states to pass laws instituting organics diversion goals, food rescue, and municipal-run organics recycling programs. More than 20 states have enacted yard waste disposal bans. States such as Maryland, Connecticut, Massachusetts, New York, and Rhode Island have all adopted state organic waste bans for large commercial organic waste generators under certain circumstances. Illinois state policymakers are considering legislation that would more effectively regulate landfill emissions.

Implementation

Signing new laws and issuing stronger regulations is never the finish line. Stakeholders, from state officials to local landfill operators, need the funding, resources, and education to implement policies, deliver meaningful emissions reductions, and advance community-centered alternatives to burning and burying waste.

THE TIME FOR ACTION IS NOW

Curbing polluting emissions from landfills requires a two-pronged approach. First, policymakers must prioritize solutions to keep organic waste out of landfills in the first place. At the state and local level, we can all work together on solutions that reduce waste or make something good out of waste, like through organics recycling programs with food recovery requirements or community composting, where communities can realize the win-wins of reducing global warming emissions, addressing food insecurity, boosting soil resilience and creating good-paying, safe jobs.

Second, we must address the waste already buried in the ground. Despite broad availability, proven results, and cost-effectiveness, many municipal landfills do not use established strategies to control methane emissions. Landfills largely ignore established best practices to design and manage emissions due to the lack of adequate regulations from the EPA.

1. Industrious Labs analysis of U.S. EPA Greenhouse Gas Reporting Program (GHGRP) 2022, U.S. EPA Greenhouse Gas Equivalency Calculator, EPA Environmental Justice Screen, and EPA Landfill Methane Outreach Program (LMOP). **www.dontwasteourfuture.org**
2. NPR (2021). Your Trash Is Emitting Methane In The Landfill. Here's Why It Matters For The Climate.
3. Cusworth, D.H., et. al. (2024) Quantifying methane emissions from United States landfills, Science. Available at: **https://www.science.org/doi/10.1126/science.adi7735**
4. Ibid
5. Industrious Labs, The Hidden Cost of Landfills, 2024. **https://cdn.sanity.io/files/xdjws328/production/4820df5770ec505062a6f29d5f6c6f9bb7f31071.pdf**
6. Max Krause et al., Quantifying Methane Emissions from Landfilled Food Waste, U.S. Env't Prot. Agency (Oct. 2023), p. 4-7 **https://www.epa.gov/system/files/documents/2023-10/food-waste-landfill-methane-10-8-23-final_508-compliant.pdf**
7. Source: Gaia, Zero Waste and Economic Recovery, 2021 **https://www.no-burn.org/wp-content/uploads/Jobs-Report-ENGLISH-1.pdf**
8. ReFed, Roadmap to 2030. **https://refed.org/uploads/refed_roadmap2030-FINAL.pdf**
9. U.S. State Department, Highlights from 2023 Global Methane Pledge Ministerial: **https://www.state.gov/highlights-from-2023-global-methane-pledge-ministerial/**

For more information, contact Katherine Blauvelt, Circular Economy Director **katherine@industriouslabs.org**

ABOUT INDUSTRIOUS LABS

Industrious Labs exists to deliver unstoppable policies, people power, and analysis to drastically reduce dangerous emissions, hold industry accountable to communities and workers, and develop a circular economy. To learn more about us, visit www.industriouslabs.org.

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