THE Climate + Clean Energy EQUITY FUND

Policy Brief: Energy Transition Concerns

October 2022

Biogas: A Polluting Source, Greenwashed

Biogas—energy created from waste or organic materials—is presented as an energy solution that is climate safe and free from air pollution. Supporters label it a "renewable" and "environmentally friendly" option. The problem is that much of the waste comes from facilities that should be implementing stronger waste management and waste reduction practices. Instead, biogas production allows facilities to profit from their waste, creating an incentive to generate more waste, even as neighboring communities live with horrific odors and contaminated water sources. In reality, biogas use keeps us dependent on the infrastructure of fossil gas, which the industry misleadingly calls "natural gas." Yet, biogas use generates the same greenhouse gases (GHGs) and air pollutants as fossil gas, which damage our health and accelerate climate change.

This brief explains why biogas is not a clean energy solution, how it harms people and the climate, and why there are better clean energy solutions to pursue.

Key Facts

- **Biogas production and use can harm nearby communities:** Biogas production poses many risks to nearby communities. The components of biogas contain trace amounts of compounds that can be toxic to human health, including known carcinogens like benzene. Some facilities that produce biogas, like concentrated animal feeding operations (CAFOs), pose a severe health risk to nearby communities due to how they manage and store the waste used to create biogas.[1]
- **Biogas is expensive:** Biogas costs more to produce than fossil gas. One study found that it can cost up to five times as much![2]
- **Transporting biogas can be dangerous:** Biogas can be compressed and transported by truck, which adds the risk of accidents involving a highly flammable fuel. It can also be transported via pipeline, which introduces the risk of pipeline leaks.
- **Biogas infrastructure = fossil gas infrastructure:** When biogas is transported by pipeline, it typically is refined and then blended with fossil gas so it can be transported in fossil gas pipelines. So biogas usage can help gas utilities greenwash their reliance on fossil gas by claiming that the gas is eco-friendly because it includes biogas.
- **Biogas and fossil gas produce the same pollutants when burned:** When biogas is burned for electricity, heating, or fuel, it creates the same types of pollutants as fossil gas. It generates nitrous oxides (NOx), which damage human health and are particularly dangerous for children.[3] Biogas combustion also generates carbon dioxide (CO_2) and risks methane leakage, just like fossil gas combustion, because the majority of biogas is methane.[4]

1 https://www.researchgate.net/publication/335598392_Composition_and_Toxicity_of_Biogas_Produced_from_Different_Feedstocks_in_California; https://www.southernenvironment.org/wp-content/uploads/2021/09/2021-09-27-Title-VI-Complaint-Index-DEQ-Biogas-Permits.pdf

2 https://www.sightline.org/2021/03/09/the-four-fatal-flaws-of-renewable-natural-gas/ (citing a 2019 study for the American Gas Foundation)

3 https://rmi.org/insight/gas-stoves-pollution-health

4 https://doi.org/10.1080/10934529.2018.1459076; https://www.eia.gov/energyexplained/biomass/landfill-gas-and-biogas.php

1 What is biogas and how can it be harmful?

First, let's define a few key terms.

- **Biogas** is a type of gas produced from organic waste, such as municipal solid waste from landfills, livestock waste (manure) from farms or dairies, food waste, wastewater, or plant waste.
- **Biomethane** or **renewable natural gas** is biogas that has been refined to remove CO_2 and trace gases. Although the industry calls refined biogas "renewable natural gas," it is not natural, less dangerous, or less polluting than fossil gas. Biogas and fossil gas are both the same thing: methane.[5]

The terms **biogas, biomethane,** and **renewable natural gas** are often used interchangeably in articles and papers that discuss the topic, even this policy brief. That's because biomethane and renewable natural gas are the same thing: refined biogas. See **Table 1** for a comparison of biogas and biomethane.

To evaluate biogas, it is important to examine how it is **produced** and how it is **used**.

How is biogas produced?

Biogas is produced via anaerobic digestion of organic waste (see **Figure 1**). Anaerobic digesters are enclosed spaces without any oxygen where microorganisms break down waste into two components: biogas and digestate.

Digestate is the solid and liquid byproduct of the process. The chemical composition of digestate varies based on the type of waste used to produce the biogas. If there are toxic compounds in the biogas feedstock, such as heavy metals or antibiotic residue, they will likely be present in the resulting digestate.[6] If the digestate does not contain toxic compounds, it can be used as a soil product to fertilize crops.[7] It can also be composted or used as bedding for livestock. However, when the digestate is land applied or composted, NOx, which contribute to climate change, are emitted, and nitrates may threaten groundwater quality.[8]

A few kinds of anaerobic digesters are used to generate biogas:[9]

- **Stand-alone digesters:** These facilities usually accept food waste, but some may accept other organic waste.
- **On-farm digesters:** On-farm digesters sit atop manure lagoons at farms and digest animal waste to produce biogas.
- **Digesters at wastewater treatment plants:** These digesters treat wastewater and produce biogas.

Biogas is made up of approximately 50-70% methane, 30-40% carbon dioxide, and small amounts of other gases, such as volatile organic compounds (VOCs).[10] These trace gases vary based on the source material for the biogas. For example, biogas created from municipal solid waste would have different trace gases than biogas created from livestock waste. This is due to the type of the waste as well as impurities present in the waste stream.

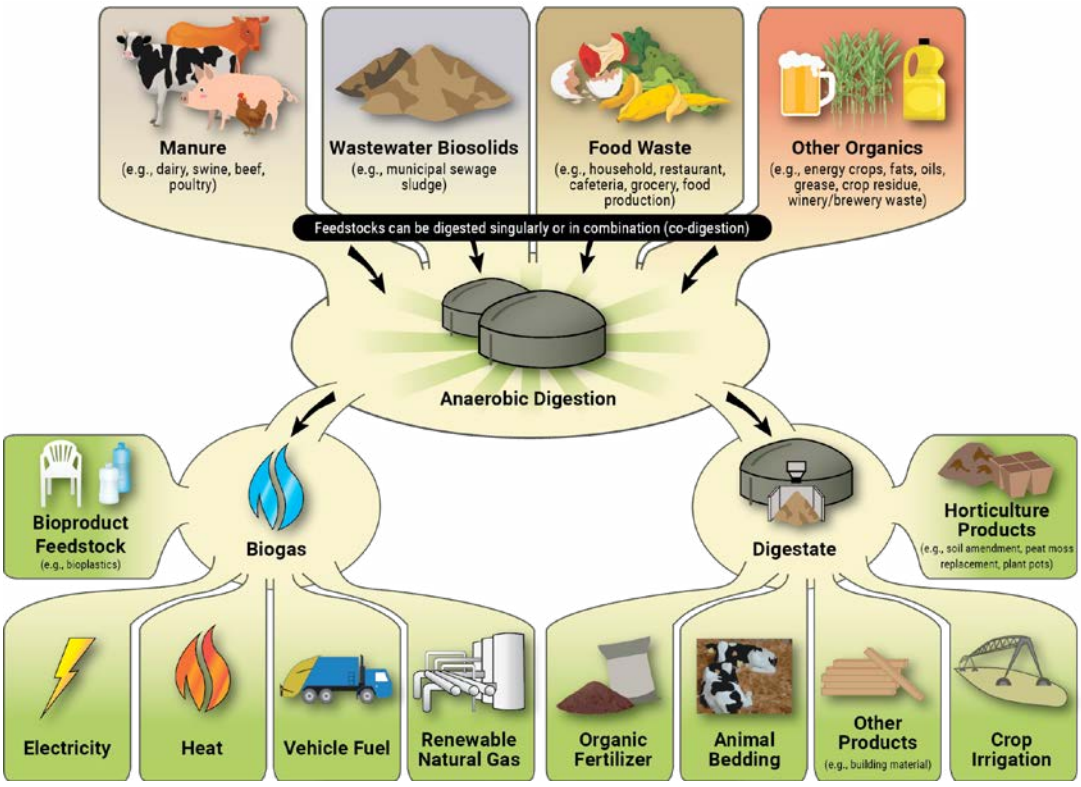
Trace gases and CO_2 are removed from biogas to produce biomethane (see **Table 1**).

Biogas and biomethane production can be costly. According to one estimate from the University of California, Davis, it costs $294 to produce $68 of methane using anaerobic digestion of animal waste.[11] Biogas production relies on government subsidies to make it economically viable. Other estimates show that refined biogas can cost more than five times as much as fossil gas.[12]

The environmental impact of biogas production translates into very real and tragic damage to the quality of life for those nearby.

5 https://www.clf.org/blog/big-gass-latest-ploy-renewable-natural-gas/
6 https://www.sciencedirect.com/science/article/pii/S0956053X1630753X; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7115761/ (describing the toxic contaminants in sewage sludge)
7 https://www.epa.gov/anaerobic-digestion/basic-information-about-anaerobic-digestion-ad#AD%20products; https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy
8 https://www.sciencedirect.com/science/article/pii/S0167880917300701; https://www.waterboards.ca.gov/centralvalley/water_issues/confined_animal_facilities/groundwater_monitoring/srmr_20190419.pdf
9 https://www.epa.gov/anaerobic-digestion/types-anaerobic-digesters
10 https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy; https://www.epa.gov/indoor-air-quality-iaq/what-are-volatile-organic-compounds-vocs
11 https://asmith.ucdavis.edu/news/cow-power-rising
12 https://www.sightline.org/2021/03/09/the-four-fatal-flaws-of-renewable-natural-gas/ (citing a 2019 study for the American Gas Foundation)

Figure 1: The Anaerobic Production Process



Source: EPA, 2022.

Table 1. Biogas vs. Biomethane

	Biogas	**Biomethane**
Sources	Organic waste, including: Wastewater sludge Food waste Yard/crop waste Manure from livestock Municipal solid waste Impurities in the waste stream, including heavy metals such as lead, ammonia, and hydrogen sulfide*	Raw biogas
How it is made	Anaerobic digestion of organic waste	Removing CO_2 and trace gases from raw biogas
Chemical makeup	50-70% methane 30-40% CO_2 Trace amounts of other gases	At least 90% methane For injection into fossil gas pipelines, 96-98% methane
Uses	Electricity, heating, cooking	Electricity, heating, cooking, vehicle fuel
Byproducts	Digestate	CO_2 and trace gases

*See https://www.researchgate.net/figure/Summary-of-common-impurities-within-biogas-and-their-reported-effects-to-human-health-and_tbl2_335991816.

Source: https://iea.blob.core.windows.net/assets/03aeb10c-c38c-4d10-bcec-de92e9ab815f/Outlook_for_biogas_and_biomethane.pdf

How does biogas production harm communities and the environment?

Biogas production can affect water quality, increase emission of air pollutants and greenhouse gases, and subject nearby residents to horrible odors. These communities are more likely to be communities of color (Black, Indigenous and other people of color, BIPOC) and/or low-income communities.[13]

The environmental impact of biogas production translates into very real and tragic damage to the quality of life for those nearby. A recent study estimates that in Duplin County and Sampson County—the two North Carolina counties that will host new biogas production facilities at CAFOs—fine particulate matter pollution has already contributed to dozens of premature deaths: specifically, 95 premature deaths in Duplin County and 83 premature deaths in Sampson County.[14]

Specifically, biogas production can generate the following harms in communities:

- **Emission of air pollutants that damage people's health:** Anaerobic digestion can produce harmful air pollutants including ammonia and NOx, which is tied to lung damage, cardiovascular impacts, low birth weight, and premature death.[15]

- **Emission of GHGs that accelerate climate change:** Anaerobic digestion produces CO_2 and methane, both of which are potent greenhouse gases.[16] Methane leaks can occur at every stage of the biogas process, from biogas processing to storage of digestate.[17] A recent study has shown that methane leaks from biogas production are drastically underestimated,[18] and digestate handling and disposal can emit so much NOx that any climate benefit from methane capture is significantly reduced or cancelled outright.[19]

- **Generation of noxious odors that trap people inside their homes:** Communities near biogas facilities—particularly CAFOs like large-scale dairies, hog farms, and poultry farms—often experience horrific odors that dramatically impact people's health and quality of life.[20] Sulfur-containing compounds in biogas can produce odors that cause headaches and make it impossible to enjoy the outdoors (see **Table A1** in the attached Appendix).[21]

- **Pollution of waterways and land:** Biogas digestate can be toxic, depending on the compounds present in the feedstock used. Toxic digestate must be handled safely to prevent land and water contamination. Biogas production from animal waste also requires waste to be stored in large lagoons (see **Figure 2**). Hog farms sometimes spray waste from the lagoons, which can become runoff that pollutes waterways and land far beyond the farm itself. Lagoons can also leak, resulting in contamination of nearby waterways. Regions prone to strong storms and hurricanes (e.g., North Carolina) are particularly susceptible to waterway contamination as a result of lagoon failure.[22] These pollution impacts make it all but impossible for people to use and enjoy their own land.

- **Risks of explosions and leaks:** Digesters operate under high pressure and create risks of fires, explosions, and gas leaks that can impact onsite workers and local communities.[23]

Figure 2. Hog Waste Lagoon in North Carolina, 2018.

Source: Matt Butler, Sound Rivers via Waterkeeper Alliance Flickr.

13 https://waterkeeper.org/news/update-exposing-fields-of-filth/
14 https://www.pnas.org/doi/10.1073/pnas.2013637118; https://insideclimatenews.org/news/29092021/north-carolina-biogas-environmental-justice/
15 https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/nitrogen-dioxide; https://www.sciencedirect.com/science/article/pii/S0167880917300701
16 https://www.researchgate.net/publication/324515528_Environmental_impact_of_biogas_A_short_review_of_current_knowledge
17 https://www.sciencedirect.com/science/article/pii/S0956053X21000167; https://www.cell.com/one-earth/fulltext/S2590-3322(22)00267-6?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS2590332222002676%3Fshowall%3Dtrue
18 https://www.sciencedirect.com/science/article/pii/S2590332222002676
19 https://www.sciencedirect.com/science/article/pii/S0167880917300701
20 https://energynews.us/2022/03/28/this-plan-is-a-lie-biogas-on-hog-farms-could-do-more-harm-than-good/
21 https://www.cpr.org/2016/12/16/fed-up-with-the-smell-neighbors-want-the-weld-county-biogas-project-shut-down/; https://www.researchgate.net/publication/335598392_Composition_and_Toxicity_of_Biogas_Produced_from_Different_Feedstocks_in_California
22 https://www.southernenvironment.org/wp-content/uploads/2021/09/2021-09-27-Title-VI-Complaint-Index-DEQ-Biogas-Permits.pdf, pp. 9-10
23 https://www.biogasworld.com/news/safety-precautions-anaerobic-digestion-systems/

What is biogas used for?

Biogas can be used in four primary ways including: in onsite processes; for producing electricity; in buildings for heat or cooking; and as a transportation fuel. Biogas should not be used for buildings or the majority of the transportation sector because electrification of buildings and transportation is cost effective and better for air quality and the climate. Biogas should not replace fossil gas to produce electricity, since biogas raises the same type of air quality concerns as fossil gas.

Biogas should not be used for buildings or the majority of the transportation sector because electrification of buildings and transportation is cost effective and better for air quality and the climate.

Table 2. Biogas Uses

Use	Example of Current or Proposed Use	Concerns
Onsite processes	Biogas can be used to heat buildings and produce power on site where the biogas is produced.	Emission of toxic air contaminants and health-damaging air pollutants if combusted Potential safety risks to workers and nearby communities from leaks, explosions, and fires* Possible emission of noxious odors and pollution of water and land
Electricity	Refined biogas (biomethane) can be transported using fossil fuel infrastructure and burned to produce electricity.	Emission of GHGs due to the combustion of methane Risk of methane leakage Emission of the same health-damaging air pollution as fossil gas More expensive than clean alternatives
Buildings	Refined biogas (biomethane) can be burned like fossil gas to heat buildings and power gas stoves.	Emission of GHGs due to the combustion of methane Risk of methane leakage Emission of health-damaging indoor air pollution More expensive than clean alternatives**
Transportation	Refined biogas (biomethane) can fuel trucks, buses, and cars.	Emission of GHGs due to combustion of methane Risk of methane leakage Emission of health-damaging air pollutants

* https://farm-energy.extension.org/anaerobic-digesters-and-biogas-safety/#:~:text=Overall%2C%20biogas%20risks%20include%20explosion,disease%2C%20and%20hydrogen%20sulfide%20poisoning

** See generally https://earthjustice.org/features/report-building-decarbonization.

How does using biogas harm communities and the environment?

Biogas use hurts communities and the environment in much the same way as fossil gas use:

- **Biogas usage emits air pollution that damages human health.** When biogas is burned to generate electricity, heat your home, or cook your food, it emits the same pollutants as fossil gas, including NOx and fine particulate matter, both of which are known to damage the respiratory and cardiovascular systems. A recent study found that children in homes using gas for electricity and heating—regardless of whether that gas is 100% fossil gas or a blend of fossil gas and biogas—face a higher risk of asthma, cardiovascular damage, learning deficits, and changed lung function.[24] In addition, biogas can contain hazardous air contaminants, including compounds such as lead and benzene. These contaminants vary depending on the source of the waste used to produce the biogas.[25]

- **Biogas usage produces GHG emissions.** Burning biogas to generate electricity, power stoves, and heat homes risks methane leakage and produces carbon dioxide. A January 2022 study demonstrated that fossil gas stoves emit methane and NOx even *when they are turned off*, which worsens indoor air quality and contributes to climate change.[26] Methane is a powerful greenhouse gas, with a global warming potential 27-30 times that of carbon dioxide.[27]

- **Biogas usage helps greenwash fossil gas.** Combusting biogas or biomethane to produce energy also deflects attention away from solutions that reduce GHGs and pollutants more effectively. Utility companies that rely on fossil gas as a key part of their business model present biogas and biomethane as a solution that will reduce GHG emissions while allowing them to continue using their existing fossil gas infrastructure. **But biomethane *is* methane.** Adding a "green" prefix (bio-) or calling it "renewable natural gas" does not change the fact that biogas has the same type of chemical composition as fossil gas.

In California, plans are already underway to extend the life of existing gas infrastructure by expanding the use of an old refinery to produce biogas, biodiesel, and "sustainable aviation fuel."[28] Yet, the National Renewable Energy Laboratory estimates that biogas from waste could only supplant approximately 5% of fossil gas use if all waste were captured and used to generate biogas.[29] According to a report commissioned by the American Gas Foundation (not a neutral party), biogas can meet up to 13% of current demand.[30]

Biogas will never be a clean energy solution that replaces fossil gas, but biogas use allows fossil fuel companies to pretend as if they are taking meaningful action to mitigate climate change.

- **Biogas is expensive compared to other clean energy alternatives.** Fossil gas is, on average, more expensive than solar energy and onshore wind, and biogas is even more expensive to produce than fossil gas.[31] Greater reliance on costly biogas for electricity and heating could expose ratepayers to potential rate increases, which could worsen the already severe energy affordability crisis.[32]

- **Transporting biogas can be dangerous:** Refined biogas can be transported by truck or injected into pipelines for offsite use. There is a risk of gas pipeline leaks and pipeline safety incidents with the use of gas pipelines.[33] A 2020 study estimated that there are more than 600,000 leaks in local-distribution fossil gas pipelines throughout the United States.[34] With transport by truck, there is a risk of accidents in addition to the cost associated with compressing the biomethane for transport and then decompressing the gas upon arrival.[35]

24 https://rmi.org/insight/gas-stoves-pollution-health
25 https://pubs.acs.org/doi/10.1021/acs.est.9b03003
26 https://pubs.acs.org/doi/10.1021/acs.est.1c04707
27 https://www.epa.gov/ghgemissions/understanding-global-warming-potentials
28 https://biologicaldiversity.org/w/news/press-releases/lawsuit-challenges-california-biofuel-refinery-expansion-2022-05-16/
29 https://www.nrel.gov/docs/fy14osti/60178.pdf
30 https://www.gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf, p. 1; https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf, p. 5; https://earthjustice.org/sites/default/files/feature/2020/report-decarb/Report_Building-Decarbonization-2020.pdf, pp. 11-12
31 https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf, p. 4; https://asmith.ucdavis.edu/news/cow-power-rising
32 https://www.usnews.com/news/cities/articles/2020-09-10/report-highlights-energy-bill-inequities-in-us-cities; increased biogas production will likely be more expensive because many of the lowest-cost projects have already been developed, see https://earthjustice.org/features/report-building-decarbonization, p. 13; https://www.sightline.org/2021/03/09/the-four-fatal-flaws-of-renewable-natural-gas/.
33 https://uspirgedfund.org/feature/ncf/methane-gas-leaks; https://www.edf.org/climate/methanemaps.
34 https://pubs.acs.org/doi/10.1021/acs.est.0c00437
35 https://www.epa.gov/sites/default/files/2020-07/documents/lmop_rng_document.pdf, p. 8

2 Are there any scenarios where biogas production and use are appropriate?

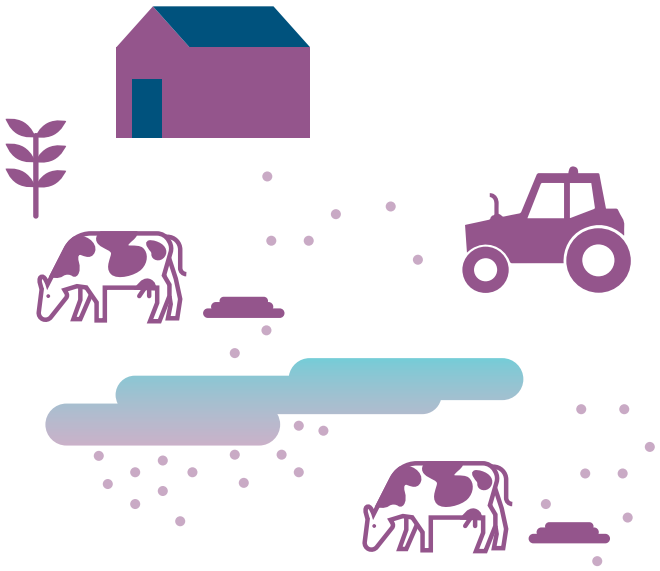
In a few cases, biogas production and use may be appropriate, as long as certain safeguards are put in place to protect communities, including:

- **Sewage treatment plant and landfill capture of biogas:** Capturing gases from existing sewage treatment facilities and landfills to produce energy is preferable to letting the gases escape into the atmosphere. Facilities should improve their waste management practices prior to simply capturing gases, such as diverting food and yard waste to composting operations, to help limit the creation of gases in the first place.[36] If some gases are still produced by these facilities, capturing them and utilizing biogas to produce energy is likely appropriate. To protect nearby communities, biogas facilities should ensure that the digesters' design mitigates safety risks and includes the best available controls to limit potential air pollutants.[37]

- **Onsite application of biogas:** Utilizing biogas produced on site for energy could also be appropriate as long as the best available air pollution controls are installed and safety measures are implemented to protect workers and the local community. This biogas production should be limited, however, by pursuing alternative resource and waste management practices that reduce the amount of biogas being created in the first place.[38] Biogas incentives should not drive facilities to expand production of biogas in lieu of appropriate waste management.[39]

The flowchart in **Figure 3**, from a report by Earthjustice and the Sierra Club, shows how to evaluate whether biomethane production is appropriate.

Biogas will never be a clean energy solution that replaces fossil gas, but biogas use allows fossil fuel companies to pretend as if they are taking meaningful action to mitigate climate change.



36 https://www.globalmethane.org/documents/ww_fs_eng.pdf

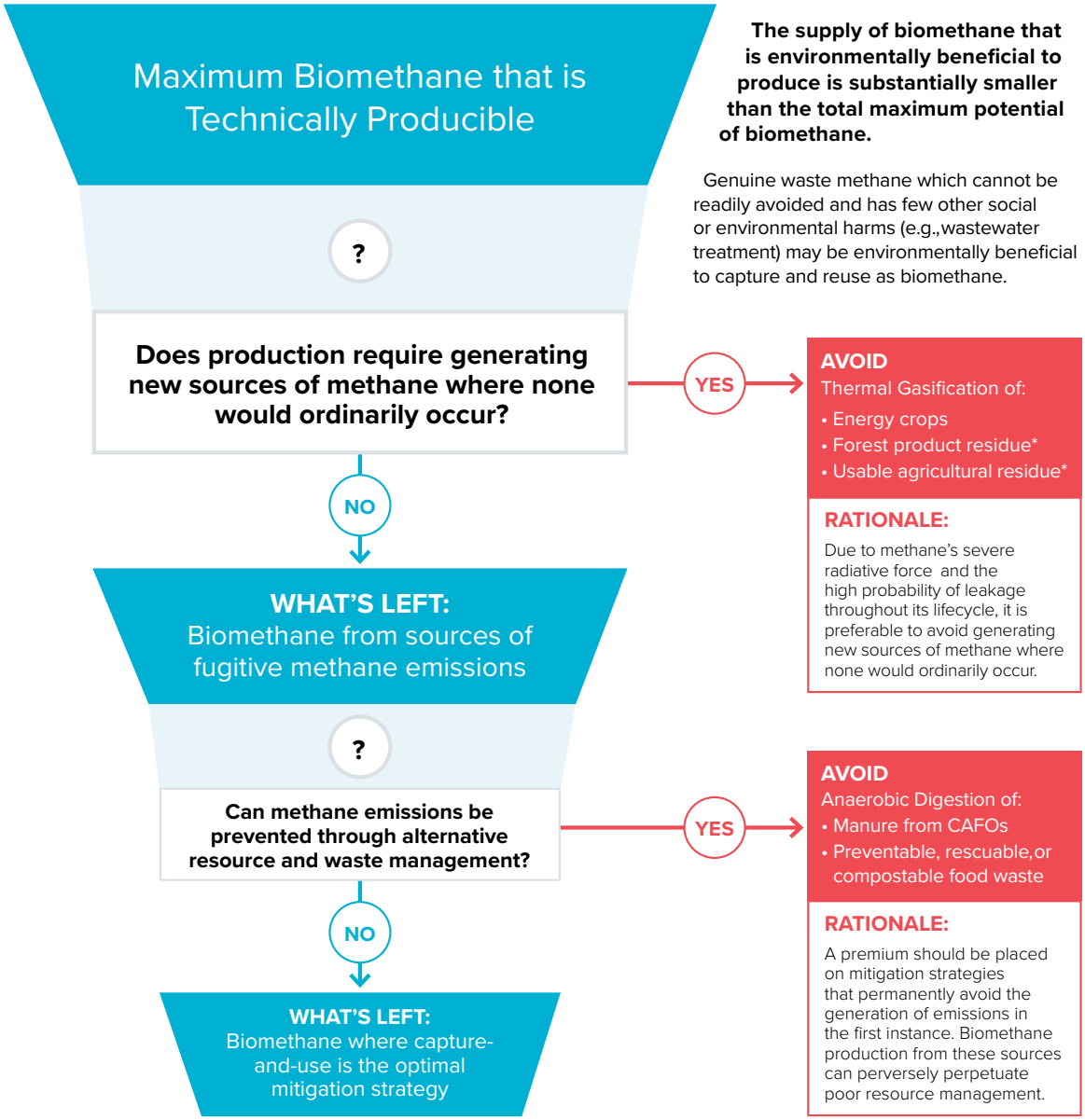
37 See, e.g., https://capstonefire.com/2018/07/3-hazards-at-your-water-wastewater-treatment-plant/ (discussing safety risks at sewage treatment plants); https://www.latimes.com/archives/la-xpm-1985-01-14-mn-9735-story.html (describing the types of concerning pollutants that need to be controlled)

38 As described below in **Section 4**, this could include more sustainable agriculture practices or practices to reduce waste being sent to landfills.

39 See **Figure 3**.

Figure 3. What Biomethane Sources Are Environmentally Sustainable?

What Fossil Gas Alternatives Are Environmentally Suitable?



The supply of biomethane that is environmentally beneficial to produce is substantially smaller than the total maximum potential of biomethane.

Genuine waste methane which cannot be readily avoided and has few other social or environmental harms (e.g.,wastewater treatment) may be environmentally beneficial to capture and reuse as biomethane.

* While they do not ordinarily generate methane, certain types of lignocellulosic biomass from agricultural or municipal solid waste (e.g., sawmill residue) may be unpreventable and difficult to compost or divert toward other uses. If no superior waste prevention or management strategy exists, it may be environmentally advantageous to redirect these waste streams toward fuel production. Nonetheless, it may be practical to exclude these from estimates of biomethane potential since multiple end-uses beyond current gas demand will compete for the limited supply of sustainable lignocellulosic biomass. Potential renewable fuel sources are generally better devoted to liquid fuels that displace more expensive, GHG-intensive petroleum.

Source: Earthjustice, 2020, p. 10.

3 What biogas uses should be avoided?

The benefits of electrification powered by clean, renewable energy sources far outweigh any benefits that could be derived from biogas. When renewable energy sources are an option, they should always be pursued before biogas production. To that end, biogas should not be used in the following use cases:

- **Biogas should not be used to heat and power buildings.** Electric appliances are more energy efficient, and their use improves air quality and avoids the risk of gas leaks. Biomethane use in buildings creates the same set of safety risks as fossil gas, can increase indoor air pollution,[40] and is also likely to be more expensive than electrification, with one study finding a fivefold cost increase to consumers.[41]

- **Biogas should not be used to fuel cars, buses, or trucks.** Electric vehicles are more efficient, cost effective, and less polluting than biomethane. Electric vehicles have zero tailpipe emissions, while biomethane produces GHGs and air pollutants.[42] In addition, biomethane fuel is expensive, and its limited potential availability makes it an unrealistic fuel replacement for most vehicles.[43]

- **Biogas should not replace fossil gas for power plants.** Clean and renewable electricity alternatives can better meet U.S. energy needs without continuing to emit GHGs and health-damaging pollution. Biomethane is chemically identical to fossil gas, which means that it is composed of GHGs and travels through the same leaky pipeline infrastructure. Some alternatives to biogas include solar, wind, energy storage, geothermal, and demand-side resources.

- **Biogas generates pollution; it is not a clean energy solution.** Plus, even if all reasonably available waste were captured and used for biogas, there is not enough biogas to replace current consumption of fossil gas. Biogas should be used only in very limited circumstances where the gas is already a byproduct of existing production processes, such as at sewage treatment plants and landfills. Biogas is neither a clean nor a renewable form of energy and should not be treated like one.

Even if biogas were safe and clean, it would not be possible to capture enough of it to replace 100% of fossil gas demand and meet future energy needs.

40 See generally https://earthjustice.org/features/report-building-decarbonization

41 https://www.sightline.org/2021/03/09/the-four-fatal-flaws-of-renewable-natural-gas/ (citing 2019 study prepared by the American Gas Foundation)

42 https://afdc.energy.gov/vehicles/electric_emissions.html

43 https://www.ucsusa.org/sites/default/files/attach/2017/05/Promises-and-limits-of-Biomethane-factsheet.pdf, p. 4 ("...battery electric vehicles powered by today's grid provide 30 percent lower global warming emissions and 20 percent lower NOx emissions than low-NOx [compressed natural gas] vehicles fueled with biomethane from landfills.")

4 What clean energy and policy solutions avoid reliance on biogas?

1. **End incentives and preferential treatment for biogas:**
   a. **Remove and redirect incentives for biogas production.** Policymakers can take action to facilitate the transition away from CAFOs and disincentivize biogas projects through legislation. A bill introduced by Senator Cory Booker (D-NJ) last year would create a dedicated fund to assist farmers who want to transition from CAFO ownership to organic vegetable production and would put a moratorium on large factory farms.[44]

   b. **Recognize that biogas is not renewable energy or a "clean fuel."** To facilitate the transition to zero-emission energy solutions, policymakers should shift subsidies away from biogas to truly clean energy production and should remove biogas from the list of renewable energy sources.

In California, advocates have petitioned for biomethane from dairy and hog manure to be excluded from the low-carbon fuel standard (LCFS).[45] Including biomethane in the LCFS has been a major incentive for biogas production. Both farmers and community members in other states can follow this example and contact elected officials to voice support for these kinds of initiatives.

2. **Improve waste management practices for municipal solid waste, animal manure, and other biogas sources:**
   a. **Transition to pasture-based crop–livestock systems or plant and agricultural farming.** Over the past century, farmers have increasingly adopted specialized and factory farming practices in which crop and livestock production are separate. These practices—and CAFOs, in particular—pose risks to agricultural sustainability, water quality, soil health, and the climate because they rely on liquefying manure that creates methane.[46] Transitioning to mixed or integrated crop systems and pasture-based farms offers a solution for reducing methane emissions overall by avoiding the storage of manure in conditions that generate methane, effectively cutting out a primary source of biogas while cultivating healthier and more productive soil and restoring natural vegetation that sequesters more carbon.[47]

   For livestock farmers, pasture-based farming that integrates crop production can eliminate or reduce the need for methane-spewing manure lagoons while creating efficient nutrient cycles between plants and animals. The effective use of livestock manure as fertilizer can reduce farmers' costs and potentially increase carbon sequestration capability of soils.[48] Crop integration also helps diversify farming operations, which could minimize the need for supplemental income generated by biogas production.

   b. **Pursue zero-waste policies to reduce waste sent to landfills.** Composting food and yard waste, as well as reuse and recycling of materials, can reduce the amount of waste sent to landfills. Less reliance on landfills is good for people and the planet, resulting in job creation and fewer emissions of air pollutants and GHGs. Composting, materials reuse, and recycling all create more jobs per ton of waste as compared to landfilling. For more information about zero-waste policies and practices, please refer to the Equity Fund's policy brief on waste incineration.[49]

3. **Focus on promoting zero-emission energy solutions.** By investing in clean energy like wind, solar, and energy storage, states can move away from a reliance on biogas as a fuel for electricity generation. Solar energy infrastructure can be deployed on both small and large scales—from spaces on rooftops or parking lots to large farms in less population-dense areas. Wind can often provide energy at night to complement solar energy, and battery storage can help to ensure energy is available when needed. Zero-emission energy solutions like these are more sustainable over the long term and are healthier for people and the planet.

44 https://www.booker.senate.gov/news/press/booker-reintroduces-bill-to-reform-farm-system-with-expanded-support-from-farm-labor-environment-public-health-faith-based-and-animal-welfare-groups
45 https://leadershipcounsel.org/climate-credits-for-factory-farm-gas-violate-civil-rights-fail-to-achieve-climate-benefits-states-petition-submitted-to-carb/
46 https://cafomaps.org/
47 https://www.carbonbrief.org/rich-nations-could-see-double-climate-dividend-by-switching-to-plant-based-foods/
48 https://acsess.onlinelibrary.wiley.com/doi/10.2134/agronj2006.0139; https://civileats.com/2020/01/13/the-plant-based-movement-to-transition-farmers-away-from-meat-and-dairy-production/
49 https://static1.squarespace.com/static/5fb58e0bd182a42ba80eabdd/t/6296637c2b42007c9f4a4f98/1654023036884/EF_Waste+Incinereation+Policy+Brief_May+2022.pdf

In Nevada, the state's largest utility provider, Southwest Gas, is pushing for an expansion of gas infrastructure, calling gas a "bridge" fuel in the state's transition to net-zero emissions by 2050. But investments in gas, including biomethane, embrace energy production practices that produce harmful emissions and air pollutants, locking them in for decades to come. Environmental groups in the state are advocating against the use of fossil gas as a part of Nevada's long-term climate strategy, pushing for legislation that will require gas companies to conduct a more rigorous planning process before building new infrastructure, and arguing against the use of biomethane as an alternative for fossil gas.[50]

5 Conclusion

While biogas comes from the waste we produce, it is anything but sustainable. Reliance on biogas as a clean energy source would harm communities near biogas facilities if those facilities expanded to meet gas demand. Landfills and concentrated animal feeding operations (CAFOs) pose inherent risks to communities. Minimizing the waste that facilities produce would be better for the health and wellbeing of those communities than creating a new revenue stream for that waste. Because these communities are predominantly BIPOC and often low income, challenging states' support for biogas production as a clean energy solution is an environmental justice issue. The best way to tackle climate change is to focus our efforts on zero-emission energy solutions while reducing the waste we produce and, in turn, reducing methane emissions from that waste.

6 FAQs

Isn't it better to use waste for energy rather than just leaving it sitting there?

We should make sure that we are treating and managing waste in the best and safest ways. Creating biogas from wastewater treatment plants, which treat human waste, can be a good way to address methane emissions that result from wastewater treatment processes. Using that energy on site to offset a plant's use of electricity from the grid can be beneficial.

On the other hand, creating waste from CAFOs entrenches an unsustainable system. CAFOs concentrate animal waste in a way that creates serious environmental and safety concerns for nearby communities. Biogas production does not address those concerns. The focus should be on using more sustainable farming practices and better waste management at these facilities. As for biogas from landfills, the most critical practice would be to reduce the amount of waste we generate and send to landfills in the first place.

It is important to note that regardless of its source, once biogas is sent into pipelines to be used offsite, gas leakage is possible. Gas leaks pose a public safety risk and increase greenhouse gas emissions.

What can be done to reduce emissions from biogas production?

States can reduce emissions from biogas production by setting responsible limits. Biogas use should be restricted to sewage treatment and landfills for generating energy that will be used on site. States should not pass policies that create a market for landfills, CAFOs, and other waste generators to get into the business of selling energy from waste.

States should also avoid investing in new pipeline infrastructure to accommodate piped biomethane. The climate crisis demands a shift away from fossil fuels and other combustion-based fuels, like biogas. New investments in gas infrastructure will last for decades and, at worst, entrench us in an energy system that worsens climate change. At best, they will produce stranded assets as the grid moves toward greater reliance on renewable energy.

50 https://thenevadaindependent.com/article/southwest-gas-faces-pressure-from-climate-groups-investors-as-it-charts-future

Are there acceptable or good use cases or waste sources for biogas?

Biogas can be useful when produced and used on site at facilities that also comply with best practices for reducing the amount of waste they generate. The remaining waste can be used to produce energy to power the facilities. The flowchart in **Figure 3** shows how to determine whether a biogas use case or waste source might be acceptable. Yet, any use of biogas increases pollution to nearby communities and should be avoided to the greatest extent possible.

At a large scale, renewable energy resources like solar and wind or demand management practices like energy storage and energy efficiency are far cleaner and more cost effective than biogas.

While biogas comes from the waste we produce, it is anything but sustainable.

What are common reasons people support biogas production? How can we respond to them?

People often support biogas production because proponents herald it as a more sustainable alternative to fossil gas. There are two ways to respond to this position:

1. Remind biogas supporters that waste is not a renewable resource. Better waste management practices are critical to protecting the environment and the health of communities near landfills and CAFOs. Treating waste as a renewable resource could result in the expansion of these facilities rather than the reduction of the amount of waste produced.

2. Let folks know that fossil gas and biogas are identical when combusted. There is no difference between fossil gas and biogas once it gets to a power plant or to your stove. Biogas emits GHGs when combusted, just like fossil gas. When biogas is combusted, it also produces NOx, and exposure to NOx is associated with serious health effects, particularly in children. In addition, producing biogas leads to methane leaks, and methane is a powerful GHG. If you are concerned about the production and combustion of fossil gas, you should also be concerned about the production and combustion of biogas.

7 Additional Resources

- This Earthjustice and Sierra Club report explains why biomethane is not a useful tool for decarbonizing buildings and includes helpful graphics and facts, like the flowchart reproduced in **Figure 3:** https://earthjustice.org/features/report-building-decarbonization

- Sightline Institute blog, "The Four Fatal Flaws of Renewable Natural Gas": https://www.sightline.org/2021/03/09/the-four-fatal-flaws-of-renewable-natural-gas/

- A highly readable analysis of the cost to produce biogas from animal manure, written by Aaron Smith, a professor at the University of California, Davis: https://asmith.ucdavis.edu/news/cow-power-rising

- The False Promises of Biogas: Why Biogas Is an Environmental Justice Issue: https://www.liebertpub.com/doi/10.1089/env.2021.0025

Legal complaints related to biogas production and use:

- A petition for rulemaking to the California Air Resources Board (CARB), asking CARB to open a rulemaking about removing biomethane from animal manure as a qualifying low carbon fuel under its Low Carbon Fuel Standard. The petition was unsuccessful, but it explains the dangers that biomethane production at CAFOs poses to communities: https://food.publicjustice.net/wp-content/uploads/sites/3/2021/10/Factory-Farm-Gas-Petition-FINAL.pdf

- A complaint filed by Duplin County NAACP and the North Carolina Poor People's Campaign against the North Carolina Department of Environmental Quality (NC DEQ) for issuing permits allowing biogas products at hog farms to move forward. The complaint alleges that NC DEQ violated Title VI of the Civil Rights Act by approving those permits. The complaint describes the suffering nearby communities have endured due to pollution from hog farm waste and the disproportionate impact that NC DEQ's permit approvals have had on BIPOC communities (particularly Black communities) in North Carolina: https://www.southernenvironment.org/wp-content/uploads/2021/09/2021-09-27-Title-VI-Complaint-Index-DEQ-Biogas-Permits.pdf