



Climate and Health Impacts of the AI Data Center Boom

Scientific studies on air quality and the health impacts for residents living near data centers is still in the very early stages. Researchers from CalTech and UC Riverside have used advanced analytics (and some AI) to understand emissions from these centers and their associated risk. Collecting industrial data is difficult as not all companies report this information. The overall determination is that using fossil fuels and diesel to power these centers presents respiratory health risks from nitrogen oxide – a major component of smog – and data centers powered by gas and fossil fuels will emit high quantities of greenhouse gases and may derail climate goals.

Breathe Project partners also have excellent resources and templates for ordinances and zoning in communities that we encourage using. (see below)

Messaging

1. Data Center Growth Carries a Major Climate Footprint. We encourage fossil-free data centers.

The rapid expansion of artificial intelligence (AI) will require massive computing power, driving up energy use, water consumption and carbon emissions at a pace that is currently outstripping sustainability efforts. (1)

2. By 2030, AI Data Centers Could Add 24–44 million tons of CO₂e (equivalents).

At the current rate of growth, AI data centers may make climate change worse by releasing the equivalent emissions of **5–10 million additional cars** on America's roads each year. (1)

3. Data Centers Are Extremely Water-Intensive and may be powered by diesel both for operations and for backup energy during times of high or peak demand.(1)

Cooling these facilities could consume **731–1,125 million cubic meters of water every year by 2030**—equal to the annual water use of **6–10 million U.S. households**. (1)

The [vast majority of data center backup generators](#) are powered by diesel, [offering proven site reliability at scale that alternative fuels have yet to match](#). Even the newest data center facilities may continue to rely on diesel generators which are typically classified as Tier 2 that have significantly higher emission rates than Tier 4 units.

Tier 4 units for nonroad diesel engines may reduce particulate matter by 95%, reduce nitrogen oxides by 90% and virtually eliminate sulfur oxides completely and therefore may be better for air quality than the Tier 2 diesel units.(3)

Commented [JG1]: according to <https://larc.virginia.gov/landing-2024-data-centers-in-virginia.asp>, Data center backup generators emit pollutants, but their use is minimal, and existing regulations largely curb adverse impacts

It may be important to note this is in VA. Also it is unclear to me if the HBR article was saying AI centers are powered by on-site diesel, or if they have on-site diesel backup generators. I looked at a recent permit, and they have both, but the onsite generators that run for routine power (local, off grid) are all Tier-4 compliant engines.

It is also true that the back up generators COULD be brought online as noted during a high demand period this past summer. Even so, they are limited to 500 hours per year. Not great for sure.

Commented [CA2R1]: Thanks John. I'm revising this to say may and mentioning the data is based on Virginia. Also the issue that back up could be brought on as needed during high demand. Hope that addresses the concerns.

4. Without Intervention, AI Data Centers Will Undermine Net-Zero Climate Goals

The combined energy and water demands risk putting the industry's **net-zero emissions commitments out of reach**, unless action is taken now to stop the growth of fossil-fuel powered data centers. (1)

5. Diesel backup generators on site could pose serious health risks to communities and people living nearby and may emit high concentrations of nitrogen dioxide.

Researchers at the University of Tennessee, Knoxville, ran an analysis on the air quality in South Memphis over the last couple of years, based on public satellite data from NASA and the European Space Agency. They found that average concentrations of **nitrogen dioxide** increased by 3% when comparing the periods before June 2024 and afterward. They also found that peak nitrogen dioxide concentration levels have increased by 79% from pre-xAI levels in areas immediately surrounding the data center, and by 9% in nearby Boxtown. (4)

6. Smart Infrastructure Choices Can Reduce Impacts by up to 86%

The Cornell study lays out a roadmap showing that **strategic siting, faster grid decarbonization and improved operational efficiency** can cut environmental impacts dramatically—**73% for carbon and 86% for water**. (1)

7. Clean, Renewable Energy Grids Alone Won't Solve the Problem

Even aggressive shifts to renewables may cut AI-related emissions by about **15% by 2030**—meaning AI data center growth could still push total emissions higher unless clean energy deployment accelerates dramatically. (1)

8. Better Cooling & Efficiency Technologies Are Essential

Advanced cooling systems, higher server utilization and other innovations may cut an additional **7% of CO₂** and **29% of water use**, on top of gains from siting and grid improvements. (1)

9. Pennsylvania – in its current circumstance regarding power generation mix and water availability, etc. – is middle to bottom of the pack of 'logical' places for AI centers in the U.S. regarding concerns around climate, health and water use.

10. CLEAN ENERGY! Even if each kilowatt-hour gets cleaner, total emissions can rise if AI demand grows faster than the grid decarbonizes. The solution is to accelerate the clean-energy transition in the same places where AI computing is expanding. (1)

How to Protect Your Community from Detrimental Impacts

- Large-scale data centers being proposed with gas/ fossil fuels in the area have the potential to create extraordinary impacts to public health, safety, welfare and the environment.
- Like warehouses and distribution centers, data centers would convert large areas of undeveloped land into impervious surface and create stormwater management, wildlife habitat and aesthetic concerns. ([PSRPA](#))

- Municipalities should try to avoid curative amendment/substantive validity challenges that may result in the municipality losing control over the siting of these highly impactful uses. To assist this, PennFuture has created a model data center ordinance to help municipalities start these conversations and create protect ordinances for data center development. ([PennFuture](#))
- Examples of successful ordinances can also be found in [Penn Township, Westmoreland County, Pa.](#) and [Fayette County Ordinance Fayette County, Pa.](#)

Sources

1. **Cornell University Report**, “Roadmap’ shows the environmental impact of AI data center boom,” and Nature Sustainability, (Study is based on a data center emissions in Virginia), November, 2025
Xiao, T., Nerini, F.F., Matthews, H.D. *et al.* Environmental impact and net-zero pathways for sustainable artificial intelligence servers in the USA. *Nat Sustain* (2025).
<https://doi.org/10.1038/s41893-025-01681-y>
2. **Harvard Business Review**, “[Migrating the Public Health Impacts of Data Centers](#),” November 2025.
3. **Data Center Air Permit Guidelines**, [Virginia Dept. of Environmental Quality](#), January 2025.
4. **Mortality risk from United States coal electricity generation**, Science, November 2023.
5. **Environmental Health Project Air Modeling Data TK**
6. **Physicians for Social Responsibility Pennsylvania**, “[What Data Centers Mean for Pennsylvania](#)” Fact Sheet

Consider adding statistics about impacted population conditions in a 2-mile radius of the proposed site of the plant from PA EnviroScreen. Also, consider adding impacted population stats from the ALA:

<https://www.lung.org/research/sota/city-rankings/states/pennsylvania/allegheeny>