

Environmental Impact of AI

One of the major takeaways from the U.S. Global Change Research Program's Fifth National Climate Assessment from fall 2023 is that the United States is warming faster than the rest of the world due to human activity.¹ Negative impacts of climate change have undue and unequal consequences on Native People and People of Color, under-resourced urban and rural communities, people with disabilities, and girls and women. It is important that decision-makers and policymakers acknowledge, consider, and confront the environmental impacts of artificial intelligence and cloud technology.²

"In the race to produce faster and more-accurate AI models, environmental sustainability is often regarded as a second-class citizen," noted University of Florence Assistant Professor Roberto Verdecchia.³

Although these technologies operate in virtual spaces, AI and the cloud will intensify greenhouse gas emissions, consume increasing amounts of energy, and require larger quantities of natural resources.⁴

Research suggests...

- **A single generative AI text query** consumes energy at four or five times the magnitude of a typical search engine request.⁵
- **Generating a single image using AI** consumes the same amount of energy as charging a phone to full power.⁶
- **Training one large AI model** consumes nearly five times the lifetime emissions of the average American car.⁷
- **Data centers**—giant warehouses filled with endless rows of computer servers that are continuously working to complete tasks—used 4 percent of total U.S. electricity in 2023, and that number is expected to jump 7–12 percent in the next three years alone.⁸

While it is nearly impossible for researchers to evaluate the full extent of the negative environmental impacts of AI technologies, decision-makers in education settings should be mindful of their environmental impacts throughout the planning and implementation phases.

¹ U.S. Global Change Research Program. Fifth National Climate Assessment. (2024). <https://nca2023.globalchange.gov/>

² Keller, J. B., Donoghoe, M., & Perry, A. M. The US Must Balance Climate Justice Challenges in the Era of Artificial Intelligence (2024). Brookings Institution. <https://www.brookings.edu/articles/the-us-must-balance-climate-justice-challenges-in-the-era-of-artificial-intelligence/>

³ Ibid.

⁴ Ibid.

⁵ Zewe, Adam. "Explained: Generative AI's Environmental Impact. MIT News. (January 17, 2025). <https://news.mit.edu/2025/explained-generative-ai-environmental-impact-0117>.

⁶ Heikkilä, Melissa. "Making an Image with Generative AI Uses as Much Energy as Charging Your Phone." Technology Review. (Dec. 1, 2023). <https://www.technologyreview.com/2023/12/01/1084189/making-an-image-with-generative-ai-uses-as-much-energy-as-charging-your-phone/>.

⁷ Hao, Karen. "Training a Single AI Model Can Emit as Much Carbon as Five Cars in their Lifetimes." MIT Technology Review. (June 6, 2019). <https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/>.

⁸ Michel, Melodie. "Data Centres Could Consume 12% of US Electricity Within 4 Years." CSO Futures. (January 7, 2025). <https://www.csOfutures.com/news/data-centres-could-consume-12-of-us-electricity-within-4-years/>.

Considerations for Educators

As you are making decisions about the use of AI technologies in your classroom, it is important to consider the environmental impact of AI's use:

- Frequent AI-powered tasks—such as automated grading, image generation, adaptive learning, and chat bot interactions—consume considerable energy and contribute to the need for more data centers in communities.
- You should be aware of the carbon footprint associated with AI tools and advocate for sustainable options.
- Where possible, schools and universities should adopt policies that prioritize energy-efficient AI models and cloud technologies powered by renewable energy.
- You should teach your students about the environmental impact of AI as part of learning around digital literacy.
- When you discuss AI ethics with students, you should include sustainability and responsible AI usage.
- When you create assignments and projects, you should encourage your students to explore energy-efficient AI alternatives, when possible.
- AI should complement, not replace, traditional teaching methods. Hybrid approaches that combine AI-driven personalization with resource-efficient teaching will help mitigate environmental costs.

This document was created in spring 2025. It will be updated as further research on this topic becomes available.