

The hidden cost of the AI boom: Social and environmental exploitation

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Credit: AI-generated image ([disclaimer](#))

Mainstream conversations about artificial intelligence (AI) have been dominated by a few key concerns, such as whether superintelligent AI will [wipe us out](#), or whether AI will steal our jobs. But we've paid less attention the various other environmental and social impacts of our "consumption" of AI, which are arguably just as important.

Everything we consume has associated "[externalities](#)"—the indirect impacts of our consumption. For instance, [industrial pollution](#) is a well-known externality that has a negative impact on people and the environment.

The [online services](#) we use daily also have externalities, but there seems to be a much lower level of public awareness of these. Given the massive uptake in the use of AI, these factors mustn't be overlooked.

Environmental impacts of AI use

In 2019, French think tank The Shift Project estimated that the use of digital technologies produces more [carbon emissions](#) than the [aviation industry](#). And although AI is currently estimated to contribute less than 1% of total carbon emissions, the AI market size is predicted to [grow ninefold by 2030](#).

Tools such as [ChatGPT](#) are built on advanced computational systems called large language models (LLMs). Although we access these models online, they are run and trained in physical data centers around the world that consume significant resources.

Last year, AI company Hugging Face published an [estimate](#) of the carbon footprint of its own LLM called BLOOM (a model of similar complexity to OpenAI's [GPT-3](#)).

Accounting for the impact of raw material extraction, manufacturing, training, deployment and end-of-life disposal, the model's development and usage resulted in the equivalent of [60 flights from New York to London](#).

Hugging Face also estimated GPT-3's life cycle would result in ten times greater emissions, since the data centers powering it run on a more

carbon-intensive grid. This is without considering the raw material, manufacturing and disposal impacts associated with GTP-3.

OpenAI's latest LLM offering, [GPT-4](#), is [rumored to have trillions of parameters](#) and potentially far greater energy usage.

Beyond this, running AI models requires large amounts of water. Data centers use water towers to cool the on-site servers where AI models are trained and deployed. Google recently [came under fire](#) for plans to build a new data center in [drought-stricken Uruguay](#) that would use 7.6 million liters of water each day to cool its servers, according to the nation's Ministry of Environment (although the Minister for Industry has contested the figures). Water is also needed to generate electricity used to run data centers.

In a [preprint](#) published this year, Pengfei Li and colleagues presented a methodology for gauging the water footprint of AI models. They did this in response to a lack of transparency in how companies evaluate the water footprint associated with using and training AI.

They estimate training GPT-3 required somewhere between 210,000 and 700,000 liters of water (the equivalent of that used to produce between 300 and 1,000 cars). For a conversation with 20 to 50 questions, ChatGPT was estimated to "drink" the equivalent of a 500 milliliter bottle of water.

Social impacts of AI use

LLMs often need extensive human input during the training phase. This is typically outsourced to [independent contractors who face precarious work conditions](#) in low-income countries, leading to "digital sweatshop" criticisms.

In January, Time [reported](#) on how Kenyan workers contracted to label text data for ChatGPT's "toxicity" detection were paid less than US\$2 per hour while being exposed to explicit and traumatic content.

LLMs can also be used to generate [fake news and propaganda](#). Left unchecked, AI has the potential to be used to manipulate public opinion, and by extension could undermine [democratic processes](#). In a [recent experiment](#), researchers at Stanford University found AI-generated messages were consistently persuasive to human readers on topical issues such as carbon taxes and banning assault weapons.

Not everyone will be able to adapt to the AI boom. The large-scale adoption of AI has the potential to worsen global [wealth inequality](#). It will not only cause significant [disruptions to the job market](#)—but could particularly marginalize workers from certain backgrounds and in [specific industries](#).

Are there solutions?

The way AI impacts us over time will depend on myriad factors. Future generative AI models *could* be designed to use [significantly less energy](#), but it's hard to say whether [they will be](#).

When it comes to data centers, the location of the centers, the type of power generation they use, and the time of day they are used can significantly impact their overall [energy](#) and [water](#) consumption. Optimizing these computing resources could result in significant reductions. Companies including [Google](#), [Hugging Face](#) and [Microsoft](#) have championed the role their AI and cloud services can play in managing resource usage to achieve efficiency gains.

Also, as direct or indirect consumers of AI services, it's important we're all aware that every chatbot query and image generation results in [water](#)

and energy use, and could have implications for human labor.

AI's growing popularity might eventually trigger the development of [sustainability standards and certifications](#). These would help users understand and compare the impacts of specific AI services, allowing them to choose those which have been certified. This would be similar to the [Climate Neutral Data Center Pact](#), wherein European data center operators have agreed to make data centers climate neutral by 2030.

Governments will also play a part. The European Parliament has approved draft legislation to mitigate the risks of AI usage. And earlier this year, the US senate heard testimonies from a range of experts on how AI might be effectively regulated and its harms minimized. China has also [published rules](#) on the use of generative AI, requiring security assessments for products offering services to the public.

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