Programmazione Web

React

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Intervento realizzato da

ITS
TECNOLOGIE
DELL'INFORMAZIONE E
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The Environmental Impact of IT

The Environmental Impact of IT

In 2023, global CO_2 emissions from energy-related activities **increased by about 2%** compared to the previous year, reaching approximately **36.5 billion metric tons**. This is comparable to the **annual emissions of about 150 million cars**.

The largest contributors to CO_2 emissions include:
- **Transportation**, with 1.86 billion metric tons
- **Electric Power**, with 1.43 billion metric tons
- **Industrial**, with 0.96 billion metric tons

Every year, **digital technologies contribute to approximately 2–4% of global CO_2 emissions**, close to the entire shipping industry's impact.

Source [#1](#), [#2](#), [#3](#)

Greenhouse emissions

Spam emails alone generate approximately **36 million tons of CO$_2$ annually**, equivalent to the emissions of some small countries.

Devices like smartphones alone estimated to generate **125 million tons of CO$_2$ per year**.

Data centers alone are responsible for **2% of global greenhouse gas emissions**, similar to the entire airline industry.

Source [#1](), [#2](), [#3]()

Greenhouse emissions

Digital activities have a **significant environmental impact**, with **the average internet user** spending around **3,230 hours online** per year, contributing approximately **229 kg of CO_2** emissions annually.
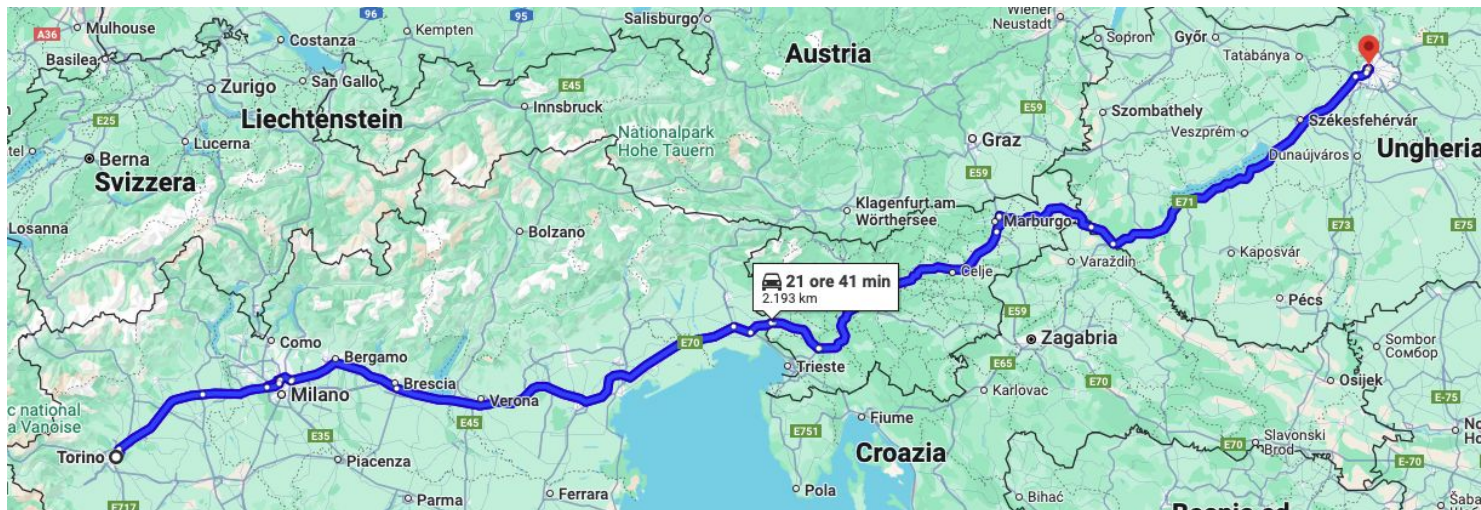
This constitutes about **3-4% of average per capita greenhouse gas emissions**.

Source #1, #2, #3

Greenhouse emissions

An **average vehicle passenger** creates emissions of **108.1g CO2 per km**.

Therefore, **229 kg of CO_2** is equivalent to a travel of **2.120 km** by car.


Source #1, #2, #3

Electricity consumption

The energy demand of ICT activities, including streaming, online gaming, and social media, accounts for about **8-10% of total global electricity consumption**.

Data centers consumed **460 terawatt-hours** (TWh) of electricity in 2022, about **as much as the entire country of France**.

AI models such as GPT-3 are estimated to **consume as much energy as five European households in a single day**.

Europe leads in energy-efficient practices, while emerging markets often face challenges.

Source [#1](#), [#2](#), [#3](#)
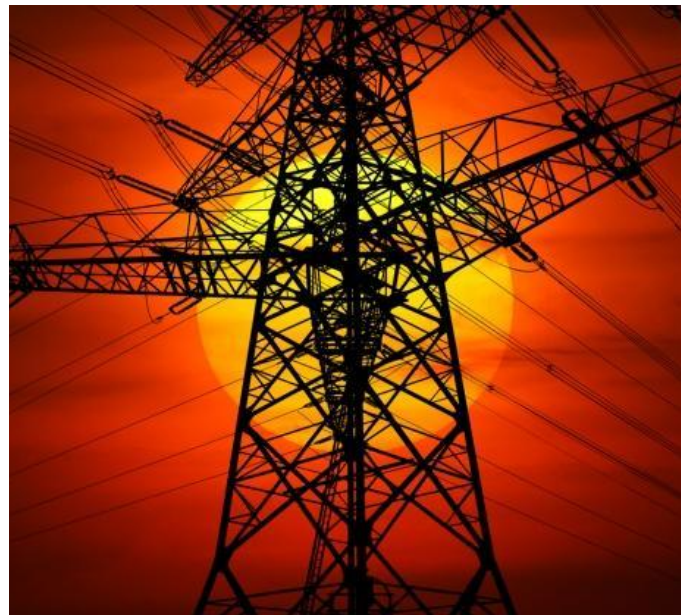
Waste

The so-called **E-waste**, including discarded screens, smartphones, and computers, **increased by 30% from 2010 to 2022**, **totaling 10.5 million tons**.

Only 24% of this was formally recycled globally, emphasizing the need for better waste management practices.

Source [#1](#), [#2](#), [#3](#)

Water consume

Data Centers in **arid regions** consume **up to 8,5 million liters per day** to maintain operations. For context, **typical household water usage** for cleaning and sanitation is about **340 liters per day**.

A single data center's water use can match that of a small city, emphasizing the need for efficient cooling technologies to **minimize freshwater use**.

Semiconductor construction companies can use **up to 10 million gallons of water daily**, and up to **2,000 gallons of water per chip**. As a comparison, this is similar to an average American's two-month water use.
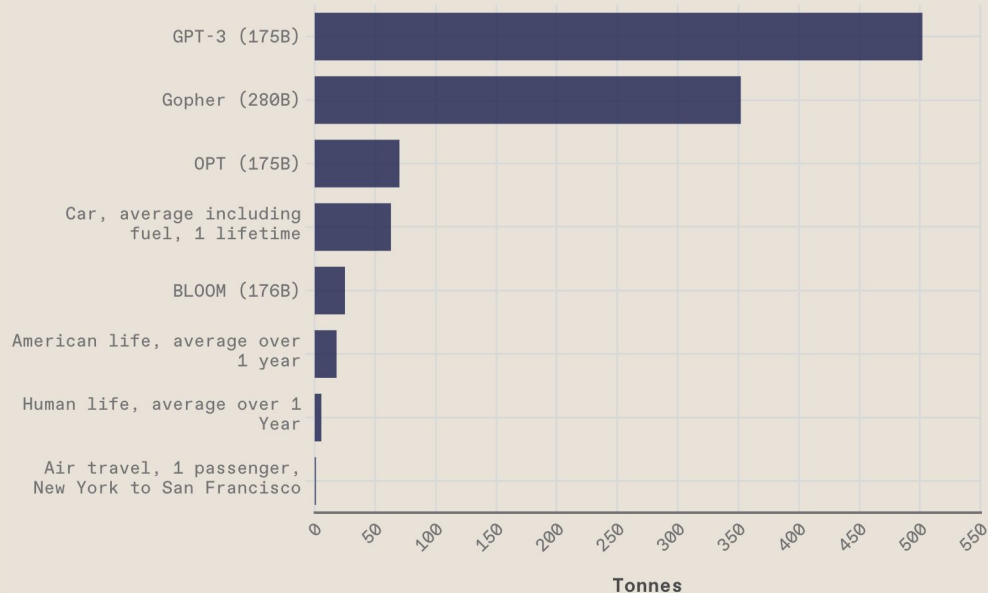

Source #1, #2, #3

Water consume

In 2023, data centers consumed over 7.500 billions of liters for cooling purposes.

Let's add AI in the equation

CO$_2$-Equivalent Emissions of Selected Machine Learning Models

Bar chart showing tonnes for:
- GPT-3 (175B): ~500
- Gopher (280B): ~350
- OPT (175B): ~70
- Car, average including fuel, 1 lifetime: ~65
- BLOOM (176B): ~25
- American life, average over 1 year: ~18
- Human life, average over 1 Year: ~5
- Air travel, 1 passenger, New York to San Francisco: ~1

X-axis: Tonnes (0, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550)
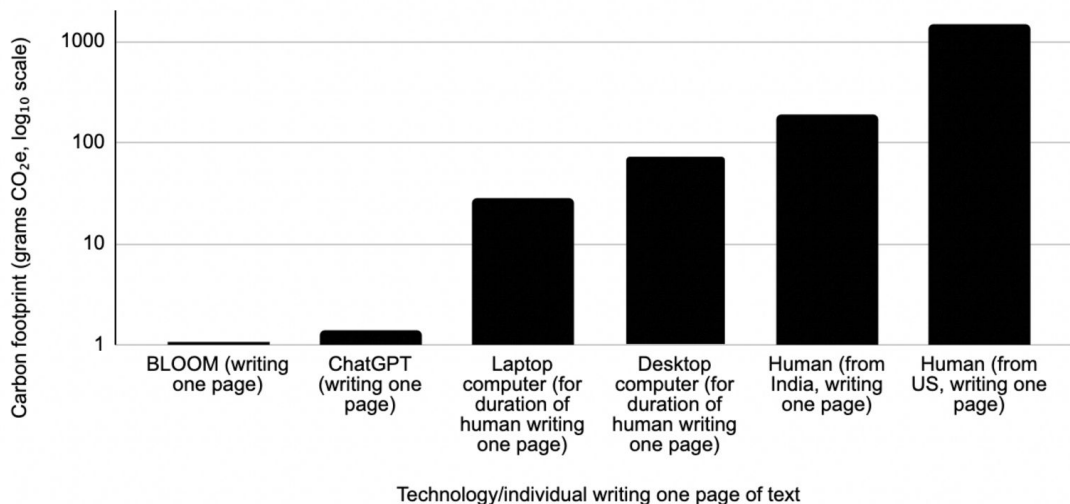
Source: Luccioni et al., 2022; Strubell et al., 2019; via the 2023 AI Index Report

IEEE Spectrum

Training and using AI models is one of the most impactful activities.

Let's add AI in the equation
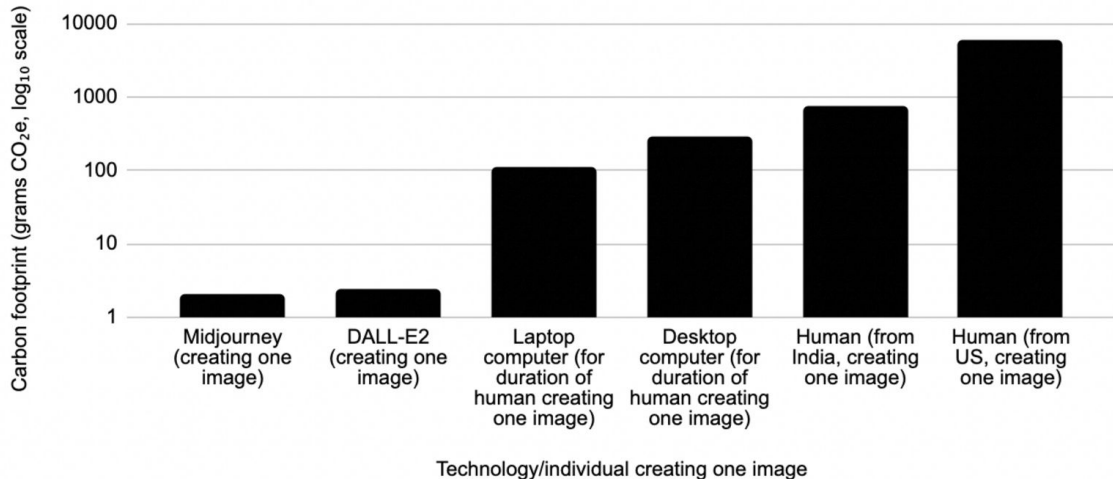

Carbon footprint (grams CO2e) for Text Writing

But can also lead to a more efficient way of doing things.

Let's add AI in the equation

Carbon footprint (grams CO2e) for Image Creation

But can also lead to a more efficient way of doing things.

What can we do ourselves?

Configure **energy saving modes** in smartphones and PCs.

Turn off your devices as simply doing it could **save around 60%** of its standby energy consumption.

The average smartphone emits about 75 kg of CO_2 over its lifecycle, which can be significantly **reduced by prolonging its use**.

Use most sustainable Data Centers and optimize data transfer, storage and CPU workloads.

Use AI responsibly and only when needed.

Source [#1](#), [#2](#), [#3](#)