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FACULTY OF SOCIAL ADMINISTRATION

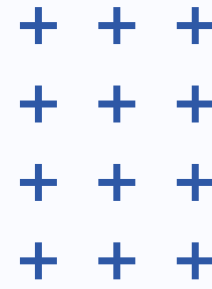
AI AND ITS COMPOUND EFFECTS ON ENERGY CONSUMPTION ON ENVIRONMENTAL SUSTAINABILITY

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What is happening?



- AI has hidden environmental impacts
- Generative AI energy use is rising: one query can use 10× more energy than a Google search
- AI increases water consumption: ChatGPT uses ~500 ml of water per 20–50 prompts
- More users = more energy + more water
- Research on AI's environmental cost is still limited

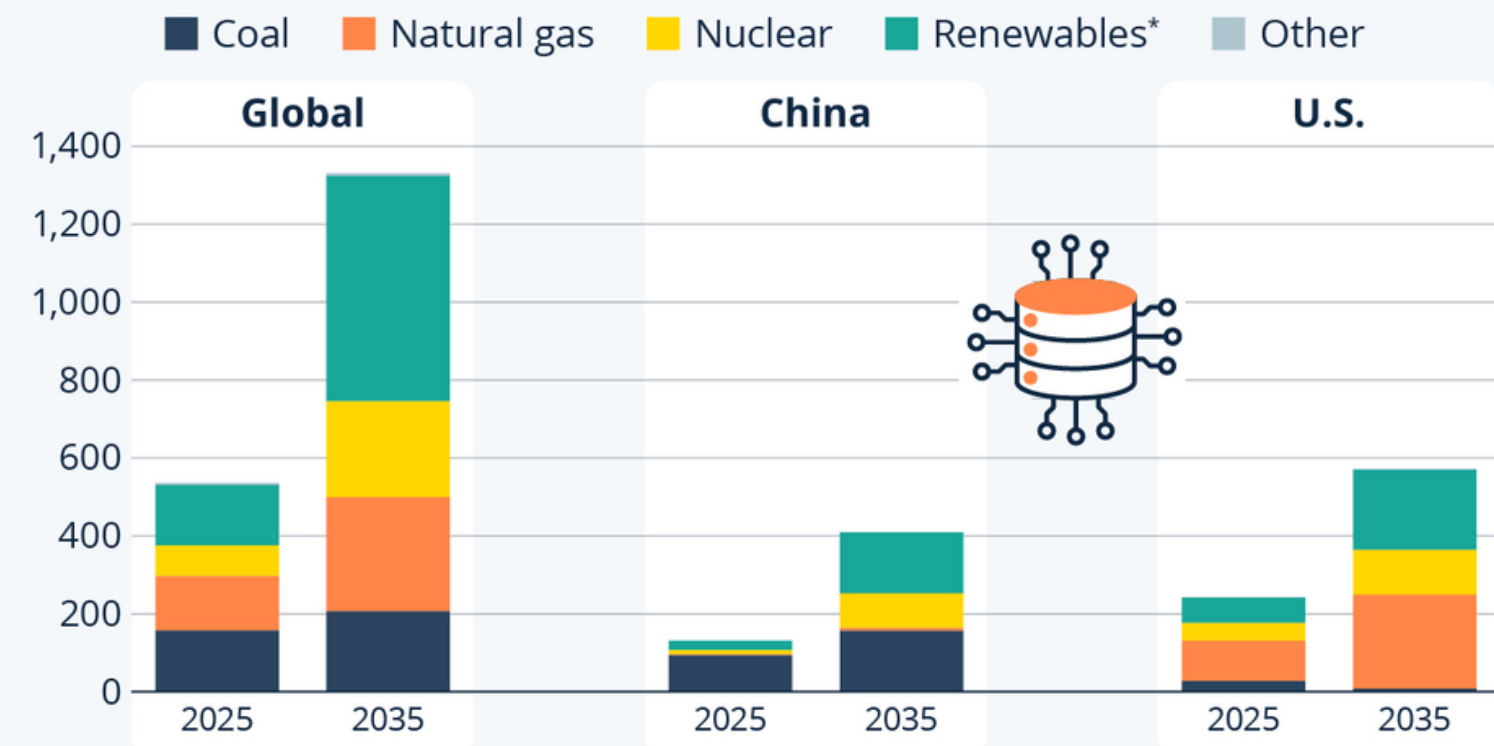
Energy Overconsumption

- AI uses a lot of electricity
- Small changes in how AI works can change energy use by 30–40%
- Big AI systems release a lot of CO₂
- Data centers use huge amounts of water for cooling
- More AI use = more energy, more carbon, more water



Data Center Energy Consumption Surges Amid AI Boom

Electricity generation to supply data centers, by energy source (in TWh)



* Solar PV, wind and other renewables

Based on the fuel mix of the electricity physically consumed by data centers rather than contractual mix of different data center operators.

Source: IEA

Research Gap

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Problem

Even though AI is developing rapidly, the consequences to environmental sustainability have not been addressed, and the mechanism to tackle this issue has yet been approached effectively.

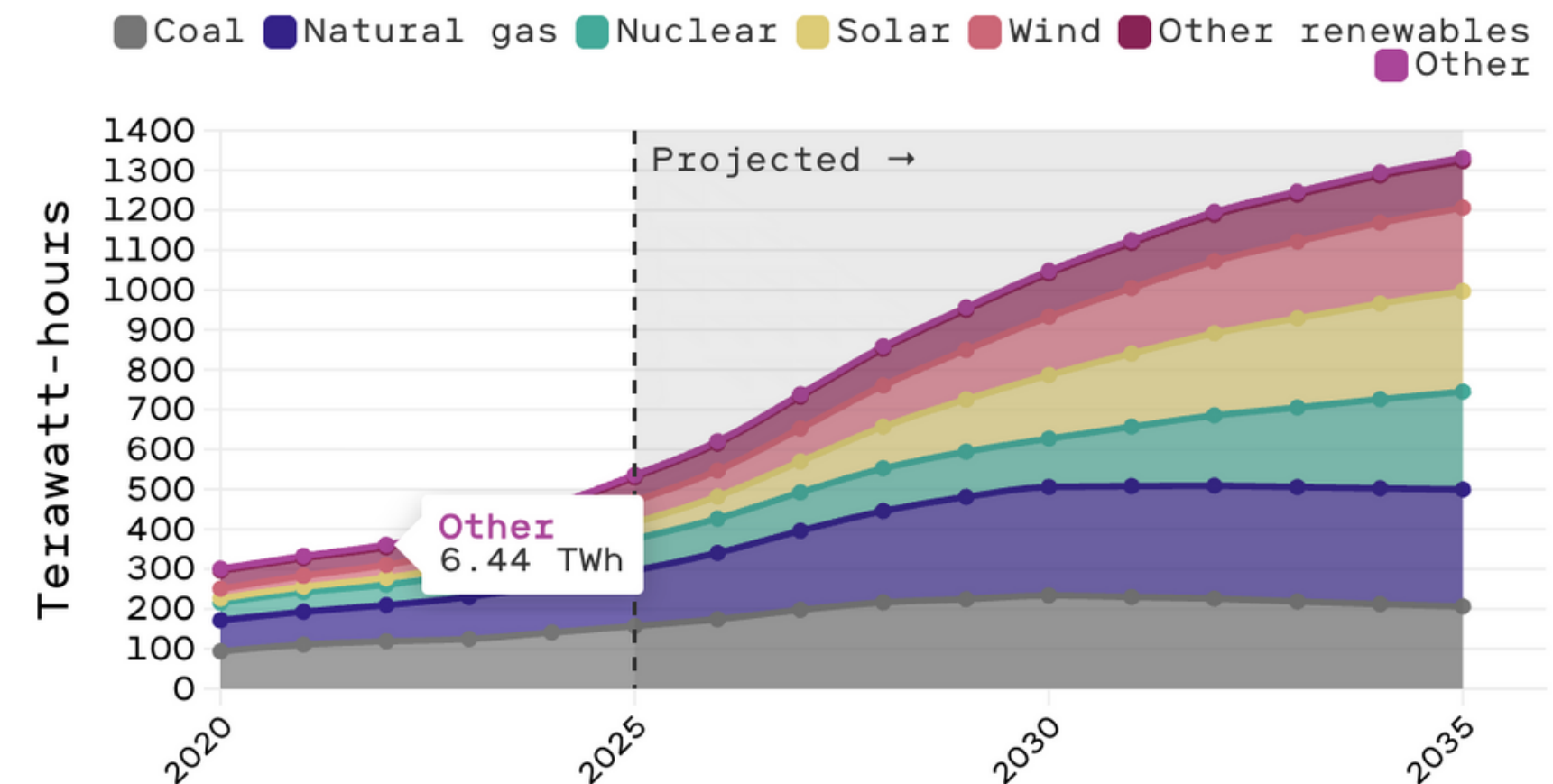


Importance

We need to understand:

- How AI can be properly used in environment sustainability
- Both the advantages and disadvantages of AI
- The long-term effect of AI in environmental issues

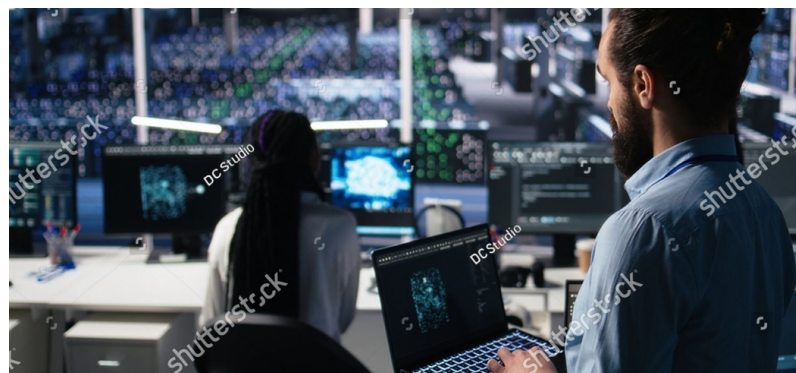
Global electricity generation for data centers



Source: [International Energy Agency](#)
Chart by Casey Crownhart, MIT Technology Review

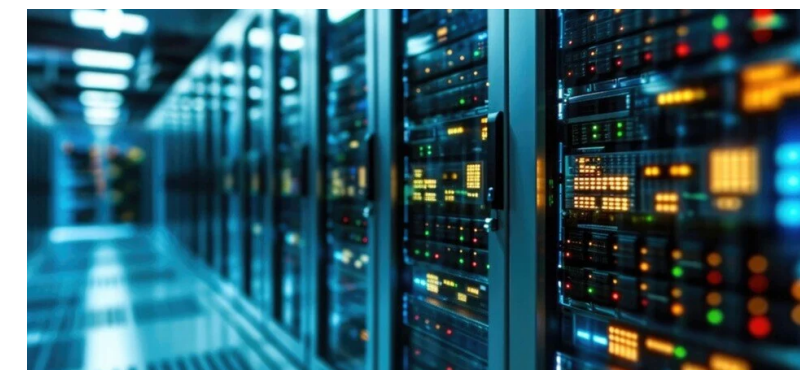
Research Question & Objective

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Research Question

How does the rapid expansion of AI development and deployment lead to rising energy consumption and result to environmental burdens?



Research Objective

To investigate how AI's expanding energy consumption affects environmental sustainability

Research Design

Scope, Data Collection,
Analytical Technique



Study Scope

Focusing on the relation between the expanding consumption of AI and its consequence of energy overconsumption to environmental issues. This cover AI platforms such as ChatGPT.



Data Collection

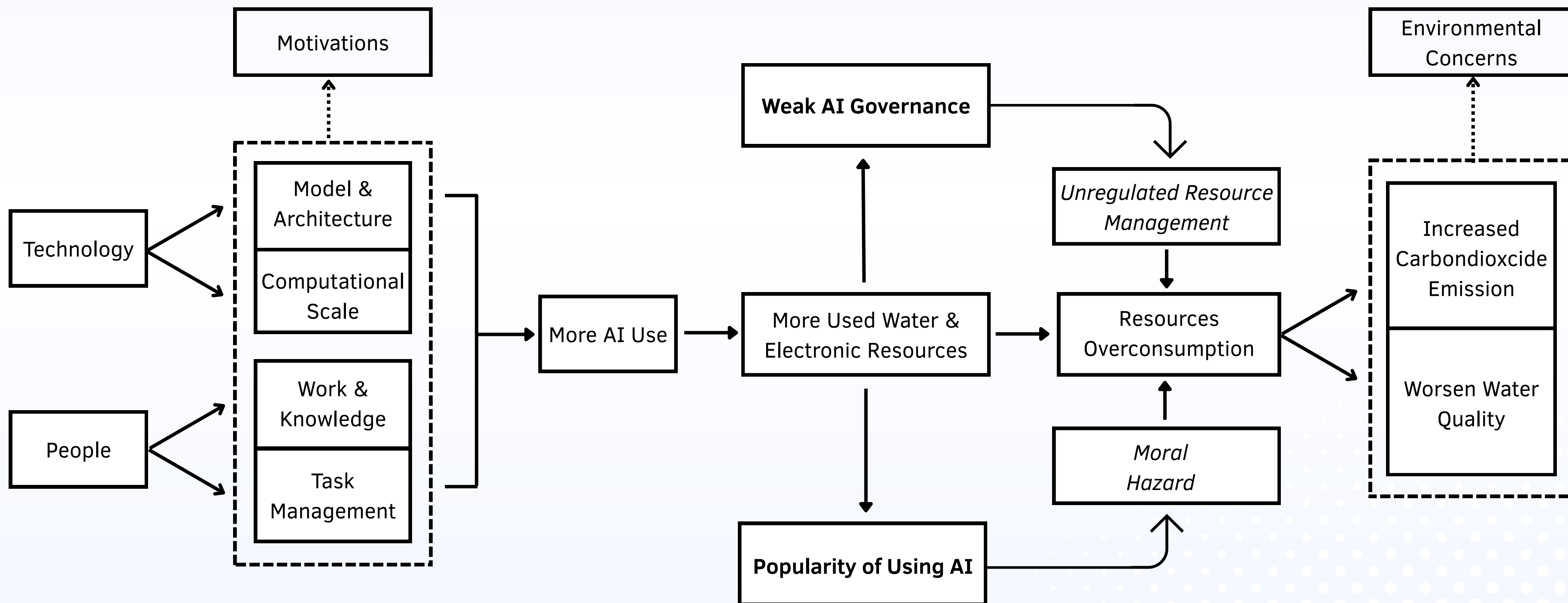
Data collected from late 2010 to early 2025



Analytical Technique

Desk review with theoretical contents analysis from national and international documents

Research Conceptual Framework





Research Key Findings - 1

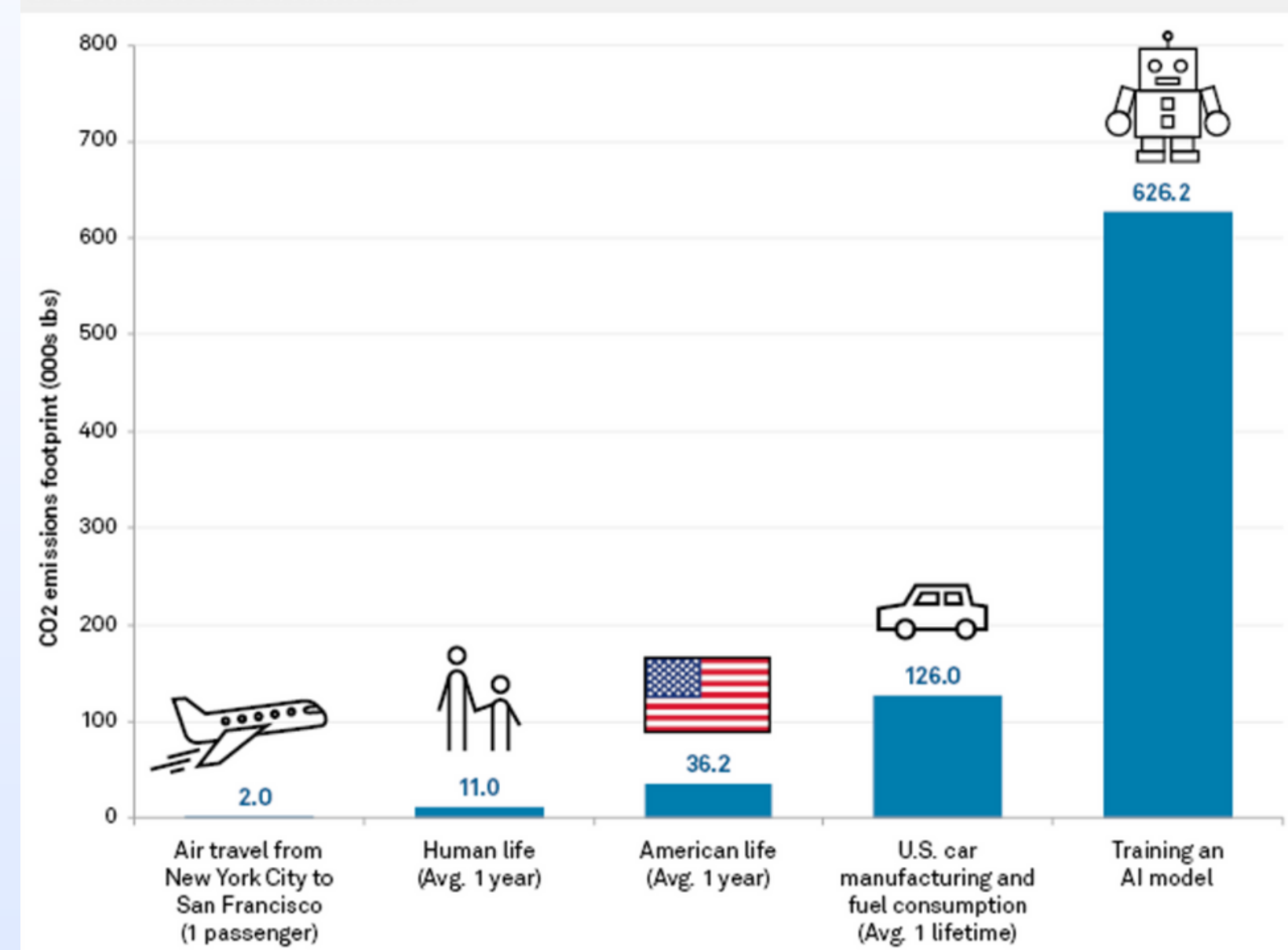
Weak AI Governance

- No strong policies for AI's environmental impact.
- Lack of global standards.
- Slow regulatory response.

Unregulated Resource Management

- Energy and water use not monitored.
- Companies self-regulate.
- Hidden environmental costs.

CO2 emission benchmarks



Research Key Findings - 2

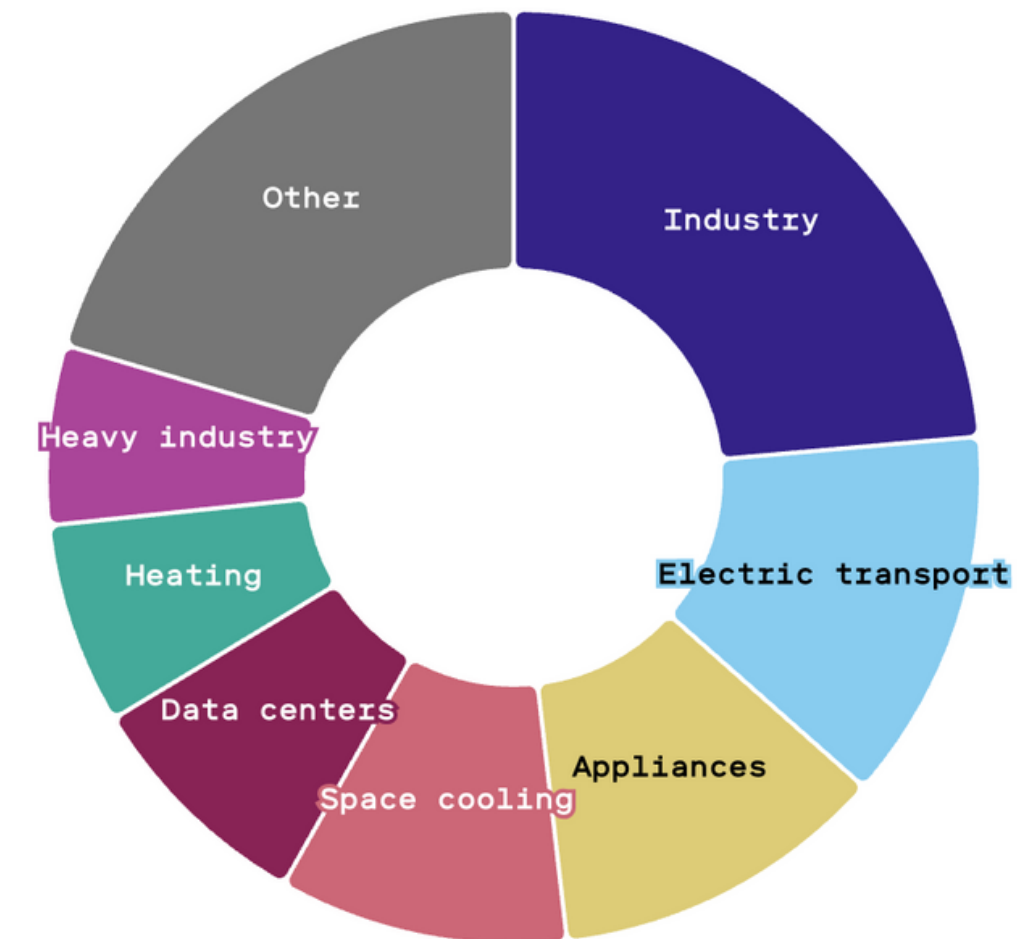
Popularity of Using AI

- Rapid growth of everyday AI use.
- High demand increases server loads.
- Pressure to build bigger models.

Moral Hazard

- Users ignore environmental cost.
- Overuse because AI feels “free.”
- Unlimited prompts = more resource waste.

Increase in electricity demand by sector, 2024-2030



Source: International Energy Agency
Chart by Casey Crownhart, MIT Technology Review

Policy Response

To address these issues, governments need to establish real AI governance rules instead of letting companies move unchecked. Clear limits on water and energy use should be enforced so overconsumption isn't treated as an afterthought. Developers must also be pushed toward sustainable, energy-efficient AI design rather than endlessly scaling systems with no environmental accountability.

1**Strengthen AI governance****2****Set limits on AI energy & water use****3****Mandate sustainable AI design**

Strengthen AI governance

- EU AI Act sets strict rules for high-risk AI systems
- Shows strong governance can control unchecked AI growth

Set limits on AI energy & water use

- Singapore & Japan require data centers to report energy use
- Include energy-efficiency and cooling-efficiency standards

Mandate sustainable AI design

- U.S. companies (Google, Microsoft) moving toward 24/7 carbon-free energy
- Policies encouraging renewable-powered AI infrastructure



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Discussion

**Weak AI Governance is
Dominated by Weak
Environmental Institutional
settings**

Hacker, P. (2023).

Weak AI governance was influenced by ineffective regulations to control AI's ecological footprint or resource use, supported by Hacker, P. (2023).

Nishant et al. (2020)

Weak governance frameworks and the absence of resource management systems in AI development amplify sustainability risks, as outlined by Nishant et al. (2020).

Sidorkin, A. (2025)

Generative AI's unmonitored energy and water use highlights major resource management gaps, as evidenced by Sidorkin, A. (2025).

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Discussion

AI Popularity and Moral Hazard Issues

Pimenow et al. (2024)

The rising popularity of AI technologies is driving substantial increases in electricity consumption and climate-related impacts, as highlighted by Pimenow et al. (2024).

Salatino et al. (2025)

The growing reliance on AI is shaping human decision-making in ways that reduce personal responsibility, as illustrated in Salatino et al. (2025).

Galaz et al. (2021)

The growing dependence on AI encourages risk-blind user behavior, allowing environmental consequences to be overlooked—an issue clearly illustrated in Galaz et al. (2021).

Conclusion

What this study reveals about the link between AI growth, rising energy use, and environmental impact?

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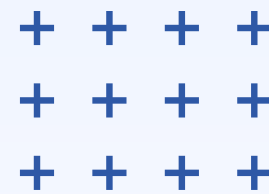
Rapid AI development significantly increases energy and water consumption, showing that current AI growth is environmentally unsustainable.



Weak governance and the absence of resource regulation intensify these impacts, allowing AI systems to expand faster than environmental safeguards.



Human-driven overuse of AI, including moral hazard and excessive reliance, further amplifies energy demand, creating long-term environmental risks.



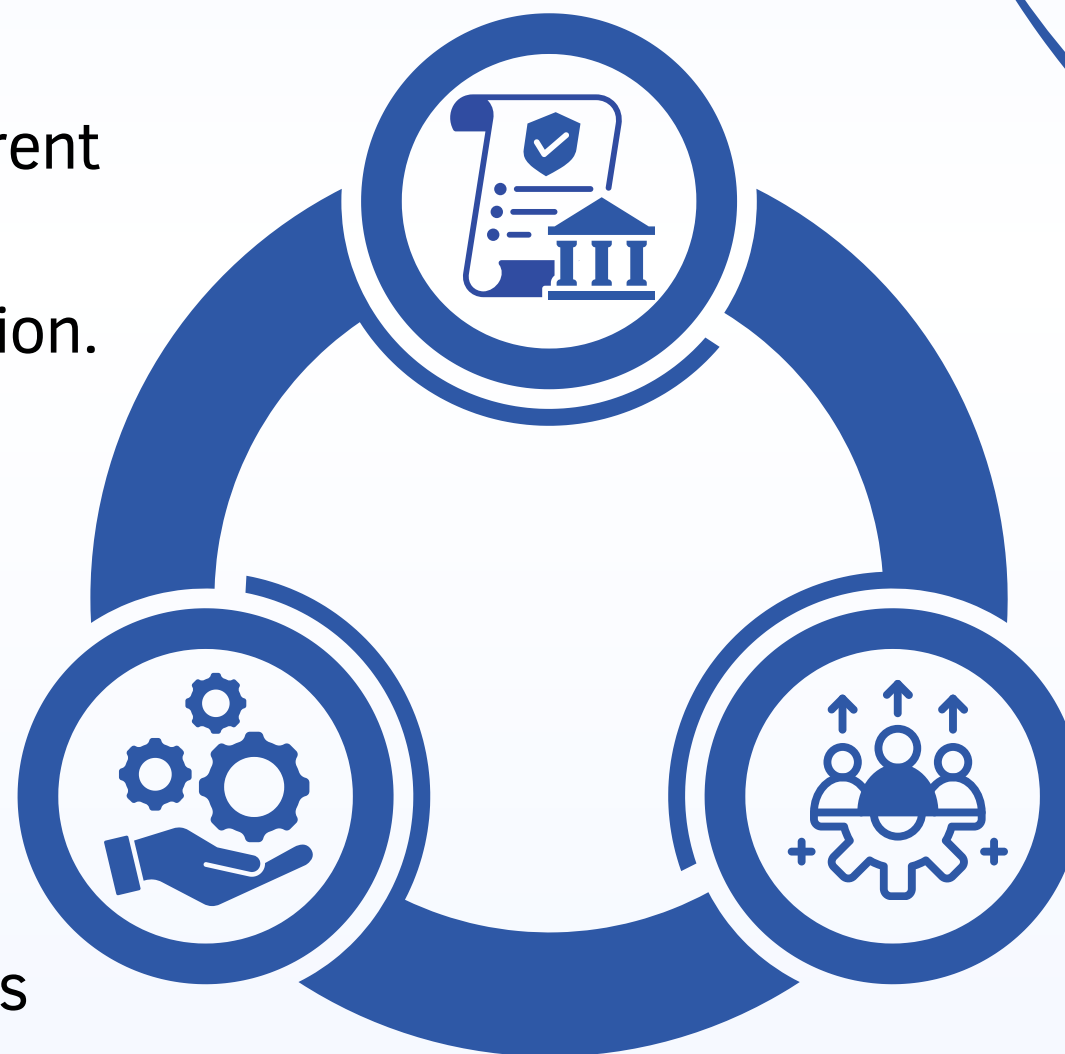
Recommendation

✓ Strengthen AI Regulation Policies

Governments should establish clear and enforceable policies for AI usage because current regulations do not address the environmental risks created by rapid and unmonitored adoption.

✓ Implement Resource Management Standards

AI systems must follow strict guidelines on electricity and water consumption, as the growing demand for natural resources remains largely ignored despite rising environmental pressures.



✓ Promote Sustainable AI Development

AI developers should prioritize environmentally efficient model architecture and infrastructure to reduce long-term ecological impacts, acknowledging that society cannot detach from AI in daily life.



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**THANK YOU FOR
YOUR ATTENTION**

