

Robotics research should think more about sustainability!

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The Golden Age of Robotics?

- Multi-purpose robots **matching and surpassing** human physical abilities
- We start imagining them becoming a part of our daily lives
 - Last mile delivery
 - Help with the elderly
 - Helping with daily activities

....

- **We are not there yet**, but many labs and companies are investing a lot of effort and money into this problem.
 - Especially in pursuit of AI based Foundational models



CGTN video (February 2026): <https://www.youtube.com/watch?v=mUmlv814aJo>

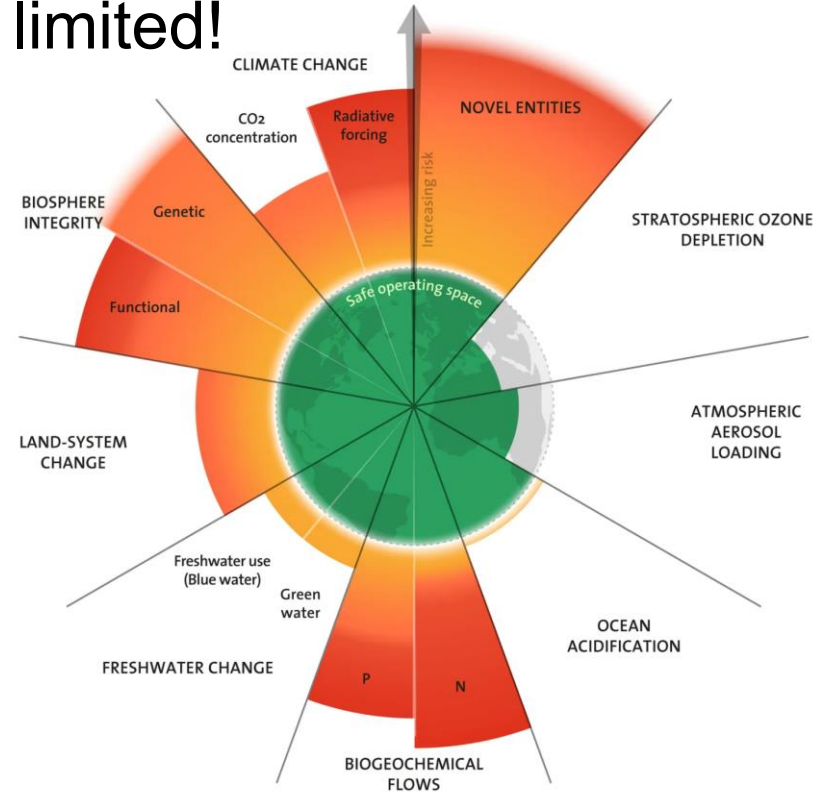
The Golden Age of Robotics?

“So what’s next? ... We are only limited by our imagination now!”

- Boston Dynamics video “How does Atlas learn? | Inside the Lab ”

It's not just our imagination that's limited!

- Sustainable development (Brundtland 1987)
"meets the needs of the present without compromising the ability of future generations to meet their own needs"
- The world is facing an unprecedented crisis
7 out of 9 planetary limits surpassed
 - Effects of climate change visible
 - Microplastics everywhere
 - ...
- Urgent action is needed
 - Reconsider **blind** progress paradigm
 - We need to act right now!



How to Act?

- Framework adopted by all UN members in 2015
“urgent call for action”
- Lists the necessary actions for sustainable transition
- Allows to measure progress



Credits: United Nations - <https://sdgs.un.org/goals>
and Haidegger et al. (2023). Robotics: Enabler and inhibitor of the sustainable development goals. Sustainable Production and Consumption

What Can Robotics Do?

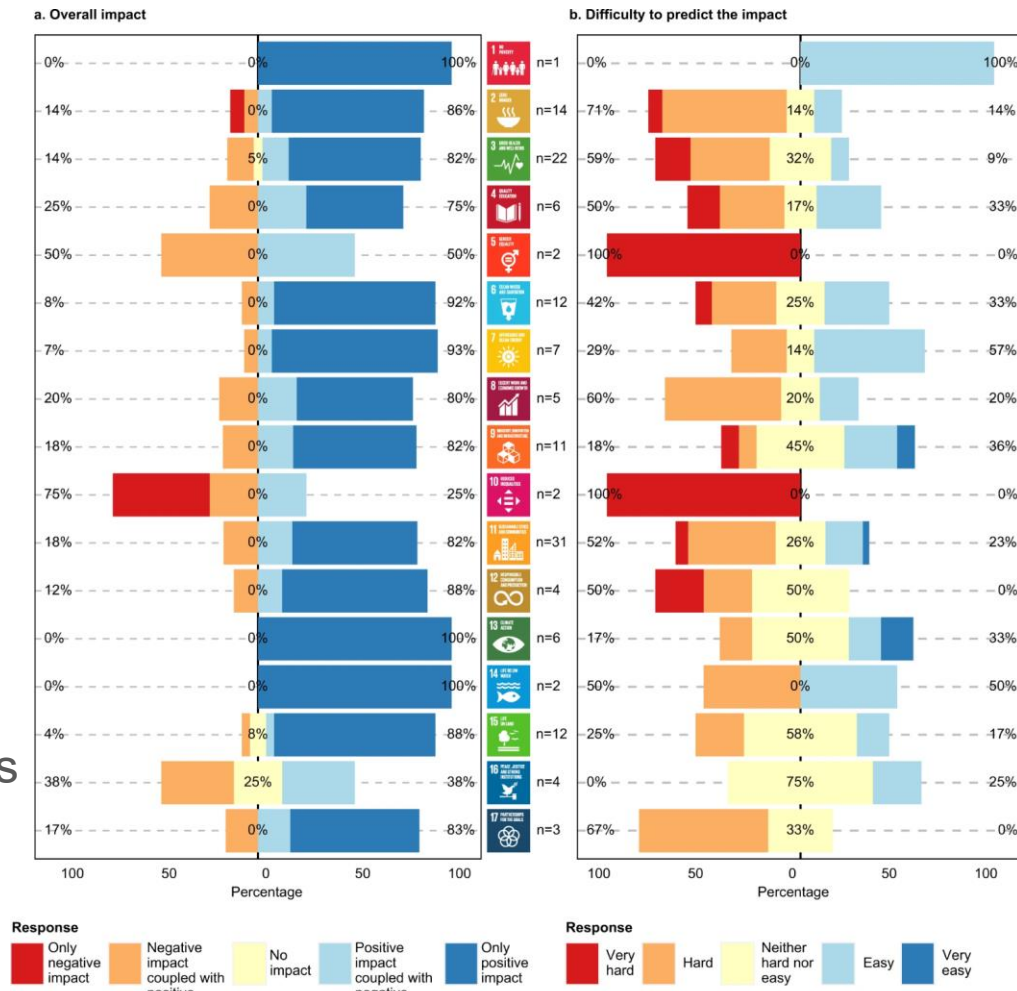
- Robotics can be a part of the solution
- *“Double edged tool”*
Can amplify to the problem



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What Can Robotics Do?

- Robotics can be a part of the solution
- “Double edged tool”*
Can amplify to the problem
- We need to steer robotics towards sustainability
 - Raise awareness
 - Cross-domain collaborations to better understand the impacts



The Research Questions



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

In 2015, the world agreed on a plan for the future...
Does robotics research do its part?



1. Do papers mention their impacts?

- Searching for mentions of Social, Ecological and Sustainability impacts
- Searching for mentions of UN's SDGs

2. Are papers motivated by sustainability topics?

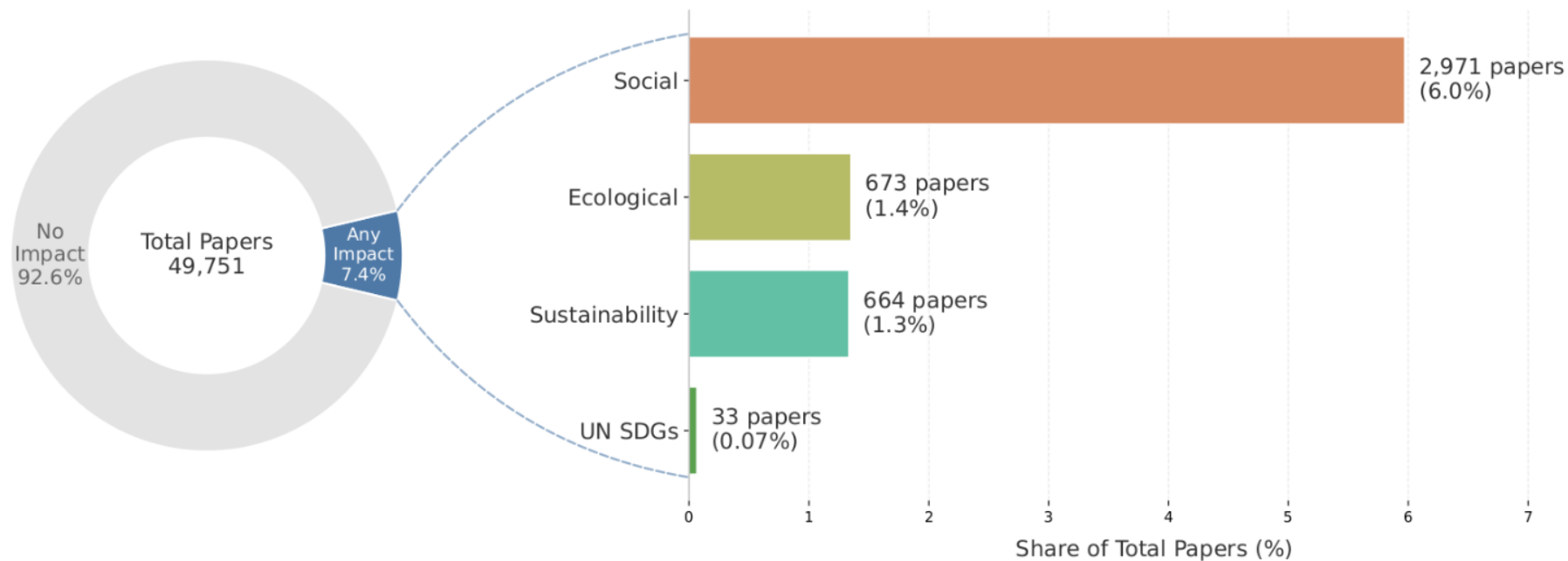
- Classify the papers topics with respect to SDGs targets
- Check if papers are motivated by some SDG targets

The Methodology

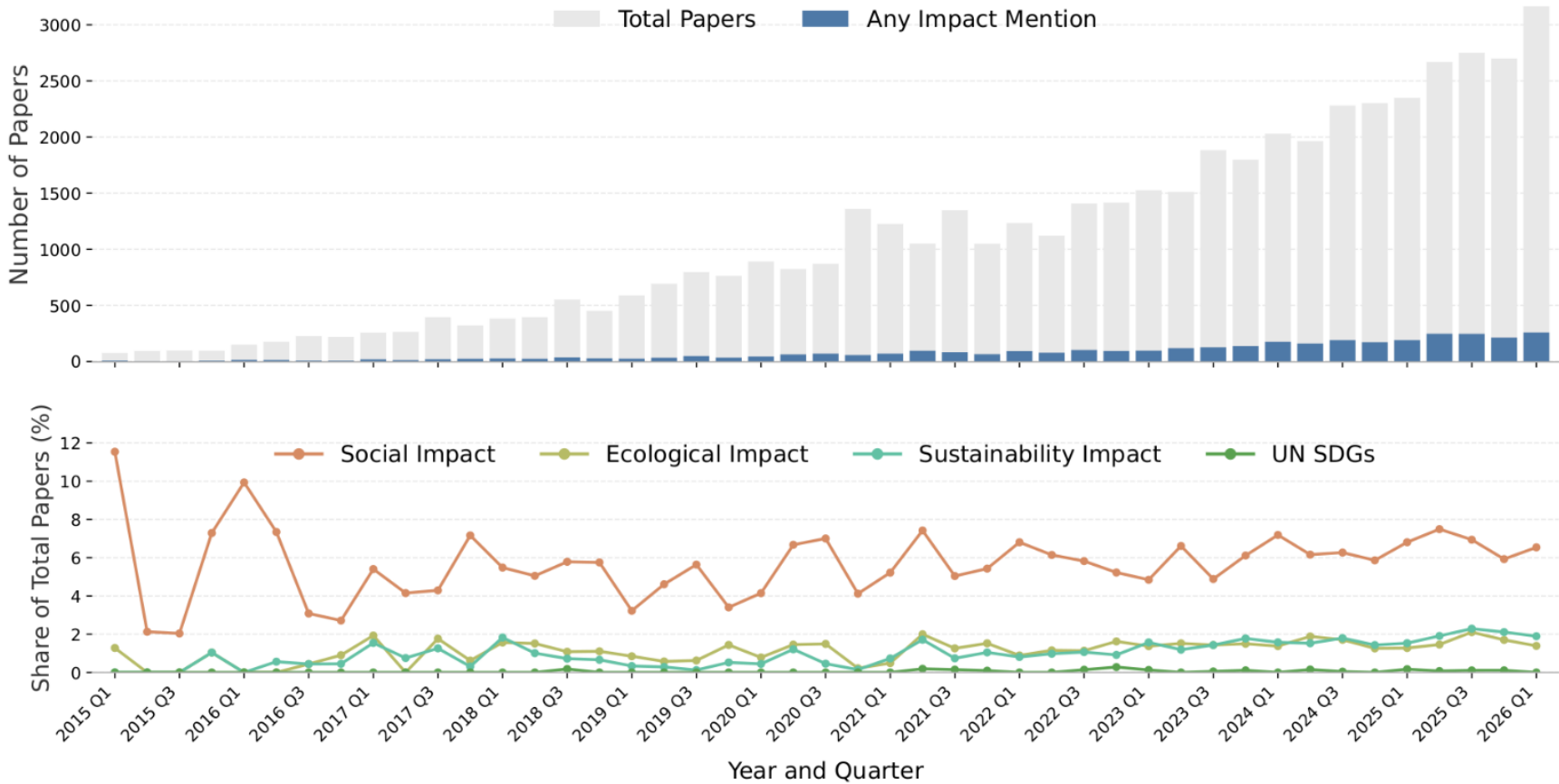
- ArXiv [cs.RO](#) category from Jan 2015 to April 2026
 - Open-Access
 - 50,000 papers
- Large Language Model: DeepSeek v3
 - Open-Weight
 - Large context window (average ~25,000 tokens per prompt)
- Analysis footprint (1.2 billion tokens)
 - Energy: **~650 kWh**
 - 30% of the yearly individual consumption of French citizens
 - Carbon: **~400 kg CO₂eq**
 - Return flight Paris - Barcelona



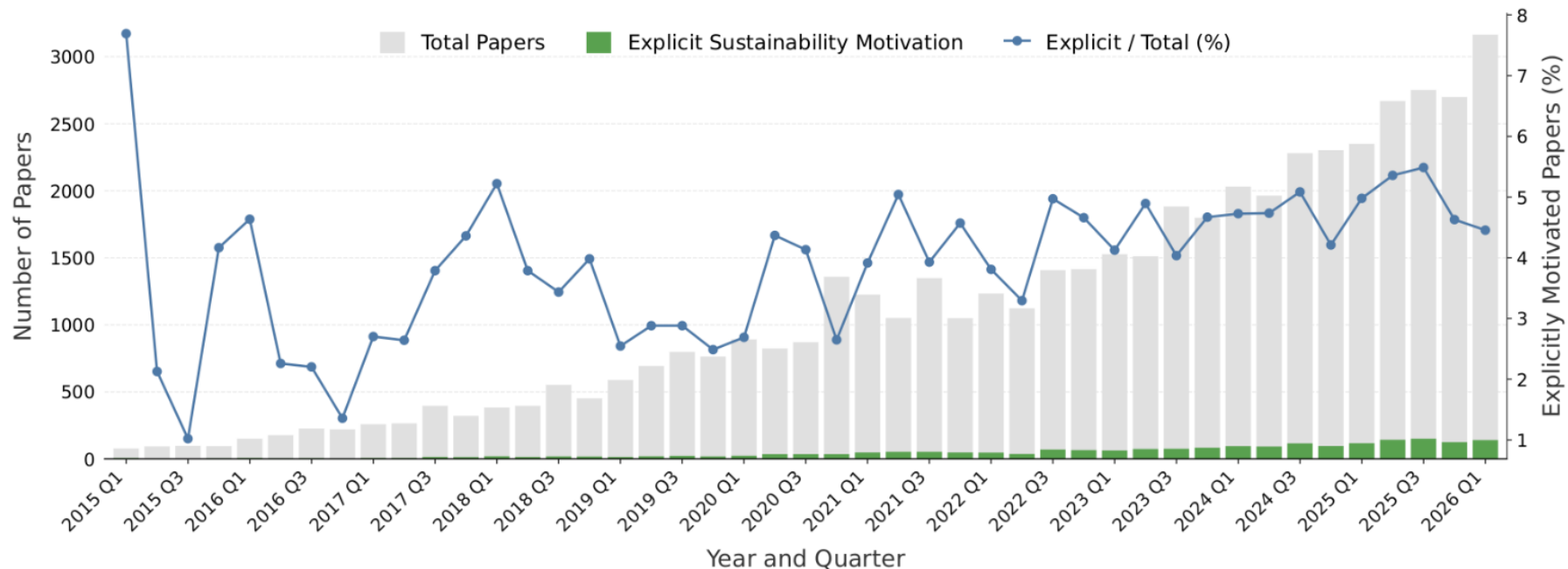
Mentioning Broader Impacts

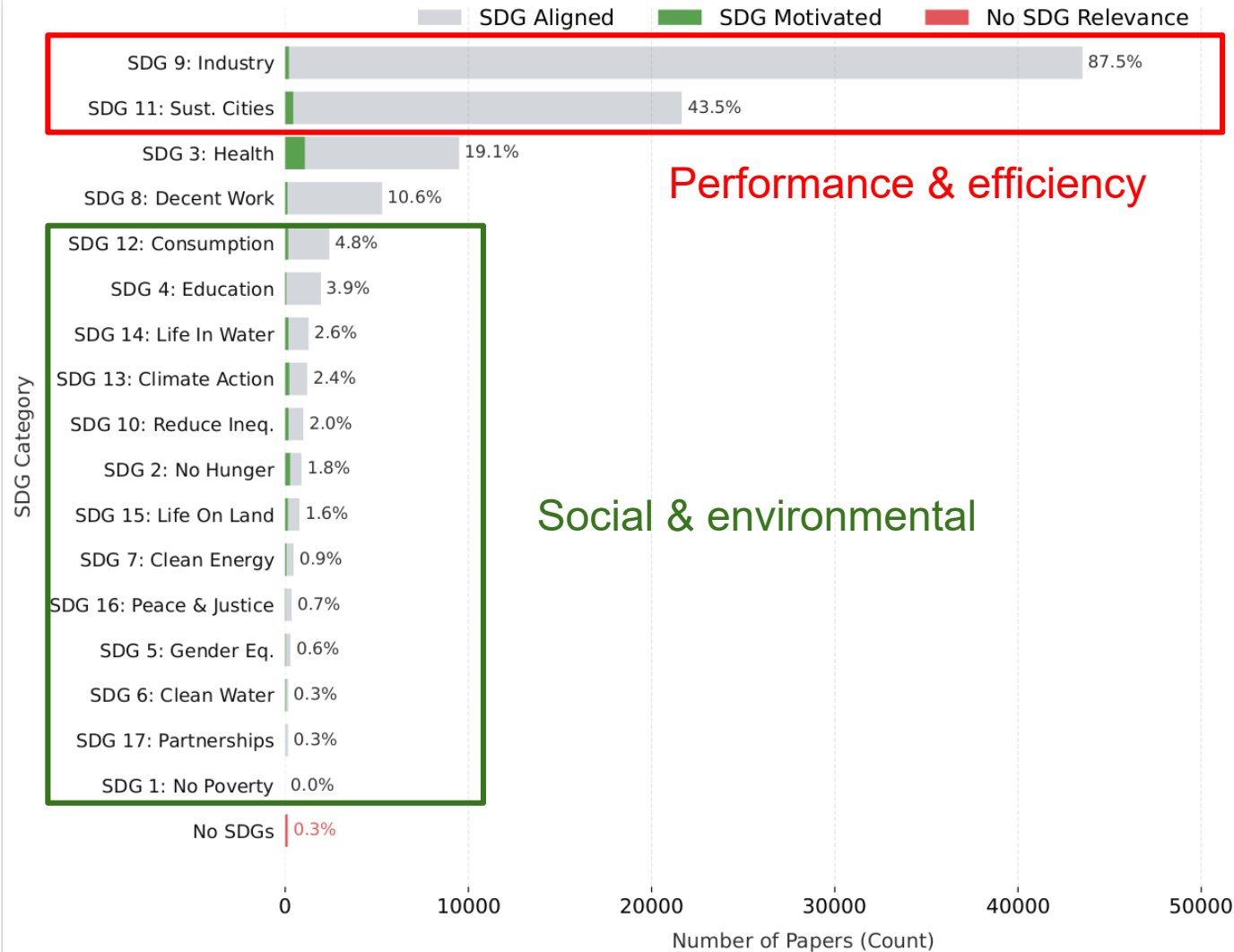


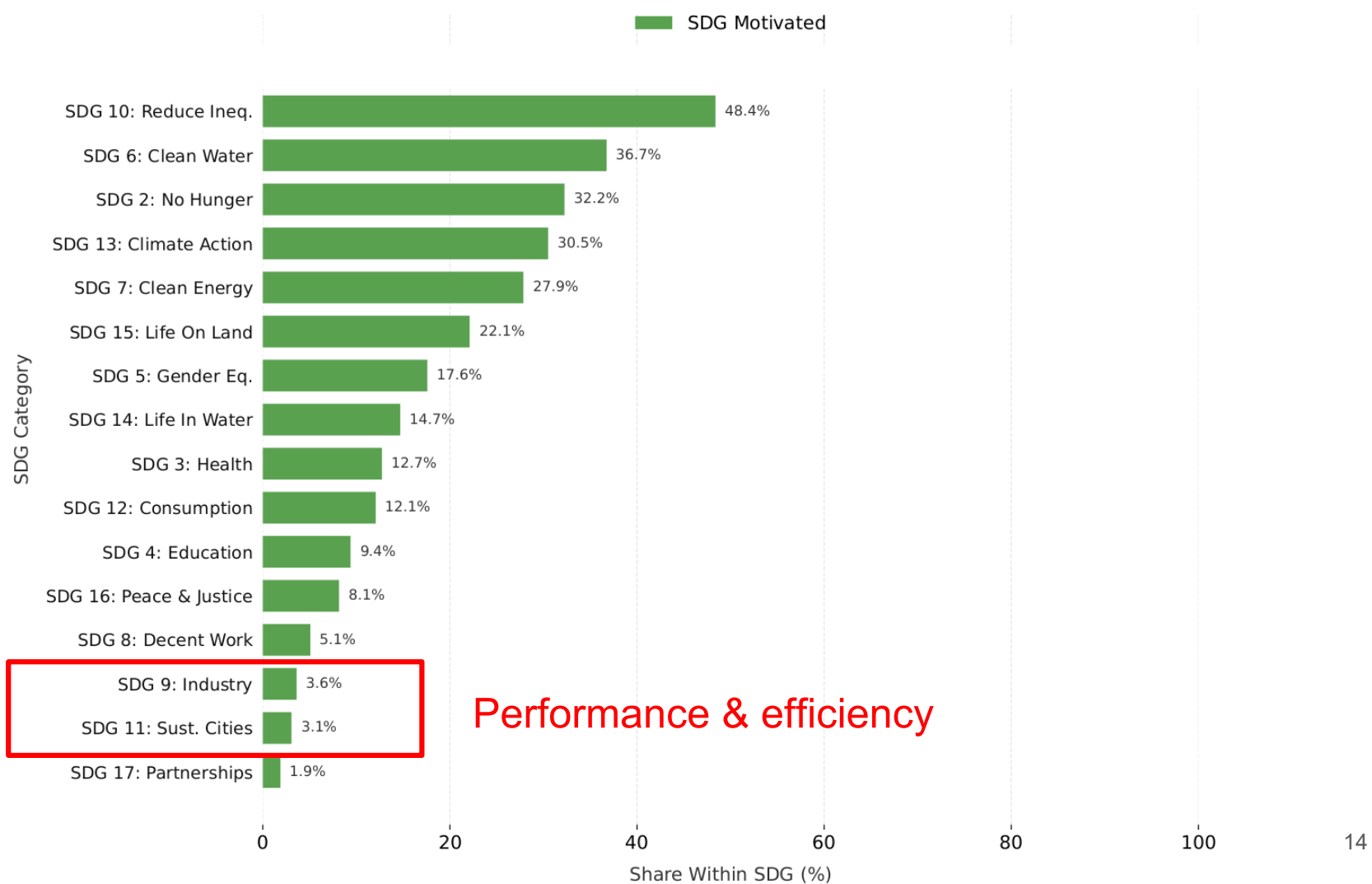
Mentioning Broader Impacts



Research Motivated by Sustainability







The Sustainability Gap in Robotics



Does robotics research do its part?

Not really !!

The Awareness Gap (92%)

The Motivation Gap (95%)

What We Can Do as Researchers?

- Write the “Missing” Section!
 - Mention the broader impacts and SDG alignment
 - When possible, explicitly state the motivations
- Open-Source your research!
 - Very few papers in the SDG 17. Collaboration and Partnership for Goals
- Participate in the Conversation
 - Join workshops, panels, seminars, conferences
 - Help to raise awareness
 - ICRA 2026:
 - Keynote panel: “Advancing Sustainability in Robotics”
 - Workshop: “Circular Robotics”

What Institutions Must Do?

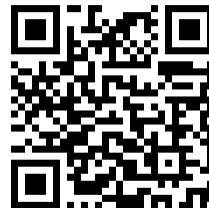
- **Nice example: IEEE HRI**
 - Named “Robots for a Sustainable World” in 2025
 - Dedicated Sustainability Chair, Sustainability Recognition for Papers
- **Systematic change in big conferences (IROS, ICRA, Humanoids, ...)**
 - Commit to Transparency
 - Clearly take environmental engagements
 - Publish footprints (even if its estimated)
 - Encourage sustainability in research
 - sustainability as a review criterion
 - sustainability-focused tracks
 - Mandating impact statements

Research tells us that robotics has the potential to be a powerful force for good,
but only if we intentionally steer it in that direction.

So let's choose to be part of the solution!



Dataset, code at interactive Blog post
<https://huggingface.co/sustainable-robotics>



Open-Access Paper
<https://arxiv.org/abs/2604.07921>

Additional resources