Measuring software power consumption

Challenges & perspectives

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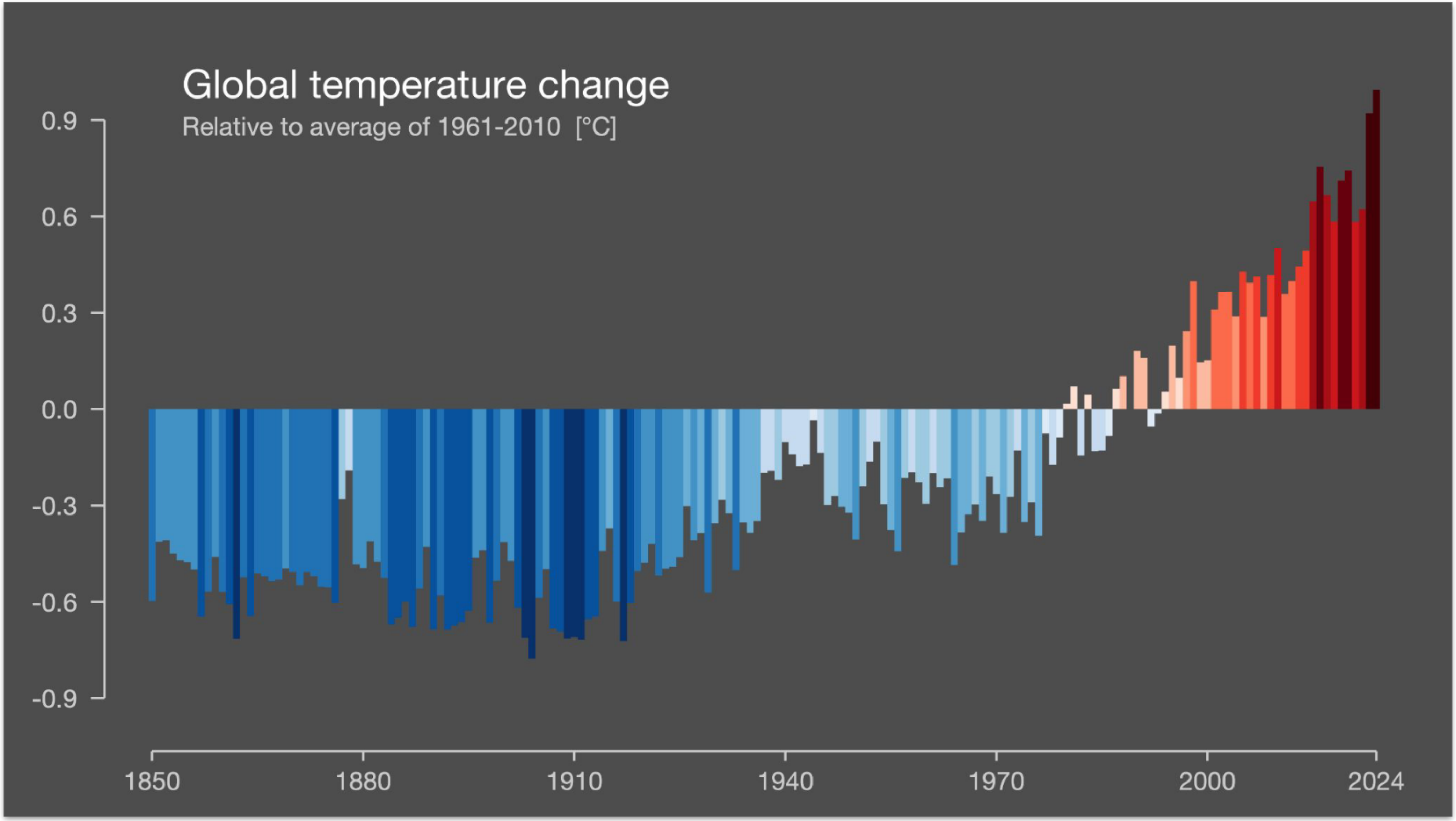
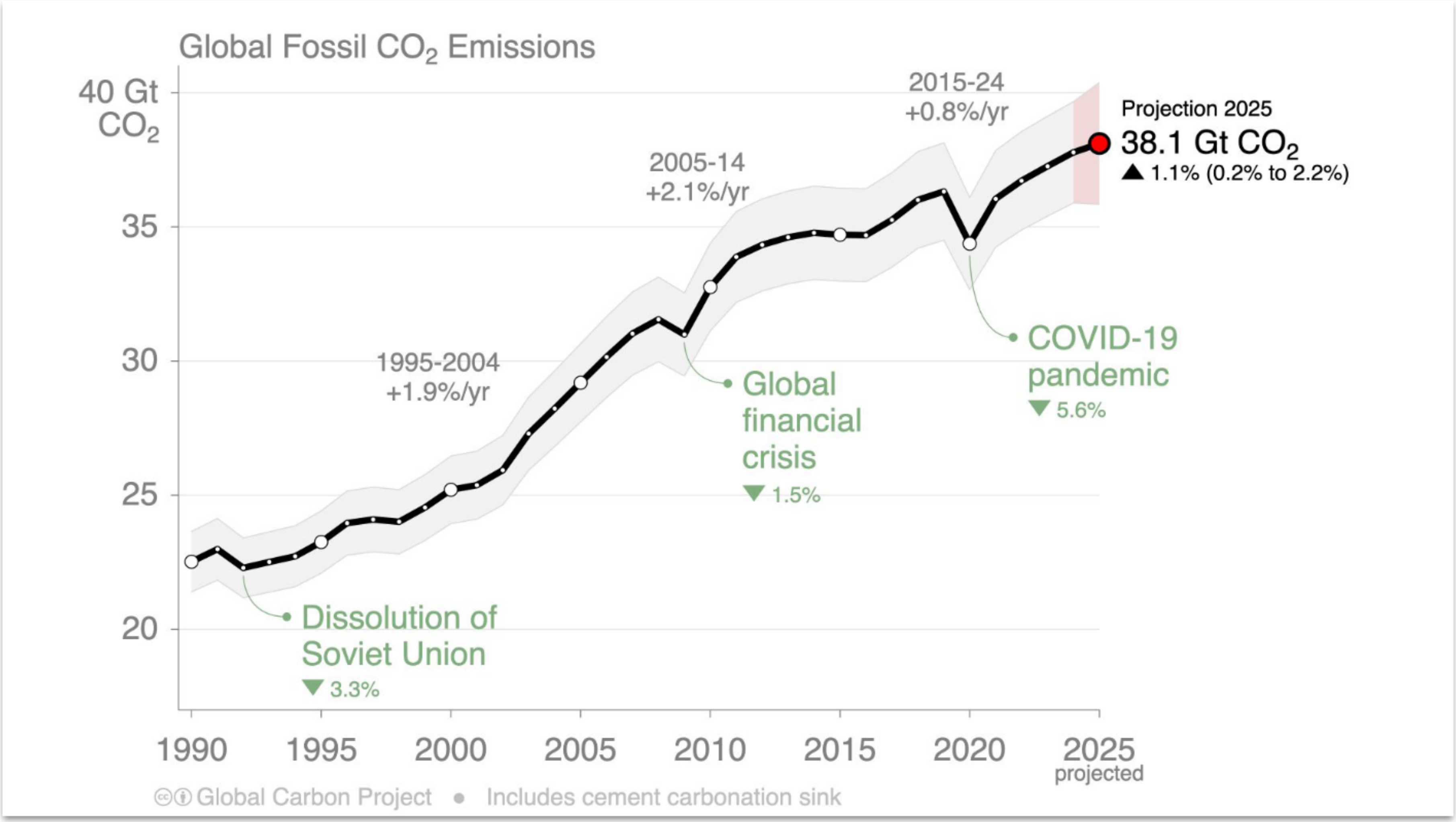


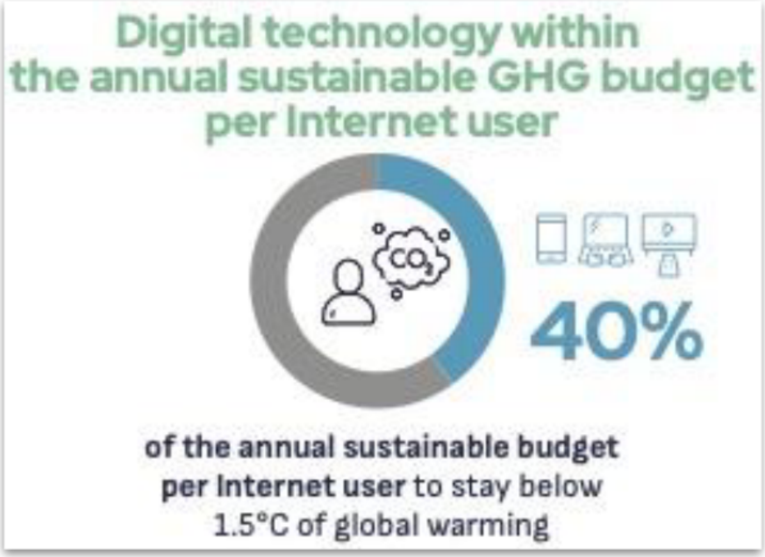
https://showyourstripes.info/c/globe



The remaining budget for 1.5°C is 170 GtCO2, equivalent to 4 years at the 2025 emissions levels.

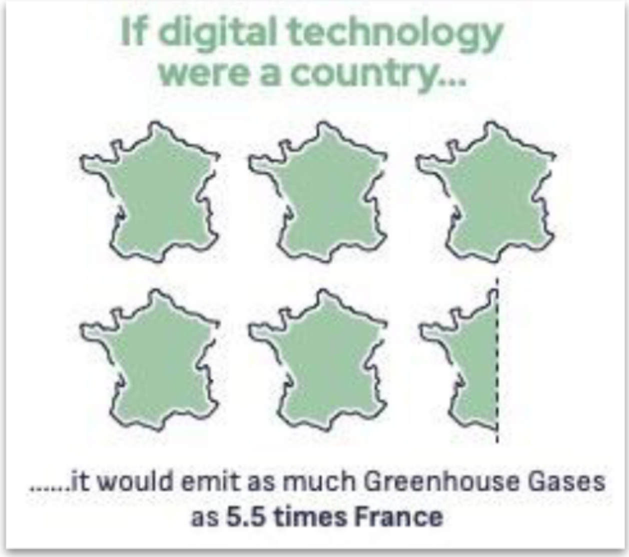
https://robbieandrew.github.io/GCB2025/

Impact of Information & Communication Technologies?



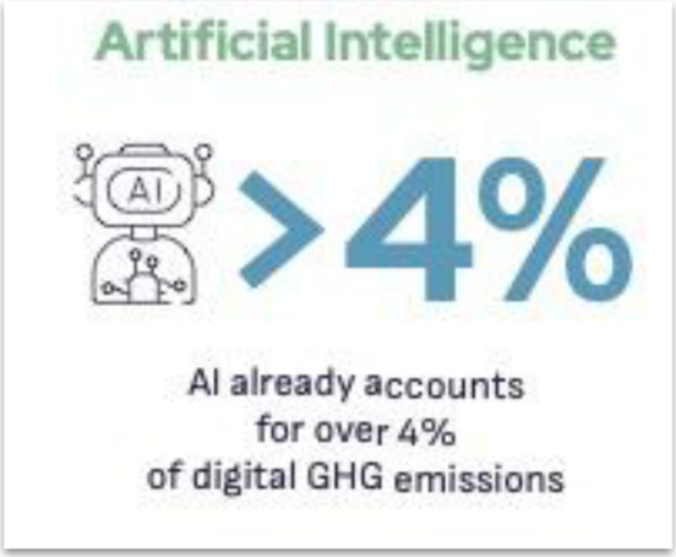
Digital technology within the annual sustainable GHG budget per Internet user

of the annual sustainable budget per Internet user to stay below 1.5°C of global warming



If digital technology were a country...

......it would emit as much Greenhouse Gases as **5.5 times France**



Artificial Intelligence

AI already accounts for over 4% of digital GHG emissions

[GreenIT: Environmental footprint of the digital world]

https://gunshowcomic.com/648

What can developers do?

- Do not develop / run things that are not needed
- Avoid hardware renewal at all cost
- Principles of Green Software Engineering (https://principles.green)
- Select vendors / frameworks / languages appropriately
- Measure and optimize!
- Carbon-aware computing / Load shaping
- Choose hosting wisely
  - Electricity mix coming from renewable sources

Why?

- Right thing to do!
- Legislation
- Good for business
  - Lower costs
  - Better brand image
  - Competitive advantage
- Good for users
  - Better usability / inclusivity
- Good for everyone!

Why involve developers?

- Actionable at the developer level
- Shorten the feedback time
- Make power-aware design decisions
- Empower developers

Measuring software power consumption

- Accurate power measurement
  - Granular up to method level
- Relevance
  - Statistical
  - Representativity
- Platform independence (meet users where they are)
- Lightweight
  - Observer vs. observation
- Historical data for comparison purposes
- Great developer experience
- Tie with observability
- Tie with profiling

Conclusions

- ICTs carbon impact ***is*** significant and growing
- Applications need to take sustainability into account
  - Avoid, Reduce, Reuse, Recycle principle should also apply to ICTs
- Measuring ***is*** complex
- Carbon impact is only part of the story

THIS IS NOT FINE!!

https://thenib.com/this-is-not-fine/