CENTRE FOR INCLUSIVE TRADE POLICY

@centre4itp

Addressing the climate gap in digital technologies[1]

Ingo Borchert*, Maria Frabboni,* Atilla Kasap,* Beatriz Kira,* Emily Lydgate,* Jeremiah Nyambinya,+ Sunayana Sasmal*[2]

Published 20th November 2023

Briefing Paper 8

Key points

- The critical issue of climate impacts has been largely overlooked in global discussions concerning the digital economy.
- Cryptocurrency, in particular, is associated with staggering energy use statistics. In an average year, Bitcoin consumes more energy than Finland.
- Difficulties regulating digital energy use stem from the non-centralised, possibly anonymised and/or non-proprietary structures and global nature of many digital operations.
- Digital platforms have information about the usage of digital services that, if shared with policymakers and researchers, could facilitate the development of sustainable solutions for digital value chains and beyond
- Policymakers must act to bridge sustainability policy and digital policy initiatives and ensure that policies reduce the environmental footprint stemming from life-cycle effects of digital technologies.
- A key plank of such policy coordination should be the strengthening and mainstreaming of a principle of data minimization.

At the core of the digital economy lies data. Its collection, storage, transfer, and various forms of processing have far-reaching environmental consequences, including energy footprint, water usage, localized heat production, and more. Yet, remarkably, the critical issue of sustainability within the digital economy has been largely overlooked in global discussions concerning digital economy governance, international trade, and environmental commitments.

Scholarly and policy debates have started to include questions related to the unequal distribution of benefits within and across jurisdictions in the data economy and the imperative to protect individuals from the risks posed by unlimited data collection capabilities, which erode privacy rights and personal data protection. However, very little comparative focus has been given to the pressing question of how to address the substantial environmental impact of the digital economy. For example, the recent Bletchley Declaration on AI, signed by a number of Governments, contains no mention of energy use as a climate-based concern. This is surprising in the context of growing commitment to climate action. As of November 2022, 140 countries, covering 90% of global

[1] The authors thank Charlotte Humma for useful comments and suggestions.

[2]* University of Sussex; + European University Institute

emissions, have agreed or are considering net-zero CO_2 emissions targets, reflecting its centrality to the global policy agenda.[1]

How does the digital economy affect the environment?

Cryptocurrency, in particular, is associated with staggering energy use statistics. Bitcoin consumed 95.53-terawatt electricity in 2022, which is more than Finland's annual average electricity consumption. The electricity consumption of data centres, whose sophisticated hardware enables mining companies to process transactions and to acquire tokens, skyrockets during extreme heat waves like the one that happened in Texas in 2022. As a result of this, many Bitcoin miners temporarily shut down their machines to decrease electricity consumption. The term 'grid citizen' was coined to refer to this practice.

Another significant area where environmental concerns should be integrated is artificial intelligence (AI). Training and utilizing large language models (LLMs) like ChatGPT requires sophisticated hardware—known as graphical processing units or GPUs—and complex data centres to operate, both of which consume more energy and water than conventional services, such as a Google search. To put it in numbers, the process of training an LLM consumes almost as much electricity as that used by 1,000 U.S. households. Once up and running, daily queries are equivalent to the daily energy consumption of 33,000 households.

Even these numbers may be just the calm before the storm. Big tech companies, including Amazon, Google, and Meta, are rushing to develop their own LLMs to compete with ChatGPT and be the winner who takes it all. The failure to consider environmental sustainability will become more apparent as AI, and AI legislation, emerges on a global scale. For example, the widely praised US President Biden's Executive Order on AI, issued on 30 October, emphasizes the potential of AI tools to mitigate climate change risks, and has directed the Secretary of Energy to develop guardrails to protect against energy-security threats, but it is noticeably silent about AI's energy footprint. It is crucial for any future regulatory effort to recognize that the development, training, and utilization of AI technologies wield an enormous environmental impact, particularly in terms of energy consumption.

Example: Non Fungible Tokens

The shift from the tangible to the digital format is evidenced in fashion, a creative industry with a global reach, where exclusivity and luxury has taken the form of Non Fungible Tokens (NFTs) associated with Blockchain technology. The impact of minting the design of a Hermès bag as a collectable digital item and recording ownership of that object as an NFT on blockchain is underestimated. The transition from tangible to digital may be considered an example of 'greenwashing' i.e. a marketing tool that confuses or deceives consumers into believing a product of the fashion industry is more environmentally sustainable or climate-friendly than fast fashion or other fashion commodities (EUIPO 2023, 26).

Why is it difficult to regulate digital energy use?

The difficulties with addressing digital energy use stem from two key issues. These include the fact that blockchain and cryptocurrencies are often built on the basis of non-centralised, possibly anonymised and/or non-proprietary structures. As a consequence, there is an absence of a central means of coordinating, supervising or regulating these types of technology. Even when major tech companies are responsible, these operate globally, and data storage often occurs across borders. This means that identifying and distributing responsibility along the global data value chain is not straightforward. These features also raise the even more fundamental concern about observability. If regulators don't know where/when NFTs are used or LLMs are trained, the whole question of governance and coordination becomes obsolete.

In the context of international data flows, the ongoing dialogue regarding data localization and the advocacy for the "free flow of data," primarily led by US and OECD nations, must be re-examined in light of environmental consequences. The geographical origins and destinations of data flows are significant, as are the locations where energy-intensive data activities occur. When data flows freely, allowing data collection and exploration to take place in developing nations, but the resulting insights are consumed and harnessed by corporations based in wealthier nations, what are the implications? How can we ensure that all parts of the data value chain not only equitably share the economic benefits but also bear the environmental costs commensurate with their gains from the data?

Policy response

All this points to the need for a stronger response to the climate fallout of digital innovations, which includes international coordination. There are some piecemeal existing efforts to address this problem on the international, domestic and private sector levels. On the international level, UNESCO has overseen a Crypto Climate Accord (CCA), inspired by the Paris Climate Agreement, this is a private sector-led initiative that commits signatories to net zero emissions by 2030 (Crypto Climate Accord, n.d.). The Ethereum community has announced a plan to transition to a new model called 'Proof of Stake' to eliminate the current dependency on mining, thus reducing the carbon emission flow per transaction (Ethereum, 2022)" (UNESCO 2022, 62). Newly developed Sustainable IT standards can be used to help guide investment as part of Environmental, Social and Governance (ESG) standards. For example, environmental metrics include technology infrastructure energy consumption (including electricity, heating, cooling), data centre energy consumption, end-user devices energy consumption, lifecycle energy consumption, IT products and services etc.

A recent White House fact sheet outlines policy recommendations that can be implemented at the national level. The EU is also preparing to take an active measure to address the environmental risks posed by AI systems. The proposed EU AI Act requires high-risk AI systems and foundation models to record energy consumption, measure or calculate resource use, and assess environmental impact during the system's lifecycle (Article 12 para. 2a & Article 28b para. 2d). To comply with these requirements, the European Commission will provide guidance on practical implementation and standardization. However, the question of whether or not an AI system is high or low risk is independent from its energy consumption. If enormous 'large language models' that consume the most energy are not high risk, then this provision in the EU AI Act won't deliver on the need to consider sustainability.

Policy recommendations

While these are not comprehensive, the additional policy suggestions below envisage some other ways to take better account of the digital environmental footprint.

1. **Using the 'problem' to create the solution**

Digital platforms constantly collect, store, and process data. This data can be used to generate insights that are useful for both strategic business decisions and public policy. For example, a digital delivery platform could use its data to identify the carbon footprint of its deliveries during a particular time of day. This insight could then be shared with policymakers to help them develop sustainable policy solutions for the digital value chain.

For instance, a local government could be concerned about the carbon emissions from digital delivery platforms (for example, a grocery delivery app). It could then work with digital platforms operating locally to share insights on the number of trips made along various routes, the type of mobility solutions used, and the total estimated contribution to carbon emissions. The city could then use these insights to create a policy that incentivizes the digital platform to share this information with the public.

The city could also launch a public campaign to educate consumers about the environmental benefits of accepting slightly longer wait times for deliveries. This would allow the digital platforms to reduce the number of trips they need to make, which in turn reduces carbon emissions. This applies even to digital platforms that promote the use of electric mobility solutions for their deliveries given that a reduced need for electric charging would lower energy consumption. While this doesn't address the overall energy intensity of data storage, it shows how digital platforms can collect data about themselves that can help to reduce their energy use in other areas, thus bringing down their overall carbon footprint.

The public benefits of such a policy solution are:

1. The proposed solution is scalable and could be implemented by digital platforms around the world.
2. It would accelerate the environmental benefits of the digital economy by encouraging platforms to reduce their carbon footprint.
3. It would also empower consumers to make more sustainable choices.

This underscores the fact that digital platforms have a responsibility to use the insights they generate to improve the lives of their users and the communities in which they operate. By sharing insights generated with policymakers and researchers, digital platforms can facilitate the development of sustainable policy solutions for the digital value chain and beyond.

2. Mainstreaming a data minimisation requirement

An existing axis of tension is the desire of digital platforms to collect as much information as possible from users, versus concerns from regulators about consumer privacy. Introducing an energy use dimension exacerbates this tension and suggests the need to apply additional pressure on digital firms not to collect and store excessive data. To take a mundane example, must an online chess programme indefinitely store every move of every game of every player? It seems at least possible that such practices may come to seem analogous to our previous thoughtless use of Styrofoam takeaway containers and plastic cutlery.

From the perspective of personal data protection, a guiding principle that can inform both international and domestic policy addressing digital waste is the principle of data minimization. In personal data protection legislation, various regulations mandate that data collection and processing be limited to what is strictly necessary for the intended purposes. Only the minimum amount of personal data required should be collected and processed to minimize individuals' exposure. A similar principle of data minimization should be extended to non-personal data to mitigate its environmental impact.

Data should only be processed when there are no reasonable alternatives to achieve the processing objectives. While it may be more challenging to determine the precise amount of data needed, especially to power AI systems, additional research is needed to ascertain whether more data necessarily leads to more accurate models. This consideration also ties into discussions about data bias and fairness in AI.

3. National-level strategies and legislation

It is not unreasonable to expect governments to address, on both a strategic and practical level, how they will harmonize their climate and digital objectives. A Digital Green Deal has already been advocated in academia to bridge sustainability policy and digital policy initiatives and to ensure that policies reduce the environmental footprint stemming from life-cycle effects of digital technologies. This includes encouraging innovation in sustainable technologies and minimising digital innovations that are counterproductive from an environmental perspective; and introducing 'production standards' for online services.

Conclusion

The digital economy has a significant environmental impact, but this is often overlooked in discussions about climate change. This is partly because the environmental impacts of digital activities are less visible than those of physical goods, and partly because it is difficult to regulate digital corporations that operate globally.

Digital platforms have a responsibility to use the insights they generate from data collected to improve the lives of their users and the communities in which they operate. By minimising data storage, and sharing insights generated with policymakers and researchers, digital platforms can facilitate the development of sustainable policy solutions for the digital value chain and beyond. It is not immediately obvious how to incentivise the sharing of information that would lead to policies which result in digital platforms paying for the environmental impact of their actions. In economic terms, the digital carbon footprint is now acting as an environmental externality. A key challenge for regulators is to try and address this externality by providing incentives such that agents in the digital economy (platforms or consumers) pay the full price inclusive of the environmental costs that their actions have. It is essential that governments develop strategies to take account of the climate impacts of digital technologies and start thinking more seriously about how they can work together to address them.

Bibliography

EUIPO, Intellectual Property Infringement and Enforcement Tech Watch Discussion Paper 2023

A Grech, V Balaji and F Miao, *Education and Blockchain* (UNESCO 2022).

WIPO, 'Blockchain technologies and IP ecosystems' (WIPO, 2022).