A scalar mismatch: the IETF's sustainability approaches in a framework of infinite growth and abundance

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Abstract (150-200 words): *Until recently, environmental harms were largely absent from internet governance discussions and their study. This article offers an analysis of how the environmental impact of internet infrastructure is discussed in the IETF to argue that sustainability becomes a justification regime for the internet's existence and growth in a world in crisis. Taking a discard studies approach, I explore what is and what must be discarded for the internet to continue to operate. These insights allow me to expand on Liboiron concept of 'scalar mismatch' to illuminate that limits to growth are directly at odds with the values that have shaped the internet. The internet governance community has not come to grips with the idea that the network is an environmental problem in itself; rather, the belief in growth, abundance of natural resources, and sustainability through innovation shapes their understanding of sustainability. This paper straddles infrastructure studies, internet governance studies, and environmental social sciences, and shows how an environmental lens to infrastructure studies allows us to connect the global governance debates with local conflict over resources.*

Keywords (5): internet governance, environmental impact, IETF, scale, regimes of justification

Introduction

The internet is widely perceived as a critical infrastructure in contemporary society, where the policy and technical decisions shape economic and social activities (Bowker & Star, 2008; Plantin et al., 2016). This prominent position makes its governance regimes an important area of study. Initial academic debates tried to understand how power operates by delineating the roles and responsibilities of the different internet governance spaces and models (DeNardis, 2013), the norms and values underpinning these regimes (ten Oever, 2020), and cultures that determine whose voices count in the governing of the internet (Cath, 2022). More recently, digital sovereignty has become a framework for understanding states' approaches to regain power and control over these internet infrastructures and their governance regimes (Couture & Toupin, 2019; Pohle & Thiel, 2020). In this paper, I contribute to the understanding of power by revisiting internet governance as an object of study and exploring how the emergence of a new issue area, sustainability, sheds light on the ideologies that shape this governance field. This approach is guided by Niklas and Dencik's (2021) observation that it is "the formulation of new policy areas, [...], provide a window into what priorities, interests and concerns currently shape" a governance field (Niklas & Dencik, 2021). To excavate the norms and values currently shaping

the governance field, I take a discard studies approach, which asks what is and isn't or what must be discarded for a system to continue to operate (Liboiron & Lepawsky, 2022). These insights allow me to expand on the concept of 'scalar mismatch' (Liboiron, 2014, 2021) to argue that our understanding of sustainability is socially constructed and shaped by an incorrect problem definition, which allows industries to continue to pollute and grow.

In this paper, I examine the contributions of the Internet Architecture Board (IAB) workshop on the Environmental Impact of Internet Applications and Systems, from now on referred to as the e-impact workshop. The e-impact workshop has been pivotal in shaping how the engineering community has come to understand sustainability. In line with the IAB workshop description framing, I'll use the term environmental impact to refer to both the climate crisis and ecological degradation. While most people probably have never heard of the IAB, it is part of the Internet Engineering Task Force (IETF), a private industry-led internet standardisation body that brings together many of the most prominent Internet infrastructure companies (Cath, 2021). Their standardisation efforts shape the operations of the internet, specifically how traffic is routed, what security and safety measures are enabled, and how users access information. As a committee of the IETF, the IAB holds a number of roles and responsibilities, including providing architectural oversight of internet protocols and procedures and establishing technical direction to ensure that the internet is a trusted medium with a solid technical foundation. Under the IAB umbrella, workshops are organised to kickstart discussion on topics related to internet architecture, industry needs, and future directions. Dhody's (2024) reflection on a decade of IAB workshops found that they have "played a key role in launching new standards work within the IETF, stimulating research initiatives at the IRTF and providing valuable insights and resources for the wider community", making them a significant object of study. While this was not the first time environmental topics were raised at the IETF, the IAB e-impact workshop organised in December 2022 was a catalyst for a sustainability agenda to materialise in the IETF community and has resulted in an active e-impact mailing list and working group.

This paper will use an infrastructural approach to understand how the technical internet community engages with the environmental impact associated with the internet, more specifically, internet routing. First, I will lay out recent academic debates on infrastructure, internet governance, and science and technology studies (STS) to investigate the perceived role of internet infrastructures in society. By departing from an infrastructural perspective, I formulate how power gets embedded and enacted through the materiality of our media. I engage with internet governance debates that theorise on the norms and values that shape meta-governance of infrastructures and STS scholars who have foregrounded the environmental impact of infrastructural objects in certain territories, to show that infrastructures are either discussed as global systems or as locally situated. As I will go on to argue, an environmental lens to infrastructure studies allows us to connect the global with the local. To illuminate the politics behind its governance regimes, I will take a discard studies approach (Liboiron & Lepawsky, 2022) and uncover the values and norms that shape sustainability discussions in the IETF.

In the findings section, I examine how the IETF community frames environmental problems and sustainability solutions, which shape discussions on 'how much' internet we need, how it is

organised, and what is considered acceptable environmental harm for the network to function. I find that the community's belief in the exceptionalism of the internet, the idea that it will revolutionise other sectors and the network's own growth is decoupled from resource use, is driving a narrow sustainability agenda. This siloing of the problem offers solutions that focus on efficiency and optimisation measures, which can be considered tech determinist, short-term, and reductionist, as it approaches the reduction of carbon emission as an interesting engineering- and not a political or economic problem. Applying Liboiron's (2014, 2021) concept of scalar mismatch to internet governance debates foregrounds three dynamics: there is an unwavering belief in the good of the network, the community disengages with questions on natural resources needed to sustain the internet, and innovation is seen as the key to sustainability. All of which provide the justification regimes for the internet's existence and growth in a world in crisis.

Infrastructure, power, and governance

Susan Leigh Star called for the study of infrastructure, the 'study of boring things' (Star, 1999), the invisible substrates that allow other aspects of society to function. In line with her argument, that we can not study a city without studying its sewer system, we can also not study information systems without studying its infrastructures, both its material layer - the data centres, cables, routers and devices and its immaterial layer – computational processes, policies, and ideologies (ten Oever, 2020). Since this initial call for the 'study of boring things' there has been a rising academic interest in understanding how infrastructures shape economic and social activities and how power gets inscribed and made durable in communication networks (Bowker & Star, 2008; Plantin et al., 2016). While Hersmondhalgh (2021) observed that many scholars follow Star's interest in the immaterial layer of infrastructure, its organisational cultures, norms, and standard-setting processes, I will show that it was the renewed interest in the materiality of media which has opened up space to theorise about the environmental impact of infrastructural objects, like data centres or submarine cable (Edwards et al., 2024; Pasek et al., 2023). I will contribute to these infrastructure debates on power by bringing Liboiron and Lepawsky's (2022) discard study approach in conversation with internet governance discussions.

Internet governance organisations, like the IETF, have since their emergence piqued the interest of social science scholars as their policy and technical coordination shape how information flows across the world (DeNardis, 2013). Initial academic debates tried to delineate the roles and responsibilities of the different governance spaces and models (DeNardis, 2013; Mueller, 2010). Van Eeten and Mueller (2013) observed that the interest in more formal global governance organisations overlooked how organisations that actually run and maintain code shape the internet. In this research, I build on the scholars who deepened these initial debates by more profoundly engaging with questions of power (ten Oever & Milan, 2022). Internet governance bodies and practices are characterised as private internet governance regimes that reject government oversight (DeNardis, 2009; ten Oever, 2020) and promote the belief that technical governance bodies and the standards and protocols are largely free from political influence (Cath & Floridi, 2017; DeNardis, 2014). The once lauded multi-stakeholder nature of some internet governance bodies, technology and policy is developed and governed through debate

and dialogue among different stakeholders, is critiqued for favouring those in power (Scholte, 2020). Specifically, the 'who' of internet governance, the over-representation of industry in internet governance debates, has become a point of contestation (Carr, 2015). The dynamic where industry is overrepresented is what Perarnaud (2025) calls corporate saturation, achieved through the consolidation of power and control in the application layer and, in some cases, across the entire stack by the big industry players. Here, companies have gained structural power over standard-setting processes, which allows them to unilaterally develop and push certain standards (Peacock, 2020; ten Oever, 2021).

The study of counter-power in internet governance bodies explored to what extent efforts to include public interest perspectives in technical and policy debates shifted power dynamics or ended up legitimising the existing order (ten Oever, 2020). Public interest is a loosely defined concept that describes a governance approach that goes beyond economic logic (Maxigas, 2024). In part, the limited success of counter-power has been attributed to the fact that the institutional mandate of internet governance bodies is in line with private interests (Perarnaud, 2025), their norms form barriers to include public interest perspectives in standardisation processes (Cath, 2021), and while these bodies are procedurally open, their organisational cultures are exclusionary. "Distinct organizational cultures – from confrontational and "rough" models of collaboration to the greater respect afforded to participants who work at large corporations – can impede, undermine, and discourage civil society participation" (Cath, 2022). While Cath primarily looked at civil society exclusion from standard-setting processes, influence from states or companies believed to be too closely affiliated with state interests is considered undesirable and at odds with the values of the open, interconnected, and free internet (Carr, 2015; Nanni, 2024; Rone, 2024). The study of exclusion illuminates how large corporations shape both the meta-governance of internet governance regimes and the specific standards and protocols according to their own interest. I will build on these insights by exploring how global governance debates are shaping our understanding of sustainability.

A material approach to the internet

In the cultural imagination, internet infrastructures have long been viewed as immaterial (Frenzel, 2023; Starosielski, 2015). To counter the imagination of the ephemeral cloud, scholarly debates on the environmental impact of media have made local infrastructural sites visible. Hogan's (2015) turn to a new material line of inquiry allowed her to theorise about the entanglements between natural resources and surveillance systems. Water, she argues, becomes more than a resource to be consumed; it is the non-human entity that unites contestation against surveillance regimes and makes infrastructures visible, material, and contestable. Similarly, other studies that looked at the relationship between non-human elements - water, energy, and land - and infrastructure have made the political entanglements of the data centres industry visible (Lehuedé & Valdivia, 2023; Rone, 2024; Velkova, 2024). Tracing the origins of infrastructural sites shows they do not materialise out of nowhere; it is part of a long-term and often non-transparent negotiation between states and companies in which favourable tax, development, and political climate should entice companies to build their physical assets on a specific territory (Brodie & Velkova, 2021). These studies show that natural

resources create the material conditions for society and reconfigure power and counter-power around infrastructural objects in specific locations. There has been little debate on how these dynamics connect to the global or how internet governance regimes shape the understanding of sustainability.

Starosielski (2015) noted that the technology industry tries to overcome conflicts that materialise when global infrastructures meet local environments through strategies of insulation. I will turn to discard studies (Liboiron & Lepawsky, 2022) to explore how internet governance regimes try to overcome fiction created by environmental impact by asking what isn't or what must be discarded for the internet to continue to operate and expand? A new policy area shows what is valued and what is left out, giving insight into the politics behind its governance regimes. In their book, Liboiron and Lepawsky invite us to think about the scale of the proposed solutions: "We articulate scale as a way of understanding the relationships that matter to defining an issue, and thus of locating where and how interventions might best take place" (Liboiron & Lepawsky, 2022, p. 39). Starting from the notion that not all relationships or solutions are equal and that the problem definition will influence the possible solutions, it is imperative to ask if the technical internet governance community is addressing the right problem at the right scale.

Methods

To gain insight into how the internet governance community accounts for the environmental impact of its infrastructure, this paper offers a thematic analysis of the position papers submitted to the IAB e-impact workshop held online in December 2022 (IAB, 2022). Invitations to the workshop were extended to those who responded to the call for position papers, bringing together a self-selected group of people who are familiar with the IAB and the IETF, and have an interest in and feel the urgency to reduce the environmental impact of the internet. The e-impact workshop had a technical orientation as the work of the IETF " is to produce technical documents (RFCs) that define how Internet technology works in detail, and can be operated and managed at scale" (IETF, 2025). The IETF community consists of 7000 active participants, of which only 82 authors submitted 26 position papers to this workshop. The limited contributions show that sustainability plays a limited role in the technical governance debates of the internet. Still, the workshop signified a transformative moment in discussion on environmental harms as it created momentum for and shaped the IETF sustainability agenda. Furthermore, the sample is considered representative of the worldviews embedded within the technical internet governance community, as organisers and participants of the workshop are long-standing members and contributors to the IETF community, and the program committee chairs have served as IETF Chair and been IAB members. After review by the programme committee, invitations were extended to everyone who submitted a position paper. The committee set the workshop agenda and invited those contributors whose topics were in the scope of the IETF mandate to present their papers.

For this paper, I conducted a thematic data analysis of the 26 position papers (excl. my contribution) submitted to the workshop. The submitted position papers range from comprehensive overview documents of the energy discussion in the IETF to short aspirational

pieces on internet sustainability. The affiliation of the authors allowed me to group the position papers as contributions from industry (13), academia (8), technical community (2), an interdisciplinary team (3), and civil society (0). The industry was represented by employees from telecom and technology companies, the technical community consists of people from internet governance bodies, namely ISOC and RIPENCC, and the interdisciplinary groups are a mix of academic, industry, and civil society contributions. Of the total number of authors, only one represented civil society.

The thematic analysis is based on the six steps recommended by Braun and Clarke (2006) using the qualitative open-source data coding software (Taguette). This process involves a constant moving back and forth between position papers, codes, and analysis. After an initial familiarisation of my data set, I started generating initial codes by highlighting specific data and leaving comments in the margins. This allowed me to organise my data and start to identify common themes (Boyatzis, 1998; Tuckett, 2005). After I coded all the position papers, I went back and recorded them to include insights and themes that emerged during the coding process across my entire data set. In the third phase, I grouped all codes and underlying data into a potential theme (Braun & Clarke, 2006). In a separate document, I clustered, grouped, and regrouped codes into possible themes and further refined the clusters by rereading all of them, seeing if they formed a coherent pattern, and weighing their prevalence in relation to my overall research questions. In the coding process, I looked for affiliation of the authors; discourses around internet infrastructure and sustainability; problem framing; proposed solutions, the underlying assumptions and foreseen implementation challenges; external pressures; economic incentives; responsibility, specifically how the engineering community defines the scope of their role and the IETF's roles on this topic. This approach offered insight into how this group of internet practitioners frames the nexus between environment and infrastructure, their problem statement and proposed solutions, before discussing what is missing from these technical visions of the internet to gain insight into the values and worldviews that shape internet governance bodies.

Findings: internet exceptionalism, greening and growth

In this section, I surface the IETF community's normative understanding of sustainability. In particular, I will explore what is valued and devalued, said differently, how environmental problems and solutions are defined and which ideas and interventions are discarded for the internet to continue to operate and expand. I foreground the belief in the exceptionalism of the internet, the reduction of environmental impact to carbon emissions, and a focus on measurements, efficiency, and innovation, to show that the community proposes a narrow sustainability agenda that requires technical but not political action.

The participants of the workshop are part of a small and nascent community of internet engineers who are concerned about the environmental impact of the internet. They share an understanding that 'climate change is considered the greatest current threat to human health [WHO]' (Arkko et al., 2022) and the 'Internet both affects and is affected by the environment and

climate change' (Robinson et al., 2022), as such, the engineering community has a responsibility to act to ensure a sustainable future. In this section, I will first excavate their understanding of the internet vis-à-vis environmental harm, which informs their propositions on how to act. In their papers, industry actors emphasise that while the internet has a direct negative impact on the environment, it has and will significantly contribute to the transformation and "greening" of other sectors. 'Arguably, networks can already be considered "green" technology in that networks enable many applications that allow users and whole industries to save energy and become more sustainable in a significant way. For example, it allows (at least to an extent) to replace travel with teleconferencing; it enables many employees to work from home and "telecommute," thus reducing the need for actual commute; [...]' (Clemm & Westphal, 2022). The belief in the revolutionary potential of the internet to 'green' other sectors is echoed throughout the workshop submissions and forms the ideological starting point for all discussions on sustainability. After the initial caveat of its greening potential, the contributors to the workshop recognise that the promise in itself can not cross out the direct environmental harms of technology and that everyone has a part to play in solving the climate crisis. 'Helping the decarbonization of other sectors cannot be an excuse for not addressing the carbon emissions of ICT – for our credibility, we need to master both' (Arkko et al., 2022). In this call to action, the authors frame the boundaries of their intervention. While most contributors briefly acknowledge the embodied cost of the internet, 'impact across their full lifecycle including raw materials acquisition, production, use and end of life treatment stages' (Arkko et al., 2022), they justify the narrow focus on energy consumption and carbon emissions as being within the scope of the IETF.

The 'technical communities have been focused on growth, "progress" & innovation since the start of the Internet' (Manojlovic, 2022). This observation by a member of the technical community is at the heart of the belief that infinite growth of the network is possible, desirable, and negative externalities can be overcome through what Cath (2021) describes as permissionless innovation. There was much debate, both in the workshop and after on the e-impact mailinglist, on the relationship between energy consumption and network growth. Industry actors emphasise that 'there is no correlation between electricity consumption and the exponential growth in the number of bits sent' (Arkko et al., 2022). The authors base this argument on studies that show that in the last 10 years, energy consumption of mobile networks has increased moderately in comparison to the exponential growth in mobile data transmission. Additionally, it is noted on the mailing list in reflection to day 1 of the workshop that "we are in a much better state today than we were a decade or two decades ago, per bit (not per demand). A router chassis that was designed 2 decades ago and has taken 10KW was replaced a decade later by 1KW 4U box (with extra capacity)' (N. Zilberman, personal communication, June 12, 2022). Indicating a belief that hardware efficiency gains have decoupled network growth from energy consumption. In addition, participants highlight how the network has become more energy efficient and greener with the increased use of clean energy alternatives. According to Arkko, Lövehagen, and Bergmark's paper (2022), greening further decouples carbon emission from energy use and data growth. In framing the internet as exceptional, where more internet is believed to make other industries more sustainable and will not lead to more environmental

impact, participants foreclose discussions on whether network growth in itself is not the problem, limiting solutions to technical advancements.

The shared understanding in the IAB workshop that the growth of the internet is decoupled from harms is debunked by Vanderbrauwhede's (2022) position paper. He argues that until now, the internet industry has had very little economic incentive to reduce energy use in networking as the number of transistors and computational power on a chip doubled every two years, also known as Moore's law (Vanderbauwhede, 2022). However, these efficiency gains have reached their limits; integrated circuits can not be scaled down anymore, growth of the network will correspond with increased energy consumption. Making computational resources finite and precious (Vanderbauwhede 2022). Van der Brauwhede (202) central focus on limits exposes what isn't or what must be discarded in internet governance discussions for the internet to continue to operate and expand. He argues that 'as a society we need to start treating computational resources as finite and precious, to be utilised only when necessary, and as effectively as possible. We need frugal computing: achieving our aims with less energy and material' (Vanderbauwhede 2022). While van der Bauwhede was not selected to present his argument at the workshop, his position paper challenges the assumption that growth itself is without harm and brings the embodied costs, pollution and harms associated with mining, manufacturing, and transport of hardware into focus.

Greening the internet: sustainability or an economic proposition

From the start, the Internet was designed from an "always-on" assumption; energy efficiency was only a secondary objective, if at all' (Jacob, 2022). This quote signifies that the emerging interest to account for and reduce energy consumption and carbon emission of the network comes to fruition in a mature network that was built for resilience and security (Munn, 2022), not sustainability. Operating within these confinements, industry actors propose a number of practical ways to 'green' the network, ranging from introducing protocols designed that reduce the volume of data to be transmitted; removing redundant links and network equipment from the network topology; to experiment with path-aware networking that steers traffic along those paths that have the smallest carbon footprint (Clemm et al., 2022; Retana et al., 2022). These optimisation efforts should allow the community to 'do the same' in terms of the Internet, only to 'do it more energy efficiently at scale' (Greening of Streaming, 2022). In this section, I will specifically explore three solutions, measurement, carbon-aware networking, and sleep mode, which got a lot of airtime in the workshop discussions, to foreground how the decarbonisation of the network is presented as a cost-saving measure that requires an engineering rather than a political solution.

Carbon emission measurement is seen as an important step in making the internet more sustainable. It stems from the belief that "you can't improve what you don't measure" (Krishnan & Pignataro, 2022). Participants agree that there is a knowledge gap; the size, decentralised nature of the internet, and entanglements with society and other industries make it difficult to gather accurate carbon emission information at scale. 'The overall impacts of ICT on the environment is complex to derive' (Arkko et al., 2022), and 'quantifying and managing the emissions related to network transfer has historically been much harder, as so many

intermediate actors are involved in supporting connections between two or more parties' (Adams et al., 2022). The information deficit stems from a lack of access to reliable information and the absence of shared agreements or standards within the internet governance community on how and what to measure (Anderson et al., 2022). Participants frame the information deficit as a barrier to taking the appropriate measures to combat climate change. The focus on quantification and standardisation of carbon emission is in line with what Andrejevic describes as 'a persistent attempt to collapse the political into the technical as if the solution to societal and political conflicts were simply a matter of imperfect information' (Andrejevic, 2020, p. 101), and not a lack of political will. The justification regimes for sustainability activities are economic in nature, where energy efficiency measures are given monetary value through the argument that these will reduce operational costs of running nodes in the network.

Two aspiration propositions, path-aware or carbon-aware networking and sleep mode, were presented at the IAB workshop and illustrate the underlying rationalities that are being actively shaped. Carbon-aware networking aims to optimise internet traffic by routing it along 'greener' nodes. It envisions a system that has the 'ability to adjust its behaviour in response to changes to the carbon intensity of the electricity it consumes' (Adams et al., 2022). Its inspiration stems from large data centre operators who employ carbon-aware computing, shifting 'non-time sensitive computational processes to times or locations where cheap green energy is in abundance' (Adams et al., 2022; Schooler et al., 2022). Participants justify investing in this type of networking solution on economic grounds, as it is believed to give companies access to cheap renewable energy sources that might otherwise go unused or cause instability in the energy grid (Adams et al., 2022). After setting the scene, the papers and discussion quickly focused on the engineering challenges that need to be solved to actualize this solution; it requires freely available and accurate information about the carbon intensity of different nodes in the network (Adams et al., 2022), a standard to include this information in the header of IPV6 packages, and a protocol that privileges routing traffic along greener paths in real-time. As such, carbon-aware networking has economic values and becomes an interesting engineering problem that allows the community to act sustainably in a global network and connect solutions to already existing industry developments like IPV6, without accounting for the territories, energy politics (Velkova, 2024), nor the communities that host these 'greener' or 'dirtier' nodes.

There is a general understanding that the 'largest gains can be made when network resources can effectively be taken off the grid' (Clemm et al., 2022) or placed in sleep mode (Jacob, 2022). There is agreement that theoretically, shutting down idle devices should diminish the total volume of energy consumed by the network, but it is an approach that raises significant concerns, as there are many unknowns. For example, how would the network know which node is in sleep mode without pinging it and 'waking it up', which would be counterproductive as it costs more energy to power a device on than to keep it running (Clemm et al. 2022). While some argue that hardware innovation, such as chip manufacturing that allows for 'microsleep modes' (Arkko et al., 2022) and hardware redesign that allows devices to power up faster (Jacob, 2022), might solve some of the challenges, the concept of sleep mode was not uncontested. Friction emerges between the idea of sustainability through powering down nodes and the core values of the internet governance community, the desire to have an internet infrastructure that is always-responsive in nature and is designed for 'speed, efficiency, and

resilience' (Munn, 2022). This points to the reality that internet governance consists of the continuous weighing of different priorities according to the norms and values embedded within its community.

An ideology based on infinite growth and an abundance of resources

The emergence of sustainability discussions in the IAB and IETF is part of a broader trend where the technology industry is accounting for its environmental impact in a number of ways. This is evident from industry discourse that actively shapes the cloud as a sustainability solution (Sridharan, 2025), sustainability reporting, and the industry's climate pledges (Kazansky & Kekana, 2023; Vrikki, 2024). In analysing the IAB contributions, it is clear that the climate and ecological crisis are sparking genuine concerns, and community members want to understand how they can contribute to ensuring sustainable futures. Yet, the proposed sustainability solutions are inadequate as they happen at the wrong scale. I will use the Liboiron (2014, 2021) concept of scalar mismatch to argue that 1) the solutions do not engage with the violence and pollutions of the network, the relationships that matter; 2) scarcity of natural resources to built and operate the internet are discarded from sustainability debates; and 3) sustainability approaches are actively shaping underlying justification regimes for internet growth in a world in crisis. These insights shed light on the ideologies that underpin the governance regimes of the internet, that of infinite growth and an abundance of resources.

The term scale is not used by Liboiron (2021, p. 84) in the traditional economic sense but in relation to governance processes, to identify the relationships that matter within a particular context, which will determine the pathways for action. Sustainability efforts focus on harm reduction, how much pollution is deemed acceptable, over addressing the origins of potential harms, the relationship that matters. Scalar mismatch describes this process, where interventions do not match the scale of the actual problem (Liboiron & Lepawsky, 2022). These observations reflect my findings relating to the harm reduction approach of the internet governance community, where the focus lies on quantification and optimisation of energy consumption of the network and does not engage with the idea that the network itself is polluting. To find the relationship that matters, we have to understand sustainability efforts as a technique of power that promotes certain interests at the expense of others. More specifically, the focus on measurement and optimisation focuses on the technical (Andrejevic, 2020) and hides the economic incentives to grow the network from view. An economic rational that has shaped the internet is known as Metcalfe's law, which dictates that when the networks grow, the cost for each new node increases linearly but the value of the network increases exponentially (Swann, 2002). Thus, the value of an infrastructure, and the services that run on top of it, are believed to be intrinsically connected to its market share and the volume of users, nodes, and data. Growth as a central value (Cath, 2021; Jansen, 2023) us achieved by developing new internet services; the expansion of the network to new geographical areas; and a rise in users and connected objects. When the internet grows, it grows in multitude, designed to be

"always-on" the internet is built for redundancy to prevent loss of connection and services (Munn, 2022). For example, packages are routed in multitudes across different paths, networking equipment is configured for peak load and with a backup option, and emergency power supplies are designed to keep everything, also non-essential services, running at all times. None of the contributions in the IAB workshop addressed the network or growth of the network as an issue, a relationship that matters. By describing the scale of the problem incorrectly, they unintentionally narrow avenues of change, redirect attention away from what needs to be done, and delay much-needed climate action.

My findings illustrate that while there was a brief acknowledgement of the various ways pollution and harm manifest throughout the internet supply chain, natural resources issues were considered outside the mandate of the IETF and occupy a marginal position in the debates on sustainability. The representation of internet infrastructure as immaterial in the cultural imagination (Starosielski 2015; Frenzel 2023) can explain why the general public does not connect technology to the environmental harms associated with the mining for critical raw materials, hardware manufacturing, and e-waste (Bridges, 2023; Falk et al., 2024; Gabrys, 2011). It can not explain why the engineering community, who are deeply connected to the materiality of internet infrastructure, discards supply chain issues. I draw on Hultman and all (2021) to argue that the processes of discarding natural resources in the discussion on sustainability is not a specific feature of internet governance; rather, it is an expression of a wider dynamic of resourcification. Industrial production in a capitalist society revolves around turning things into resources for extraction and accumulation. Resourcification, a term coined by Huktman et al. (2021) to argue that resources do not just come into being; economic value is created through social processes, by actors seeing the potential of a resource and creating demand for it. The process of resourcification can only be achieved by slowly sacrificing certain Lands for the economic and social prosperity of other areas (Juskus, 2023). In sustainability discussions, these social processes are taken as a ground truth, which provides grounds to disengage with the notion of violence and harms of extractive processes in the supply chain, or are justified by the rhetoric of progress. Thus, while internet governance in whatever form is thus far more intrinsically connected to questions of resources, these social processes detach sustainability debates from the material reality of routing and perpetuate a worldview that there are enough resources to power and grow the internet.

In priming the sustainability discussion with the caveat that the internet is crucial for the decarbonisation of other industries, the internet governance community is actively shaping underlying justification regimes for internet growth in a world in crisis. To locate this observation within underlying structures that shape society, I built on ten Oever and Milan (2022) approach to the study of internet governance organisations and standards processes as a study of power. The authors built on Weber (1968) and Peet (2007) to argue that internet infrastructures are not merely defined by the power struggles in the market, state, and citizen nexus but are shaped by ideology, the dominant social norms and values that allow power holders to justify their position and actions (Beetham, 1991b, 1991a). As my findings show, in positioning the internet as exceptional and crucial for progressive change, the industry justifies the violence of extraction and pollution by aligning itself with the dominant social norms of progress and positions itself as the means to achieve a sustainable future (Jansen & Thorne, 2024; Sridharan, 2025). The

positioning is the continuation of a long line of tech-solutionist approaches where the emphasis is on innovation rather than change (Sætra, 2023). Where Cath (2021) has shown that in the internet governance imagination, growth and innovation are intrinsically tied to each other. The internet is imagined “as an inherent good whose availability depends on uncurbed growth and a non-prescriptive ethos” (Cath-Speth, 2021, p. 17). A belief that prevents critical engagement with the question ‘how much internet do we actually need and at what cost?’ and embeds justification regimes for growth in narratives around innovation and progress as central to sustainability approaches.

Conclusion

In this paper, I show how the study of sustainability approaches offers a lens to understand the politics of internet governance regimes. The concept of scalar mismatch helps to discern that in the age of the Anthropocene, where human activity continues to have a devastating impact on our planetary system, the internet governance community has not come to grip with the idea that the network and its growth are a problem, as such, none of the proposed sustainability intervention match the actual scale of the actual problem. In light of geopolitical uncertainty, the climate crisis, and rising energy prices, it is important to understand sustainability efforts as an attempt to create stable conditions for the network to keep functioning. These insights allow me to theorise that the norms and values of infinite growth, abundance of resources, and sustainability through innovation shape the governance of the internet and justify it existence and growth in a world in crisis. The contribution is an outline of a research interest at the intersection of infrastructure studies, environmental social science, and internet governance studies for understanding internet governance as a locus of power that is shaping the terms on which environmental harms and sustainability are understood. More research is needed to understand how the internet governance community reconcile their desire to positively contribute to a sustainable future with the norms and values that shape its understanding of the internet. In addition, what governance approaches that address the problem at the right scale could look like.

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