ICT Standards and the Environment: a call of action for environmental care inside Internet Governance

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Abstract

There is nothing inherently green about information and communication technologies (ICTs) and "going digital" does not necessarily mean "going green. This project addresses one dimension of the intersection between the environment and ICTs: it maps environmental concerns and practices embedded in ICTs standards. Standard-setting organizations define mechanisms through which digital technologies operate and establish rules on how data circulates online. These organizations are increasingly working on the creation of "greener" ICT standards, and engaging in public policy at the intersection of technology and geopolitics. Recognizing the importance of the Internet and other communications technologies considering the current environmental crisis, this paper asks: What are the implications of ICT standards for enabling and/or constraining environmental rights, meaning the right to a healthy, clean, safe, and sustainable environment? To answer this question and develop a framework through which one can analyze the wide applications and intersections between the environment and ICT standards, the paper relies on semi-structured interviews with individuals working on the environmental impact of ICTs and examples from two standard-setting organizations' documents: the International Telecommunication Union Telecommunication (ITU) and the Internet Engineering Task Force (IETF).

Keywords: Standards; Infrastructure studies; Internet Governance; Environmental Media

The Internet Governance Forum set the 'environment' as a main thematic track for the first time in 2020. The United Nations multistakeholder venue for Internet policy discussions signaled a growing interest in addressing the environmental impact of information and communications technologies in its annual meetings. And it is not alone in such an endeavor. Standard-setting organizations (SSOs) that establish rules for how information and communications technologies (ICTs) work and how information circulates over the Internet are also turning their attention to environmental concerns and working on the creation of greener Internet protocols.

As digital technologies enter various areas of life and business, permeating all aspects of the physical world (Wäspi, 2022; DeNardis, 2020), climate change, pollution, biodiversity loss, resource depletion, and other environmental issues elevate the environment to the top of the global policy agenda. Despite discourses of immateriality, information and communications technologies (ICTs) do not have inherent green qualities. In this sense, standard-setting organizations are a key component to making the ICT sector sustainable, for they intersect with industry strategies, government policies, civil society advocacy, and academic input.

This paper is the first step of a broader research project on ICT standards and the environment. It explores what are the implications of ICT standards for enabling and/or constraining environmental rights, meaning the right to a healthy, clean, safe, and sustainable environment (UNEP, n.d.), and signals ways through which we can explore environmental action through ICTs standards' design and the policy engagement of ICT standard-setting organizations in environmental matters. To do so, the paper relies on semi-structured interviews with individuals working on the environmental impact of ICTs and the content analysis of standard-setting organizations' documents.

Research paths on the environmental impact of information and communication technologies

Internet and communication scholars are increasingly turning their attention to the material and the entangled implications of digital technologies. Sustainability communication over time has become a distinguished area of research on its own (Anderson, 2021). The bulk of the scholarship on the field unravels and highlights the materiality, the physicality of the Internet, as exemplified by a growing number of studies on undersea cables, satellites, data centers, and e-waste that represent an infrastructural turn among Internet Studies (Parks & Starosielski, 2015), and the establishment of "environmental media studies" as a field addressing problems in the overlapping spheres of environmental issues and the production and use of new media (Shriver-Rice & Vaughan, 2020).

Against narratives and imaginaries of communication and information technologies as immaterial, ICTs are scrutinized for the natural and human resources, the labor, and the materialities surrounding and composing them. Scholars call for more sustainable practices for digital media (Maxwell & Miller, 2012; Cubitt, 2016; Rauch, 2018; Finn & Rosner, 2019; Khreiche, 2020), emphasize that going digital will not always equate to going green (Ensmenger, 2018; Kuntsman, 2020), and dismantle narratives surrounding data centers, the cloud and Artificial Intelligence as things detached from material, nature-demanding infrastructures (Holt & Vonderau, 2015; Hogan, 2018; Pasek, 2019; Brevini, 2020; Monserrate, 2022; Brodie, 2023). Some scholars follow a call to reorient the communication field towards what Kuntsman (2020) labels as "materialist accountability," trying to situate investigations about how digital technology relates to the environment geographically and historically, highlighting which technologies, and where, may inflict harm, and on who. Goethals and Ziegelmayer (2023) go beyond addressing the footprint of ICTs to demonstrate empirically that environmental concerns have also an impact on the way end users use digital technologies once they are aware of the environmental footprint of this use.

Still, even among research fields that turn their attention to the hidden environmental consequences of ICTs, a fundamental but niche aspect of ICTs may be overlooked: their standards. As the environmental agenda becomes more and more urgent, spaces such as SSOs increasingly engage in environmental matters. For example, a working group from ISO/IEC (the International Organization for Standardization and the International Electrotechnical Commission) called the Moving Picture Experts Group (MPEG) created the "Green MPEG", a standard to maintain video quality in the transmission of video data online while optimizing energy consumption in the encoding, decoding, and displaying process. ICT standard-setting organizations (SSOs), through both the standards they create, and the related policy work they engage in, are also dealing with issues connected to the environment.

An environmental agenda for Internet Governance

Standards lay the basis in which information and communication technologies operate and, as such, they play a role in assuring sustainable practices in the ICT sector. Besides, the ICT

standard-setting organizations themselves, as they increasingly act on environment-related issues, are becoming policy players and an arena where interests compete about what is the relationship between ICTs and the environment and what should be done about it.

Internet governance scholarship long has examined Internet standardization processes by considering how protocols are inherently involved in issues of culture, politics, economics, and law (DeNardis, 2014; DeNardis & Musiani, 2016; Epstein, Katzenbach, & Musiani, 2016; Milan & Ten Oever, 2017; Cath, 2021; ten Oever, 2021). ICT standards are political things, and not just technical ones (Abbate, 2000; DeNardis, 2009). Standard-setting organizations need to be aware of and address the sociopolitical implications of their design decisions (Cath, 2021; Ten Oever, 2021).

When dealing with how politics and values become inscribed in Internet governance artifacts and decisions, and how Internet infrastructures may serve as control points, most approaches tend to focus on those rights more clearly related to the digital world (e.g., privacy, freedom of association, and freedom of expression). However, environmental rights should also be considered as yet another example of how politics and rights are embedded in Internet governance. The right to a healthy environment can be fostered or threatened by current digital technologies' infrastructures and standards.

Internet governance practices and the work of ICT standard-setting organizations more specifically may advance or hinder sustainable digital technologies. Standards concerning information and communications technologies need to be assessed not only for their technical qualities but also for their political and material implications, including environmental ones. Besides, as SSOs increasingly turn their attention to environmental issues and become global players on such matters, their policy work and advocacy should also be scrutinized. The intersection between ICT standards, the SSOs, and the environment requires the input not only of engineers working in standardization and Internet governance practitioners, but also environmental activists, governments, and citizens alike concerned about the environment.

Prior investigations have highlighted the overlaps between Internet Governance, digitalization, and sustainability (Fuchs, 2017; MacLean et al., 2023). Digitalization processes

bring new opportunities and challenges for sustainability practices in the ICT sector (Stanković et al., 2021), meanwhile, there is a lack of and need for comprehensive regulation addressing these opportunities and risks that digital technologies impose (Santarius et al., 2023). Amid the growing interest and necessity to investigate and act on the intersection between ICTs and the environment, a focus on Internet infrastructure seems to be underexplored by scholars who focus on degrowth (Pansera et al., 2023). Pansera et al. (2023), for instance, argue against a logic of perpetual (economic, social) growth that is built into the global Internet infrastructure via Internet protocols and governing mechanisms that include the network's design.

As the environmental agenda becomes more and more urgent, Internet Governance spaces such as SSOs and venues like the Internet Governance Forum (IGF) become another field in which environmental politics are enacted. In the IGF, for instance, while environmental related topics (e.g., climate change, sustainability, e-waste) have been part of its meetings for a while, they became a more visible priority in 2020 when they became a thematic track, also in light of the creation of the Policy Network on Environment (PNE), a group of voluntary diverse stakeholders focused on intersections between environment and digitalization, which created a document describing policy recommendations on the topic (Wäspi, 2022).

Methods

This study is part of a wider research project that compares environment-related standardization discussions and policy engagement among two ICT standard-setting organizations: the International Telecommunication Union Telecommunication (ITU) and the Internet Engineering Task Force (IETF). In this paper, a brief overview of the work of these two organizations is used as an example that contributes to our understanding of ICT standardization concerning the environment. To explore the implications of ICT standards for enabling and/or constraining environmental rights, this paper also relies on semi-structured in-depth interviews with experts that work or have worked on environmental issues related to ICTs. Interviews are based on both purposive sampling and snowball sampling, following the angles of a discussion

the interviewees deemed important (Brinkmann, 2014; Rubin & Babbie, 2016). The questionnaire is provided in Annex A.

Eighteen interviews were conducted purposefully with experts that have already advocated for environmental concerns about the Internet and its infrastructures, as well as experts who have published or talked about the intersection between the Internet and the environment. Interviewees were chosen based on the literature review on papers discussing the environmental impact of digital technologies, white papers, other types of publications published by advocacy organizations, and recommendations by fellow interviewees. The interviews' transcripts and recordings, as well as any memos, went through content analysis using NVivo as a qualitative coding software (Saldaña, 2012).

The project follows the ethical guidelines of the Association of Internet Researchers (AoIR) and research standards set by the American University. Access to the interviewees occurred through their voluntary will after an invitation over email to participate in the research and they provided written consent. As it is not fundamental for this study, no real names and affiliations are disclosed, and quotes edited to ensure the impossibility of identifying interviewees.

Results

> *"The virtual world is not virtual. It's very dirty. It has a data center behind it. It has a device manufacturer behind it. It has a lot of CO2 just to put it in place. (Interviewee I)"*

Echoing the literature, interviewees situated the debate on how ICTs relate to the environment between two parallel understandings of technologies. As one interviewee put it:

> "Digitalization allows us to enable a more sustainable economy. It's simple things like us having a video chat now rather than flying halfway across the globe but also allowing more efficient and smooth decision-making, modeling, and rendering of many operational procedures, and also climate models to ultimately help us tackle and combat climate change. On the other hand, though, there are also the negative aspects of digitalization when it comes to energy resources, water and

> rare earth metals consumption, which directly impacts sustainability, environmental change, and global warming" (Interviewee II).

Most of the experts explicitly mentioned avoiding digital solutionist accounts, "using digital technologies as an end in itself" (Interviewee III), "thinking that by default, digitalization goes the same way as ecological policies" (Interviewee IV), or even believing that "increasing digitalization will bring up more social progress" (Interviewee V). Two experts exemplified the belief that "if it's all digital so it's obviously good for the environment," (Interviewee VI) by demonstrating that people naturally assume that not printing online documents is proof of the ICTs' environmental friendliness.

The ways that ICTs intersect with the environment are manyfold and are usually divided into three categories (Berkhout & Hertin, 2004; Mickoleit, 2010). First, there are direct impacts related to the physical existence of ICT goods and services, such as the problem of e-waste and cooling data centers. Second, there are enabling effects of digital technologies. Because ICTs affect how other products are designed, produced, consumed, and disposed of, they can make production and consumption more or less resource efficient. Finally, there are systemic impacts, intended and unintended behavioral changes related to the wide application of digital technologies in society. For example, when people meet over Zoom instead of going on a business trip and use a streaming service instead of buying a physical album, these new consumption patterns generate direct impacts (e.g., an increase in the energy consumption of servers storing digital music) and enabling ones (e.g., reduction of physical music media) (Mickoleit, 2010, p. 9).

In all categories, as Berkhout and Hertin (2004) demonstrate, the two parallel understandings mentioned by interviewees abound. On one hand, the environmental effects of ICTs appear to be exclusively positive since 'information' is generally considered to be disconnected from the use of material resources. For example, optimistic narratives overtly focus on how the development and implementation of ICTs can help curb climate change, barely mentioning how they may also increase it. On the other hand, digital technologies are seen as a case of unsustainable production and consumption of tech-related devices and services, in which

the materiality of ICTs imposes negative outcomes such as the proliferation of electronic waste, the incorrect disposal of materials, and data centers' high demands for water and energy sources. As one interviewee pointed out, "I need to use data better in order to solve climate change. But the amount of data that's being generated from all these devices we're trying to deploy these smart things, has an environmental footprint in itself" (Interviewee VII).

Both accounts are more united than it seems. To act on the intersection between the Internet infrastructure and the environment, one should account for how we use digital technologies to be more environmentally friendly, and also how environmentally friendly are digital technologies themselves. Ensmenger (2018), for instance, recounts that the invisible infrastructure of the Internet follows the contours of geography and human settlement and argues that once people understand computing power as "necessarily resource-intensive, pollution-producing, and potentially damaging to the environment", they can make more informed choices about why, when, and how to employ such power (p. 27). Similarly, Kuntsman (2020) argues in favor of materialist accountability, one in which the usefulness of digital technologies, specifically concerning its adoption into sustainability projects, is addressed together with the extensive environmental damages brought by digitization itself.

Where do standards fit in this conversation?

> *"What we need is standards, or frameworks that are dedicated to sustainability rather than, you know, putting an appendix on an existing standard that just mentions: "Try to not burn down the planet if you can." (Interviewee VIII)*

When it comes to establishing what roles ICT standards could play in enabling us to account for both promises and pitfalls of digitalization processes, experts highlighted two main areas of action: establishing a common language and parameters, and mechanisms for enforcing accountability. Both were mentioned in regard to standards for "digitally enabled, avoided emissions" (Interviewee I), meaning standards to help measure avoided carbon emissions or any other environment-related parameter that are due to digitalization, and standards for accounting and cutting down the environmental impact of ICTs themselves.

As one interviewee puts it:

> "(In the ICT sector) There are many things that are connected. We can talk about energy consumption. We can talk about the use of natural resources. We can talk about waste... One solution would be to look first at the standards that exist at the moment. And one of the things that we noticed is that there is a lack of uniformity in standards, which allows for many gaps and greenwashing, since nobody knows very well what we are talking about, without common standards and methodologies for both companies and governments" (Interviewee VI).

The experts seemed to agree on standards to bring harmonization, a "way of putting (different stakeholders in the ICT sector) on the same starting line, and ensuring that a lot of fragmentation is avoided, since now everybody has their own way of doing (environmental) things" (Interviewee IX). Some tied the harmonization issue to a need for transparency, mentioning that standard-setting could "help with the interoperability of a lot of different sectors that are supposed to work with each other (Interviewee X)" and that currently we lack a common taxonomy or nomenclature to deal with the relation between ICTs and the environment, let alone a way to measure the size of the potential effects of the entanglement between the two.

Scholarship has been trying to tackle those same issues from distinct start and endpoints. On networking alone, some has been discussed about the difficulty of measuring its carbon footprint. Zilberman et al. (2022), for instance, argue in favor of mutually agreed metrics to account for the carbon footprint of data networks, in which one could trace the carbon efficiency of data transmission systems from the end-to-end environmental cost of data transmission to the up-the-stack costs of data processing, rather than merely the independent network devices.

Scholars such as Schooler et al. (2022) and Nafus et al. (2021) are also exploring solutions for carbon-aware networking and carbon-responsive computing. Among algorithms studies, there have been some initiatives trying to account for environmental awareness, especially when it comes to energy usage accountability (Lottick et al., 2019), and the number of carbon emissions of machine learning processes (Lacoste et al., 2019; Matus & Veale, 2022). When it comes to electronic waste, quantifying and mapping the effects of e-waste on the environment on a local

and global scale has also been a challenge (Maphosa & Maphosa, 2022), as is the case with data storage and processing (Monserrate, 2022).

Beyond the challenge of measuring, and providing a common language for the sector, experts also demonstrated concern over the standard-setting process. Some, for example, were skeptical about the industry regulating itself, especially in highly privatized standard-setting organizations, and questioned the existence of net zero or other environment-related commitments that are never tracked. The origin of such skepticism is manifold, and it also comes back to the lack of common ground and common measurements. As one puts it:

> "When I look at the quality of the data (industry players) are providing (about the environmental impact of their activities), at the end of the day, you understand that they don't know much about the manufacturing of their own services and their own products. (...) You should look at the projection of numbers that "prove" that digitalization will make sustainable policies or transition policies more easily because most of them are completely fake. (...) But all these numbers are really shaping policy making in a sense that they are a cheap justification that we should do this (digitalization) right now" (Interviewee IV).

As one expert mentioned, lack of common language and measurements hinders not only how the ICT sector deals with its entanglement to the environment, but also the motivations behind initiatives to ethically account for that from both the industry and other governmental and civil society sectors:

> "Coming from an industry built on and driven by data, the lack of absolute numbers is stunning. There is very little knowledge of how digital infrastructures impact the climate. There is perhaps, a more gut-feeling pushback on the expansion of digital infrastructure, especially in Europe, Canada, and Australia. But it's not very data-driven. It's very much sentiment-driven. And I truly wish that would become more data-driven to allow for better decision making" (Interviewee II).

On the centrality of materiality

> *"We should have been having these conversations about technological sustainability 40 if not 50 years ago. Now we're playing catch up in a market that is completely dominated by consumerism and very short product lifecycles" (Interviewee XI).*

At the center of the discussion of the intersection between the environment and ICTs, and the role of standards in this case, is the necessity for quantification and addressing materiality. Quantification is a vital part of what standards, ICT-related or not, are all about. Standards define procedures, regulate behaviors, predict outcomes, ensure interoperability and, to do so, rely on quantifying, classifying, and formalizing practices that most of the time remain unnoticed by the ones who benefit or are affected by them (Lampland & Star, 2009). Although unnoticed, standard-setting, especially about ICTs, is an increasingly politicized procedure among private and government actors (Klotz, 2023). Infrastructures, including ICTs standards, reflect the values and interests of those involved in their creation and enactment, as they will enable certain behaviors or make others more difficult (ten Oever, 2022). Following calls to promote the recognition of human rights related to digital technologies in the work done by and within standard-setting organizations, there has been some increasing inclusion of public interest concerns in some ICT SSOs (Harcourt et al., 2020).

Regarding how ICTs standards may relate to environmental rights specifically, the entry point of most of the debates within the standard-setting organizations about this issue reflects that of environmental media scholarship: unraveling the materiality of digital technologies and their infrastructures. In practical terms, this refers to what the interviewees desired for ICT standards: measuring the relationship between ICTs and the environment in preferably straightforward ways.

Measuring the environmental impact of ICTs, be it from a software, hardware, or networking standpoint, is never an easy task. Even when people do recognize the physicality of the Internet, there is no simple way to quantify its relation to the environment, be it in terms of carbon footprint, energy consumption, natural resources extraction and usage, disposability, and more. Moreover, as interviewees put it, "standards are normally lagging behind our special interest (...since) technological advancement is too quick for the specific kind of work that

standardization can do". (Interviewee IX) Such struggle, however, should not hinder environmental action through ICT standards.

As Sterne (2014) demonstrates, materiality refers to the shape and affordances of the physical world we live in, but also the constitutive social relations that compose our lived reality (p. 120). ICTs are physical things situated in and interacting with the environment, even when they are surrounded by discourses of immateriality. To recognize this, and act on it, does not mean necessarily that we will be stuck if we are not capable of precisely measuring the entanglement of digital technologies and nature, or that we should stop at the measuring phase. Recognizing that ICTs are physical things that impact the environment is also recognizing them as relational, as embedded in both physical and social processes.

Interviewees pointed to something similar when they identified what they believe to be the root of the problem at the intersection of ICTs and the environment: not the environmental impact of separate and individual devices, products, and services, but the entire socioeconomic model behind how society deals with digital technologies. One interviewee, for instance, stated that "Standard-setting is really important because it allows for environmental best practice to come in and enter its way at the technical level, but this is in direct competition with the (ICT sector) business model" (Interviewee XI).

Or, in the words of another interviewee: "Nobody wants to address the elephant in the room: that we have to change our economic model. It can no longer be about growth and profit if we want to continue living as a species (Interviewee XIV)". Other experts used the usual sustainability language around "circular economy", "life cycle perspective", or "structural change" (Interviewees XII, XIII, and VII). The idea, still, is that standard-setting initiatives, as limited and stricter as their focus may be, could and should be part of a greater push for comprehensive change through all the ICT production and consumption chains.

Standards in action: examples from the ITU and the IETF

> *"Especially when it comes to ITU and organizations such as this, there's a lot of established interests among the parties who support the work, both financially and from a knowledge*

> *perspective. When pushing away from the status quo and moving the needle, those are perhaps not the... early adopters" (Interviewee II).*

Some standard-setting organizations are already engaging more intensely with the environmental agenda. Such engagement, however, is not without pushbacks. As exemplified by one interviewee, "You could argue (environmental matters are) far removed from (ICTs) standard-setting, but a standard is also about how our technology starts, how it works, and where. So we can't talk about the environment without talking about how (ICTs) actually work in design terms (Interviewee V)."

Standard-setting organizations engage in environment-related discussion both by creating standards to deal with how ICTs interact with the environment, and also how as organizations themselves they might contribute to environmental degradation and climate change (e.g., through carbon emissions due to business travel, or energy consumption of their headquarters).

The Internet Engineering Task Force (IETF), one of the oldest standard-setting bodies that developed many Internet protocols, is one example of an ICT standard-setting organization that is increasingly turning its attention to environmental matters. Another ICT SSO is the International Telecommunications Union's Telecommunications Sector (ITU-T), the United Nations specialized agency developing telecom standards.

The ITU is the oldest United Nations organization currently operating. It was founded in 1865 to facilitate international connectivity in communications networks – from the telegraph to current systems. Presently, its mandate is to "allocate global radio spectrum and satellite orbits, develop the technical standards that ensure networks and technologies seamlessly interconnect, and strive to improve access to ICTs to underserved communities worldwide" (ITU, n.d.). ITU's Telecommunication Standardization Sector (ITU-T) is the entity within ITU responsible for developing "ITU-T Recommendations" (ITU-T Recs), the protocols created by the organization for Information and communications technologies.

The ITU operates as a public/private partnership for developing ICT/telecom standards. ITU membership is restricted to nation-states and corporate entities from the ICT industry, as

well as technical organizations, associations, and academic bodies involved in the field of ICTs. Applications to participate in the ITU must be approved by a national telecommunication administration in the Member State where each organization is based, and membership fees apply. Moreover, ITU-T Recs require consensus and approval of the Member States to be enacted (DeNardis, 2009). ITU-T members have the exclusive right to access working documents of standards under development. Once approved, ITU-T Recs are usually made available at no cost for anyone interested, except for a minority of standards sold through a partnership with ISO/IEC (the International Organization for Standardization and the International Electrotechnical Commission).

As part of the UN system, the ITU tends to follow UN guidelines such as the Sustainable Development Goals (SDGs). It hosts the "Study Group 5 - Environment and circular economy," which is responsible for studies on how to use ICTs to help countries and the ICT sector adapt to environmental challenges in line with the SDGs. The group started with the mandate to work on ICT safety, reliability, and electromagnetic compatibility. From working on providing standards to secure ICT systems and devices from disruptions caused by external physical phenomena (e.g., lightning), the study group's mandate evolved to encompass climate action and sustainable digitalization.

One example of the work the group has been doing is the proposal of an energy-efficient one-charger-fits-all mobile phone solution that enables a single charger to be used in future phones regardless of manufacturer. This solution is one among many standards the institution is creating to reduce e-waste, greenhouse gas emissions, and energy consumption (ITU, 2022). The group also works on the establishment of methodologies for measuring the carbon footprint of ICTs. Currently, the ITU has more than 140 standards that are somehow related to environmental issues, standards already approved or in discussion from Study Group 5 or other working groups.

The Internet Engineering Task Force (IETF) also is engaging in environmental debates, although later in comparison to the ITU. The IETF is an open international organization that has created core Internet standards like the Internet Protocol (DeNardis, 2009). The IETF was created in 1986 and, since 1993, has developed standards for the Internet as an entity under the umbrella

of the Internet Society (ISOC), a non-profit membership-based international organization. In comparison with ITU, the IETF is more inclusive about who gets to participate in the decision-making process. While many informal barriers to the public exist, there are no membership fees to participate in IETF's discussions. Besides, while most participants have affiliations in the private sector, people can participate in their capacities. The IETF standards documents are called RFCs (Request For Comments), standards containing "technical specifications and organizational notes for the Internet" (IETF, n.d.). IETF RFCs are developed and communicated primarily through mailing lists to which anyone may subscribe, and they are approved upon rough consensus. Once in place, IETF standards are made available for free for any interested party.

The IETF has several standards under discussion related to energy efficiency in networking. For example, RFC 7668 (IETF, 2015) proposes a low-power version of Bluetooth to facilitate communication in devices such as sensors, smart meters, and appliances. This protocol could make the energy consumption of the Internet of Things (IoT) less demanding. Recently, it also supported a workshop by the Internet Architecture Board (IAB), a committee of the IETF, on the "Environmental Impact of Internet Applications and Systems."

Following up the workshop, IAB established the E-Impact Program as a venue for discussing the environmental impacts and sustainability of Internet technology. The scope of the group is to look "at trends, issues, improvement opportunities, ideas, best practices, and subsequent direction of work related to Internet technology, architecture, and operations, including visibility and efficiency on energy and other environmentally-impacting attributes." The IETF itself also hosts the Human Rights Protocol Considerations Research Group (hrpc), which, according to its website, follows the "problem statement that human-rights-enabling characteristics of the Internet might be degraded if they are not properly defined, described and sufficiently taken into account in protocol development."

Standards created by the organizations mentioned above are endowed with formality and take the form of documents describing guidelines that should be followed so that they can properly function, although their implementation is voluntary (Ermoshina & Musiani, 2019). Their standardization processes are usually long and contingent. Despite the challenges involved

in both creating, maintaining, and implementing standards, ICTs standard-setting organizations seem to be catching up with environmental discussions. The next step of this research is to delve into the work they are doing and investigate ways forward through the content analysis of the standards they are proposing, as well as interviews with members of the organizations.

Conclusion

> *"My dream is to see digital technologies that do not accelerate but slow down" (Interviewee XV).*

As part of a greater research project on the environmental impact of ICT standards, this draft paper asked what the implications of ICT standards are for enabling and/or constraining environmental rights. Experts working at the intersection of ICTs and the environment projected that standards could bring harmonization for environmental action within the sector, as well as clarity on measuring methodologies, and enforcing mechanisms. More than that, they argued that standards could help shift over-consumption and extractive ICT business practices that harm the environment.

Besides, in addressing these implications, interviewees suggested other important questions. "Can standards and standard-setting fix the business-as-usual scenario that we have to go away from, and can standard-setting be a tool for innovation and a more sustainable future?" (Interviewee XIII). "If we don't center (on certain) economic business model in the development of Internet and digital technologies, but we center environment, what would our Internet infrastructure then look like?".

Scholarship already established that standards are political things that can incentive or constrain certain behaviors and outcomes. Two important ICT standard-setting organizations themselves are already engaging and increasingly acting on environmental matters. To try to address the questions posed by the experts, the next steps on this research project involve understanding what specific environmental policy themes and concerns are being addressed by environment-related ICT standards and what is being overlooked, as well as what types of actors

are working on those issues within these SSOs, what interests do they advance, and who is missing from such endeavors.

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Appendix A - Semi-structured Interviews Prompts

1.1 How long have you been working with environmental issues? How did you start working on those issues?

1.2 What areas do you work on?

ICTs and the environment

My work untangles the influence of the Internet infrastructure on environmental rights through standards. I focus on how information and communication technologies (ICTs) standard-setting organizations care about the environment and what they are doing – both by creating standards, but also by engaging in environmental policy – to deal with the environmental impact of the infrastructures they help to create and maintain. ICTs are the technological devices and services we use to create, transmit, and display data and information electronically, from satellites to mobile phones, from cables to the Internet, and from software to hardware.

2.1 To what extent does your work involve information and communication technologies (ICTs)? (e.g., as an object of inquiry, a problematic area, a solution area, enabling tools, no clear connection)

2.2 How do you understand the intersection between environmental considerations and ICTs?

2.3. Are there any aspects of the environmental impact of ICTs that concern you, and if so, which? If not, why?

2.4 If they state in 1.2 that they work with environmental issues concerning ICTs, ask:

2.4.1 How and why did you start working with environmental issues about information and communication technologies (ICTs)?

2.5 What would you like the future relationship between ICTs and the environment to look like?

Standard-setting and the environment

My work focuses on standard-setting organizations (SSOs). These are the organizations that establish rules and guidelines for how information and communications technologies (ICTs) work and how information circulates over the Internet.

3.1 Are you aware of any work being done in technical ICT SSOs? If so, can you give examples?

3.2 Have you ever done any work related to standards/protocols? If so, what?

3.3 Do you believe ICTs standards and protocols could impact the environment? If so, how?

3.4 Where do you see environmental work regarding ICT standards going in the foreseeable future? Where do you wish it goes?

Conclusion

4.1 Is there anything you wish people talked about or that you think is being overlooked about the environment? If so, do ICTs have anything to do with it, and how?

4.2 Is there anything you would like to add or something I haven't asked you? Is there anything you had expected us to discuss that we have not?

4.3 Do you have any recommendations about people I could talk to? I'm interested in how information and communication technologies (ICTs) standard-setting organizations care about the environment and what they are doing, do you know any environmental experts related to that?