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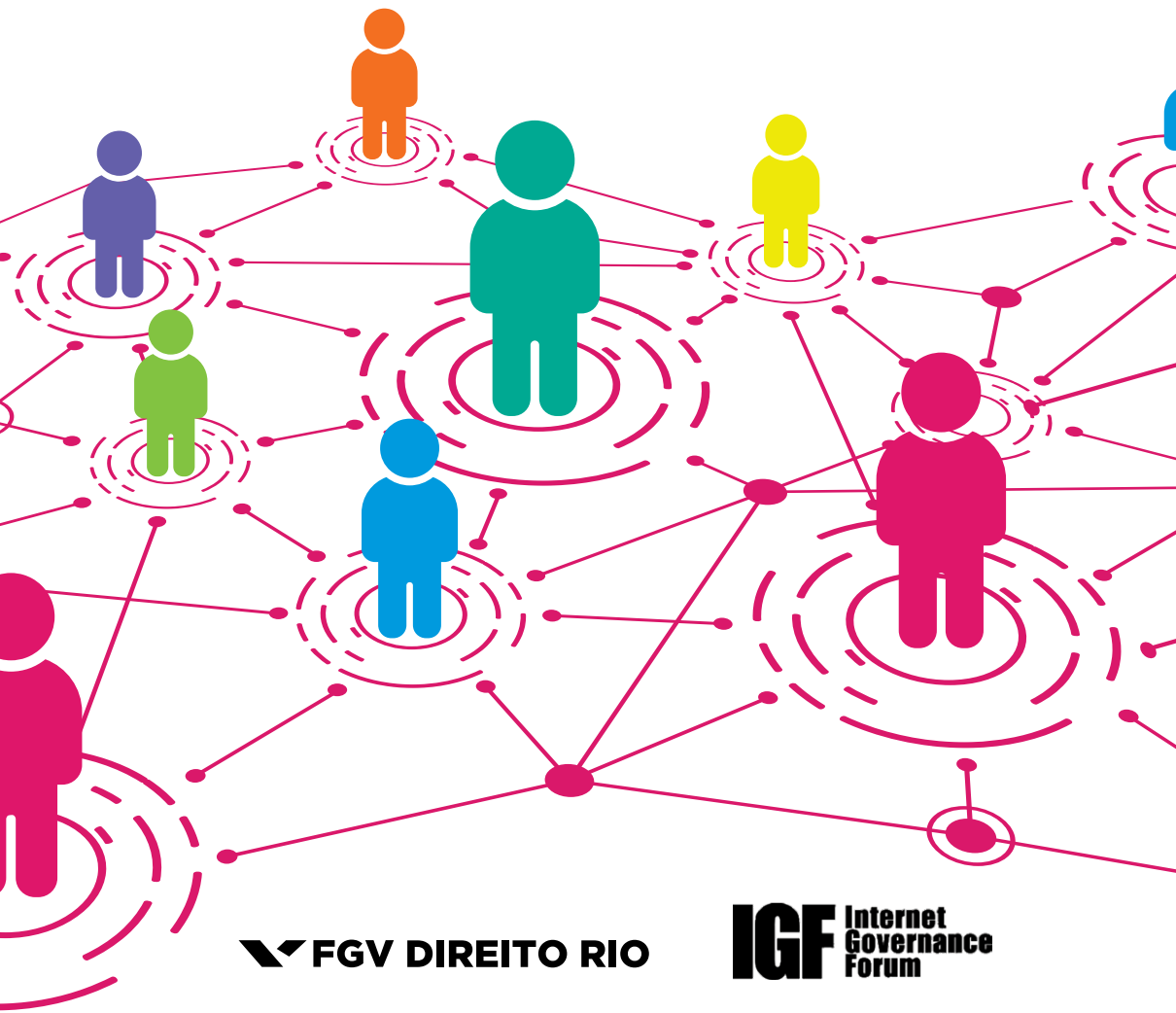
LUCA BELLI and SENKA HADZIC

Community Networks as Enablers of Human Rights

Official Outcome of the UN IGF Dynamic Coalition on Community Connectivity



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Community Networks as Enablers of Human Rights

Luca Belli and *Senka Hadzic*
Editors

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1 Community networks: recent Brazilian institutional approach in the national and international levels

Ronaldo Neves de Moura Filho

1.1 Introduction

Over the last decade, the National Telecommunication Agency (Anatel), the Brazilian regulatory body for telecommunications, has been implementing a wide range of tools to promote connectivity expansion and bring new operators to offer fixed broadband access, especially in remote and underserved areas. Moreover, in a specific strategy, there are relevant efforts considering the role of community networks, starting from an approach that involves stakeholders such as the Dynamic Coalition on Community Connectivity (DC3), the Embassy of the United Kingdom in Brazil, and the Association for Progressive Communication (APC). Lately, the theme has become part of the Brazilian positioning in the international arena.

This essay aims to concisely describe Anatel's activities related to the promotion of community networks, the relevant synergy between these activities and the DC3's and other stakeholder's performances, and advances regarding complementary networks and solutions within the most recent International Telecommunication Union (ITU) Plenipotentiary Conference (PP-22). The outcome intends to be a brief but comprehensive overview of how the Brazilian regulatory body addresses community networks, nationally and internationally.

1.2 Community networks in Anatel's agenda and synergies

Historically, the scenario of telecommunications services in Brazil, from the perspective of the number and the character of operators, resulted, among other factors, from the history of concentration evolved from the former state provision; the expressive amount of investments necessary for the implementation and maintenance of infrastructures; and, in some instances from the dependence on a scarce input (portions of the radio frequency spectrum).

However, the last decade corresponds to an expressive emergence of new stakeholders, like small and medium enterprises, and new models of services provision and network arrangements, especially considering underserved areas of the country (rural areas and urban outskirts, e.g.). That emergence coincides, provokes, and has been fed back by measures adopted by Anatel. It includes asymmetric regulation, with fewer regulatory obligations imposed on small operators, and the imposition of the big operators with significant market power to offer their network resources on an equal and transparent basis to the small and medium stakeholders.

This course of regulatory actions is derived from the recognition that different models and stakeholders should be fostered to bridge the digital gap and promote better connectivity, among them the community networks model. This was clear when, in September 2020, Anatel and the Embassy of the United Kingdom in Brazil signed a Memorandum of Understanding (MoU) concerning Digital Access Development in which one of the objectives was the 'support the expansion and improvement of community networks', to 'promote digital access as a method to support the development of vulnerable populations' *inter alia*.

This was the starting point of a specific joint work from Anatel's technical staff and the Association for Progressive Communication (APC), a chosen partner for its expertise. It is worth highlighting that, besides research and interviews with many stakeholders, the parts built their outcomes upon the work produced by the Dynamic Coalition on Community Connectivity (DC3): *The community network manual: how to build the Internet yourself* (2018).

The work above demonstrated how these initiatives might be used to improve connectivity while empowering Internet users and triggering the creation of new content, applications, and services. Taking the *Manual*'s premises into account, the MoU outcomes intended to point concrete paths to achieve such new infrastructures, governance, and business opportunities in Brazil. It reveals a synergy and a line of continuity between DC3's *Manual* and Anatel's first results.

The outcomes delivered by APC to Anatel in December 2021 were the following:

1. *Policy brief* (English and Portuguese versions), consisting of a comprehensive analysis of the current scenario of community networks in Brazil, including a compilation of the main challenges and a set of specific recommendations for the agenda improvements, considering different stakeholders and the country›s digital development; and its Executive Summary;
2. *Community Networks Manual*, enrolling recommendations to those interested in implementing these networks in Brazil; and
3. Audiovisual guides based on the *Community Networks Manual.*

The DC3's *Manual* and the outcomes became part of Anatel's website, where there is a page devoted to disseminating information about community networks and clarifying practical aspects of their implementation and the regulatory and bureaucratic perspectives. Furthermore, apart from disseminating information to the concerned public, Anatel officially sent the recommendations to other governmental bodies responsible for addressing part of them, like the Ministry of Communications.

Subsequently, the Agency started an ongoing internal verification and analysis of the recommendations under its competencies. The premise adopted is that the current regime, which disciplines community networks under the rules of limited private service as a non-commercial model, should be retained. However, another set of regulatory rules and actions should evolve to promote those networks. There are indications of current regulatory reviews regarding spectrum use, competition, and even general rules for services that can cover the discussion raised by the APC's propositions.

It is important to note that Anatel's technical area endorsed the conclusion that community networks projects are eligible to be funded by financial resources from the Brazilian Universal Fund for Telecommunications Services (Fust). Furthermore, it pointed out that the fund's current framework includes programs developed by cooperatives and civil society organizations. This understanding is significant because the Agency is a member of the Fust's Managing Board and has diverse competencies related to the selection and monitoring of the projects.

1.3 Steps towards an international level of promotion of community networks

Anatel is legally the administration body competent to represent Brazil in international telecommunications organizations. Among those organizations, the International Telecommunication Union (ITU), the United Nations (UN) specialized agency for information and communication technologies (ICTs) has a marked prominence for being responsible for allocating radio spectrum and satellite orbits, developing technical standards, and improving connectivity globally. In a regional scope, considering Brazil as an American country, the Inter-American Telecommunication Commission (CITEL), an entity of the Organization of American States (OAS), has tasks related to promoting telecommunication modernization and coordination. Since 1998, Anatel has been permanently working with and positioning Brazil in both in a way to create international frameworks and projects aligned with the country's priorities and interests.

It is worth noting that the recent Brazilian agenda to ITU included community networks once the organization's supreme organ, the Conference of Plenipotentiary, convened in 2022 (PP-22), in Bucharest, Romania, from 26th September to 14th October. The outcomes of the Conference correspond to the high-level framework that should guide the organization's activities in the following years and bring recommendations to its Member States and Sector Members.

Among the Brazilian propositions submitted to the PP-22, the one related to ITU Resolution 139, '*Use of Telecommunications/Information and Communication Technologies to Bridge the Digital Divide and Build an Inclusive Information Society'* addressed the theme under an original definition of ‹complementary access networks and solutions›. The main objectives were to emphasize ITU›s role in encouraging different business and regulatory models such those; to instruct ITU›s Development Sector to consider them to cover unserved and underserved areas; and to establish the role of ITU›s Members in creating an enabling environment for investment and expansion of connectivity, including them.

It is possible to summarize the initiative as an unprecedented effort to include community networks and other emerging models at the

center of ITU strategies to bridge the digital gap while stimulating governments and other stakeholders to take them into account.

During the regional preparation within CITEL's meetings, the Brazilian document got support from other American countries to be submitted to PP-22 as an Inter-American Proposal. During the Conference, any advance to modify current ITU Resolutions or produce new ones depends mainly upon consensus by all present Member States. Therefore, proposals are usually adjusted or vetoed during a series of negotiations as a result of the divergences of perspectives from different countries and regions.

In the case of the ITU Resolution 139 (2022)[1], the version that emerged from the PP-22 is not far apart from the Brazilian proposal, being however distinct in some of the language and scope. There is direct instruction to the Director of the ITU Development Bureau to *support sharing national experiences and information, such as case studies, and support enabling environments for the use of affordable technologies for bridging digital divide, such as current and emerging telecommunication/ICTs infrastructure, including telecommunications/ICTs complementary access networks and solutions*. Regarding the Member States, they are now invited *to consider facilitating an environment for sharing national experiences for bridging the digital divide, as appropriate, using affordable technologies, such as current and emerging telecommunication/ICTs infrastructure, including telecommunications/ICTs complementary access networks and solutions, according to national regulations*.

In this way, new approaches of network deployment and management became part of an instrument central to the international regime of expanding connectivity, and they may be at least necessarily considered in certain ITU development activities. It became a topic to be reflected upon by different countries as well. Considering that the inclusion of emerging themes in ITU Resolutions is a historically long and complex process, it is reasonable to consider that, in this case, the theme gained momentum and might be further developed in the following years.

1 The full Provisional Final Acts of the 2022 Plenipotentiary Conference (PP-22) can be accessed at https://www.itu.int/md/S22-PP-C-0202/en.

1.4 Conclusion

During the last years, the Brazilian telecommunications regulator started to address community networks as an effective approach to expanding connectivity. The still ongoing work, which includes actions from information dissemination to regulatory revisions, relies on the synergy crafted with previous and current efforts from other stakeholders like the DC3, the Embassy of the United Kingdom in Brazil, and the APC. This meaningful articulation expresses the existence of a consensus on the efficacy of those networks to fill gaps and promote a new governance model which started to be recognized at the international level, considering ITU.

An evolution to the next phase might go through public policies and regulation improvement on different grounds and advances related to funding projects, particularly from FUST. At the same time, progress in the international arena can feed back the Brazilian efforts in technical and strategic aspects. To this extent, a coherent alignment of the movements can lead to concrete outcomes, valuable to impact the Brazilian connectivity scenario.

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2 Community Networks: A Powerful Complementary Strategy to Bridge Digital Divides Sustainably

Luca Belli and Senka Hadzic

2.1 Introduction

This paper has been elaborated originally presented at the World Internet Conference (WIC), Wuzhen Summit 2022, organised by the Cyberspace Administration of China and the Chinese Academy of Cyberspace Studies, and will be featured also in a WIC publication to be released in 2023. The aim of the paper is to provide a brief overview of Community Networks, highlighting their potential as viable alternative strategies to bridge digital divides. Alternative connectivity options are increasingly considered as appealing by a relevant number of stakeholders, as traditional strategies show their limits, leaving almost 40 percent of the world population without Internet access in 2022. In this perspective, the paper aims at offering conceptual, technical and policy elements on community networks, to facilitate the understanding of such initiatives, drawing from examples from the BRICS countries.

As the world attempts to recover from the Covid-19 pandemic, Internet connectivity has become vital to every side of our lives. From our education to our economy and our health, our lives increasingly rely on access to digital technologies. Yet, almost 40 percent of the world population still does not have access to Internet and, even more worryingly, most of the individuals considered as connected by official statistics are only partially connected and very far from what is considered "meaningfully connectivity".

This paper discusses alternative solutions to expand connectivity, focusing on community network (CN) experiences. CNs are collaborative networks, developed in a bottom-up fashion by groups of individuals – *i.e.* communities composed of groups of self-organised individuals, local businesses or public administrations, or non-governmental organisations – that conceive, deploy and manage new network infrastructure as digital commons. It is important to stress that, at the centre of CNs and the socio-economic ecosystems they generate lay the communities and their members, who are

essential to initiate, maintain and guarantee the success of these connectivity efforts (Belli, 2017).

Our research demonstrates that CNs are a valuable solution to connect people in places that are the hardest to reach by traditional services (so called market failure areas), thus complementing existing connectivity solutions that fail to connect populations living in those areas. Hence, CNs represent a valuable strategy to implement concretely the International Telecommunication Union Recommendation D.19 on Telecommunication for Rural and Remote Areas (2010)[2].

Besides, offering a significant example of the existence of alternative and valuable approaches to expand connectivity – and, consequently, to fulfil the United Nations Sustainable Development Goals[3] – CNs also offer a demonstration of how Internet governance processes can allow different stakeholders to cooperate, concretely influencing the evolution of the Internet.

Importantly, our research highlights that CNs should not be considered as competing or antagonistic models either to the state or to the market, but rather as complementary solutions. Our case focuses on CNs, as these initiatives give rise to many positive externalities, enabling sustainable local economies and new governance models, as they expand meaningful connectivity. Our research also highlights that CNs foster the development of low cost open-source software and hardware technologies to connect the unconnected and, consequently, these new Internet users also become producers – rather than mere consumers – of new content and services in local languages, catering to the needs of local communities (Belli, 2016).

2.2 Community Networks: Towards Sustainable Connectivity

Our research on "Community Networks: Towards Sustainable Funding Models" (Belli & Hadzic, 2021) emphasises that CNs offer a viable alternative to connect populations in settings where traditional models do not fit, i.e., where mainstream telecom operators do not see a

2 The full text of ITU Recommendation D.19 can be accessed at https://www.itu.int/rec/D-REC-D.19-201003-I/en.

3 Notably, Goal 9 establishes the United Nations members' commitment to "build resilient infrastructure, promote sustainable industrialization and foster innovation." (United Nations, n. d.)

business case in investing in remote areas providing service to few households with little purchasing power. CNs are owned and operated by local communities usually relying on low-cost technologies, open-source solutions, and unlicensed spectrum for access provision.

Technologies developed by CN communities to overcome common challenges include Village Telco (2011) and LibreRouter (2019). For example, the South African community network Zenzeleni (2022) started off by deploying Village Telco, and later migrated the network to LibreMesh (2020) as they had considerably improved the 'Plug&Play' nature of the Village Telco firmware.

LibreRouter is networking equipment conceived to provide community mesh networks with a hardware and software platform, designed with their specific needs in mind (Belli, 2018). The LibreRouter project has been developed by the Altermundi collective in Argentina (which also builds and promotes CNs) in cooperation with Zenzeleni team. Funding was raised thanks to grants from FRIDA (Programa FRIDA, n. d.), FIRE Africa (2018), and the Internet Society (2022). LibreRouter comes with LibreMesh as preferred firmware and is manufactured in China by Dragino.

While local open-source products have the advantage of being built and directly deployed by the community members, commercial products such as Ubiquiti and Mikrotik have the advantage of ease of scaling: even hundreds of products can be easily ordered when a network starts growing. iNethi (2022), another community network in Ocean View near Cape Town, uses Ubiquiti equipment and runs LibreMesh firmware on top of it; a combination of both is also possible.

Importantly, access to spectrum is critical for CNs to be able to scale, as there are physical limitations of technologies operating in unlicensed spectrum bands (i.e., WiFi). Apart from unlicensed WiFi spectrum bands, some community networks have experimented with open-source cellular equipment. OpenBTS (n. d.) is an open-source GSM base transceiver station (BTS) implementation and has enabled a wide range of projects aimed towards building community networks such as the community cellular deployed in Papua, Indonesia (Heimerl et al., 2013) or Rhizomatica (n. d.) in Mexico, which used OpenBSC developed by Osmocom (n. d.).

2.3 Technical Implementation

CNs have been developed for many years in Brazil, to connect the unconnected, especially by organizations such as Nupef, and Coolab (2020). Recently, CNs attracted the attention of the National Telecoms Regulator (ANATEL), which has first created a dedicated webpage and subsequently commissioned a policy brief to explain their benefits and provide indications on how to develop CNs (Agência Nacional de Telecomunicações, 2020). While different CNs use different networking equipment, the above mentioned case of LibreRouter is particularly interesting, as it has been conceived primarily in Argentina and South Africa, it is manufactured in China and has been homologated in Brazil in July 2020 (LibreRouter, 2020).

However, while the Free and Open Software technology on which it is based would make it a perfect candidate for low-cost networks, when imported to Brazil its price doubles due to import taxes, reducing considerably the potential of this technology as well as the business and connectivity opportunities that the commercialization of such technology may unleash.

Other interesting examples of technologies developed for and by CNs is iNethi, a community-owned, edge-hosted platform that allows easy creation, customization, curating and sharing of content and services within a community. iNethi was initially deployed in Ocean View, Cape Town in September 2018 and is providing low-cost internet access using a voucher system, but also a wide range of free local content and services. The COVID-19 crisis has highlighted the benefits of having a community-owned low-cost network infrastructure.

The iNethi landing page was hosting infographics providing tips for avoiding infection and remaining healthy, describe symptoms to look out for, and even help community members identify the fake news that were spreading rapidly during that time. One of the key successes of the network was access to online educational content, at the time when local schools suddenly went online (van Zyl & Lloyd Johnson, 2020). Teachers would upload curricular content to Nextcloud (an open-source cloud hosting service) and have it synchronized to the local iNethi server, providing learners living

in Ocean view with free access to this content via WiFi, without incurring any mobile data costs for the learners.

Another effectiveness indicator of this complementary access solution is the fact that CNs are being increasingly recognized in many countries in the Global South, including several of the BRICS countries (especially in Brazil, India, and South Africa (APC News, 2018)). The national CN schools are taking place throughout 2022 in five countries: Brazil, South Africa, Indonesia, Kenya, and Nigeria. The fact that the South African branch of the school is co-funded by multiple government bodies and agencies shows the official commitment to support their growth and uptake. These co-funding entities are the Northern Cape Department of Economic Development and Tourism, Technology Innovation Agency (TIA), the University of the Western Cape, and the Republic of South Africa's Department of Science and Technology (Kyalo, 2022).

2.4 Conclusion

Increasing recognition is proof that community networks are, in fact, not only a viable solution to expand connectivity, but also a powerful engine of sustainability. Recognition is visible in terms of licensing efforts at national levels, funding agencies' willingness to invest in community networks development, and technical community's interest in developing new tools to enable the expansion and scalability of community networks.

These tools are being developed by a global network of practitioners while at the same time respecting the basic principles of the CN movement, such as openness, inclusiveness, and participation. The deployment of CNs creates new socioeconomic opportunities for previously disconnected populations and allows each user to enjoy the benefits of connectivity being both a consumer and a producer of online content, applications, and services. Therefore, CN members, in their quality of "prosumer" – i.e. potential producers and consumers of innovation – can contribute to expand connectivity sustainably, stimulating the creation of new digital products and services that meet the needs of local communities, precisely because they are developed by local communities to solve their own problems and necessities.

To conclude this paper the authors would like to offer the Policy Elements on Community Networks (included in Annex I) as well as some Regulatory Elements (included in Annex II), elaborated through a multi-stakeholder process, facilitated by the UN IGF Dynamic Coalition on Community Connectivity (DC3). These Elements should be seen as suggestions for the consideration of those stakeholders interested in understanding what are the core elements of CNs and what specific policies and regulations may facilitate the deployment of these initiatives. The authors would like to express deep gratitude and acknowledge the essential and high-quality contributions of the DC3 members to the elaboration of Annex I and Annex II, included in the following sections.

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3 Community Networks as Human Rights Enablers

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3.1 Introduction

The discourse on connectivity is often shaped by a developmental lens, focusing on the digital divide and socio-economic aspects of being connected or not. There is, however, a key dimension to consider as a cornerstone of connectivity, namely human rights.

In May 2011, former United Nations (UN) Special Rapporteur on the freedom of expression, Frank La Rue, issued a landmark report for the discussions of connectivity as a fundamental right enabler, exploring key trends and challenges to the freedom of expression through the Internet. The 2011 Human Rights Council's Report underscores the unique and transformative nature of the Internet. Internet connectivity not only enables individuals to exercise their right to freedom of opinion and expression, but also a range of other human rights, and to promote the progress of society as a whole (United Nations Human Rights Council, 2011). Connectivity has long been recognised as a fundamental enabler of freedom of expression.[4]

UN Rapporteur La Rue emphasised that "the Internet has become an indispensable tool for realising a range of human rights, combating inequality, and accelerating development and human progress, ensuring universal access to the Internet should be a priority for all States. Each State should thus develop a concrete and effective policy, in consultation with individuals from all sections of society, including the private sector and relevant Government ministries, to make the Internet widely available, accessible and affordable to all segments of population.[...] By acting as a catalyst for individuals to exercise their right to freedom of opinion and expression the Internet also enables the realisation of a range of other human rights" (United Nations Human Rights Council, 2011).

4 Human rights organisations, such as Article 19, have entire programs dedicated to the theme, while the Dynamic Coalition on Internet Rights and Principles released the Charter on Internet Rights and Principles (2011).

The abovementioned report represented a turning point in the discussion. Indeed, provoked by the 2011 Report, the UN Human Rights Council adopted a resolution, in June 2012, urging the UN members to "promote and facilitate access to the Internet and international cooperation aimed at the development of media and information and communications facilities in all countries" (United Nations Human Rights Council, 2012). The call of the UN Human Rights Council influenced several policymaking efforts, such as the Brazilian Civil Rights Framework for the internet, better known as Marco civil da Internet, whose article 7 states that "access to the Internet is essential for the exercise of citizenship"[5]; the Council of Europe Recommendation on a Guide to human rights for Internet users, which stresses that "Although access to the Internet is not yet formally recognised as a human right (noting differences in national contexts including domestic law and policy), it is considered as a condition and an enabler for freedom of expression and other rights and freedoms" (Council of Europe, 2014); and the Declaration of Internet Rights of the Italian Chamber of Deputies (2015), proclaiming that "Access to the Internet is a fundamental right of all persons and a condition for their individual and social development.'

Over the past decade, there has been an increasing recognition that open and meaningful connectivity have become indispensable to the enjoyment of a large spectrum of fundamental human rights. Furthermore, the corollary of such evolution is that lack or undue restriction of connectivity generates a restriction of the full enjoyment of those rights, creating or exacerbating existing socio-economic divisions. The recent Covid-19 pandemic has provided a harsh and telling illustration of the remarkably cruel consequences of the lack of connectivity, which de facto meant denial of almost any type of public or private services, education, work or leisure.

5 Law 12.965 (2014), better known as the Civil Rights Framework for Use of the Internet in Brazil, or Marco Civil da Internet (MCI), establishes the fundamental principles and rules that govern the use of the Internet in Brazil. Despite being an ordinary law, the MCI has been considered as the "Internet Constitution" of Brazil, given that it defines the foundational elements of the Internet discipline in Brazil as well as its marked intention to protect fundamental rights and freedoms on-line. The MCI is considered a symbol of participatory democracy due to the online consultation process that led to its creation. The process of opening and collaboration that led to the creation of the MCI was initiated and orchestrated jointly by the Center for Technology and Society of Fundaçao Getulio Vargas together with the Ministry of Justice of Brazil (Comitê Gestor da Internet no Brasil [CGI.br], 2014).

Importantly, during the COVID-19 crisis, the need to access reliable information about the pandemic, health recommendations and vaccines, made internet access a right to health enabler (Coronavirus: Access to the internet..., 2020). Due to mandatory social distancing requirements, our right to work and right to education would not have been possible to exercise without connectivity. Hundreds of millions of children lost years of education because of the shutdown of schools and their lack of home or community Internet access. With the ever increasing number of private and public services moving to an online-by-default format, without even offering an offline alternative, an open internet (UN IGF Dynamic Coalition on Network Neutrality, 2022) and meaningful connectivity are becoming increasingly essential preconditions for the full enjoyment of fundamental civil rights, thus unavailable to approximately 37% of the world's population without Internet access today, according to the ITU (Belli et al., 2020; International Telecommunication Union, 2021).

On the other hand, the lack of meaningful Internet connectivity and the adoption of business models based on access to limited range of applications – so-called zero rating models (UN IGF Dynamic Coalition on Network Neutrality, 2019) – exacerbate existing digital divides and create new ones, including by facilitating the circulation of disinformation, which can affect societies to the extent of impacting democracy (Rennó & Novaes, 2022).

According to the UN Special Rapporteur on freedom of opinion and expression, one of the measures to counter disinformation is that "States should ensure connectivity to an accessible, free, open, reliable and secure Internet and invest in digital, media and information literacy. Where people can access and critically assess news and information online, they are better placed to identify disinformation."

In this context, Community Networks can be seen as a powerful ally in the fight against digital exclusion and a considerable engine for people-centred connectivity and full enjoyment of human rights by all.

3.2 The case for community networks

Connectivity itself comes in different shapes and forms. Community Networks (CNs) have the approach to place people (communities

and individuals) at the centre of not just the deployment of internet technologies, but also their design, development and management (Belli, 2016). In this context, users should be able to decide:

- How they would like to be connected,
- who owns the infrastructure they communicate through,
- who has access to the personal data that might be retained when they connect to the network,
- and ultimately – whether they want to be connected at all.

There are different aspects to look at: connectivity as a right (Grey, 2020), network self-determination (Belli, 2017b), connectivity as a tool for exercising human rights (primarily freedom of expression) (Article 19, 2017), the right to co-create the Internet (Echániz, 2017), and others. The international legal framework for community networks has been discussed in "Community Networks in Latin America: Challenges, Regulations and Solutions" (Baca et al., 2018). Previous DC3 publications explored some rights-based aspects of community networks, most notably network self-determination.

The Declaration on Community Connectivity was elaborated through a multistakeholder process, between July 2016 and March 2017 (UN IGF Dynamic Coalition on Community Connectivity [DC3], 2017). The Declaration defines rights and obligations of community network members as active participants. These include, among others:

- the right to know the technical details and operation of the network and its components, and to share knowledge of its mechanisms and principles;
- the right to offer services and contents to the network, while establishing their own terms;
- the right to join the network, and the obligation to extend this set of rights to anyone according to these same terms.

The Declaration also recommends that any policy development related to community networks should take into account the full enjoyment of human rights, notably freedom of expression and privacy.

The first chapter of "Community networks: the internet by the people for the people" (Belli, 2017a) – official DC3 outcome in 2017, argues that the right to network self-determination finds its basis in the

fundamental right to self determination of peoples,[6] as well as in the right to "informational self-determination" that, since the 1980s, has been consecrated as an expression of the right to free development of the personality. Network self-determination is the right to freely associate to define, in a democratic fashion, the design, development and management of network infrastructure as a common good, in order to freely seek, impart and receive information and innovation.

The chapter emphasises the essential role that network self-determination plays allowing individuals to associate in collective entities, joining efforts to bridge digital divides in a participatory, democratic and bottom-up fashion. In this sense, network self-determination should be seen both as an individual right to free development and as a collective right of a community to determine its own destiny, promoting socio-economic development and self-organisation.

Thus, network self-determination can be seen as an instrumental condition to allow the full exercise of individuals' human rights and as a principle of Internet governance which can be enjoyed by building new infrastructure, managed as a common good, that allows new users to access economic opportunities and to actively participate in the evolution of the Internet as well as in the socioeconomic evolution of their local community.

3.3 International legal framework for community networks

The set of fundamental rights addressing community networks can be divided into three major groups. The first group consists of the rights related to universal access to ICT and those related to freedom of expression. These are directly related to the service provided by these networks, as they enable connectivity.

The second group comprises those related to the right to free development of the personality and have to do with the possibility that individuals and their associations have to determine freely how

6 This fundamental right is prominently enshrined in Article 1 of the Charter of the United Nations as well as in Article 1 of both the International Covenant on Economic, Social and Cultural Rights, the International Covenant on Civil and Political Rights.

the access they seek to provide for themselves should be organized, in other words, what Belli calls the right to network self-determination.

Finally, there are specific rights for indigenous peoples that derive from their right to self-determination, specifically their right to have their own media.

The sections below will briefly discuss each group of rights.[7]

3.3.1 Rights Related to Universal Access to ICT

The rights included in this group relate to the service provided by these networks and include the rights related to universal access to ICT. Many constitutions recognize access to ICT as a human right and, in cases where it is not expressly recognized as such, this can be inferred from the multiple dimensions of the right to communication and freedom of expression addressed by international human rights agreements.[8]

Likewise, access to ICT is considered a crucial means for the exercise of human rights, as noted by the Special Rapporteurship for Freedom of Expression of the Inter-American Commission on Human Rights (IACHR) in its document titled *Standards for a Free, Open and Inclusive Internet*:

> Access to the Internet is essential for the exercise of human rights and must be universally guaranteed by taking measures to bridge the digital divide and promoting infrastructure development policies.
>
> States must ensure that private parties do not erect disproportionate or arbitrary barriers to Internet access. Interrupting the Internet access of entire populations or segments of the population is never justified, even for national security reasons.

7 The following sections are based on Baca et al., 2018.

8 See for example, *General Comment No. 34* to the International Covenant on Civil and Political Rights, Session 102 of the United Nations Human Rights Committee (2011): "States parties should take account of the extent to which developments in information and communication technologies, such as Internet and mobile based electronic information dissemination systems, have substantially changed communication practices around the world. There is now a global network for exchanging ideas and opinions that does not necessarily rely on the traditional mass media intermediaries. States parties should take all necessary steps to foster the independence of these new media and to ensure access of individuals thereto."

> States should adopt long-term infrastructure plans to prevent the arbitrary exclusion of certain sectors and create broadband plans and measures that enable the development of mobile Internet.

In this regard, the role of community networks is directly related to the exercise of the basic right not only to obtain a service, but also to use this service for the exercise of human rights.[9] Thus, as noted by the Rapporteurship, "there can be no disproportionate barriers to access." In other words, no regulatory mechanisms or economic barriers that impede a community's efforts to access the Internet should be established. In this sense, community networks are the clearest expression of the exercise of a human right.

The exercise of this human right to communication also implies access to the resources that are essential for communication. The third paragraph of Article 13 of the American Convention on Human Rights (Pact of San José) is clear regarding the need to allow access to spectrum:

> The right of expression may not be restricted by indirect methods or means, such as the abuse of government or private controls over newsprint, radio broadcasting frequencies, or equipment used in the dissemination of information, or by any other means tending to impede the communication and circulation of ideas and opinions.

This means that telecommunications regulations should not impose artificial economic, administrative or legal barriers that impede access to the spectrum. The IACHR Special Rapporteurship for Freedom of Expression has been emphatic in this sense, as noted in its 2010 report where it called for member States to implement the following recommendations:

> Adopt legislation to ensure transparent, public, and equitable criteria for the allocation of radio frequencies and the new digital dividend [...].

9 Similarly, the Declaration of Principles of the World Summit on the Information Society (United Nations & International Telecommunication Union, 2003): "Communication is a fundamental social process, a basic human need and the foundation of all social organisation. It is central to the Information Society. Everyone, everywhere should have the opportunity to participate and no one should be excluded from the benefits the Information Society offers."

> Legislate in the area of community radio broadcasting, in a manner that will produce an equitable division of the spectrum and the digital dividend to community radio stations and channels. The allocation of these frequencies must take into account democratic criteria that guarantee equal opportunities to all individuals in the access and operation of these media in conditions of equality, without disproportionate or unreasonable restrictions, and in conformity with Principle 12 of the Declaration of Principles and the "Joint Declaration on Diversity in Broadcasting" (2007).

Many states use auctions as the main mechanism to access spectrum. While in certain cases this can be considered an objective and non-discretionary mechanism, when it is the only available mechanism for the allocation of resources, it ends up excluding large social sectors from the process. As noted by the IACHR (2003, Chapter VII):

> Auctions that involve solely economic criteria or that award concessions without giving all sectors an equal chance are incompatible with democracy and with the right of free expression and information enshrined in the American Convention on Human Rights and in the Declaration of Principles on Freedom of Expression.[10]

This provision confirms what we noted in the chapter on the legal nature of community networks and their characteristics with regards to the specific treatment they must receive when considering access to the spectrum and the possibilities of legally fighting any provisions that may force them to use the auction mechanism to do so.[11]

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10 This criterion was used by the Supreme Court of Mexico for the annulment of Article 17 of the Decree that modified the Federal Telecommunications Act of 11 April 2006. See also paragraph *D. On assigning and renewing frequency concessions in Freedom of Expression Standards for Free and Inclusive Broadcasting*.

11 As a result of the above, some countries have adapted their regulatory frameworks to set up licensing mechanisms other than auctions for community media. An example of this is Mexico, where part of the spectrum is reserved for social concessions and is allocated directly. I recommend reading the document published by the Internet Society *"Unleashing Community Networks: Innovative Licensing Approaches"* (2018).

3.3.2 Rights Related to the Free Development of the Personality and to Collective Self-determination

Article 22 of the Universal Declaration of Human Rights[12] recognizes that everyone has the right to the free development of their personality. The collective exercise of this right as a people gives rise to the principle of self-determination. The German Constitution of 1949 is the main reference for the legal development[13] of this right: many other constitutions incorporate or are inspired by the German precept.

> Everyone has the right to the free development of their personality, provided that they do not infringe upon the rights of others or infringe upon the constitutional order or the moral law.

As noted in Article 15 of the International Covenant on Economic, Social and Cultural Rights (ESCR), the State must recognise the freedom indispensable for scientific research and creative activity, provided this freedom is exercised without affecting the rights of others or attempting against the constitutional order. In this perspective, it can be argued that a corollary right is the fundamental freedom to create and organise network infrastructure to expand Internet connectivity.

As noted earlier, the Internet is an indispensable tool for the exercise of multiple rights, and the right to the free development of the personality allows a person to freely decide how they wish to access and use this basic service. In other words, each person has the power to provide themselves with the means they consider most appropriate to define how they will access the Internet, not only by using the infrastructure offered by commercial or state networks, but also by using those their imagination and ability allow them to create.

12 Other references to this right can also be found in articles 26.2 and 29.1 of the Universal Declaration of Human Rights (United Nations, 1948).

13 The German constitutional precepts concerning the free development of the personality allowed German courts to uphold the right to informational self-determination, which states that the protection of personal data is essential for a person's free and autonomous development. "At the same time, the self-determined development of the individual is a precondition for a free and democratic communication order." (Hornung & Schnabel, 2009).

Community networks around the world are convincing evidence of how this type of network allows many people not only to have better or more affordable access, but also one that is in line with their development goals and worldview.[14] Multiple rights and principles enforceable against the State are associated with the right to the free development of the personality, including the freedom to work, freedom of trade, the principles of technological, net neutrality, and the abovementioned principle of network self-determination.

In this sense, regulations that impose regulatory, economic or access to infrastructure barriers, which may be considered arbitrary and prevent a person or community from generating their own networks, would be violating a fundamental human right, i.e. the right to the free development of the personality.

Finally, as mentioned above, the emerging right to network self-determination can also be considered as the collective enjoyment of the right to free development of the personality, which allows a community to determine its own destiny, promoting socioeconomic development and self-organisation. In this perspective, if they so wish, individuals should be able to autonomously determine how to build and organise the network infrastructure, allowing them to improve their political, economic and social status and independently decide which kind of technology, applications and content are best suited to meet the needs of their local community.

3.3.3 The Rights of Indigenous Peoples

Indigenous peoples and communities have a framework of specific guarantees deriving from their status as indigenous peoples and based mainly on the recognition of the right to self-determination and the right to territory, two closely related rights.

International Labor Organization (ILO) Convention 169 is the most important reference for indigenous rights and has served as the basis for the recognition of the rights of indigenous peoples in the constitutions of the countries of the Americas (ILO, 2014).

14 Examples of community networks and their benefits can be found in the reports published by the UN-IGF Dynamic Coalition on Community Connectivity (Belli, 2016; Belli, 2017a; McKnight et al., 2019).

The fundamental rights mentioned in the document include the right to self-determine their forms of development, set forth in Article 7 of the Convention. This comprises not only the right of these peoples to decide their own development conditions, but also the right to exercise control over their own economic and cultural development. Article 20 of the UN Declaration on the Rights of Indigenous Peoples notes the right of indigenous peoples "to maintain and develop their political, economic and social systems or institutions, to be secure in the enjoyment of their own means of subsistence and development, and to engage freely in all their traditional and other economic activities." (United Nations, 2007).

In regard to telecommunications networks, this right is set forth in the UN Declaration on the Rights of Indigenous Peoples, more precisely in Article 16:

> *Indigenous peoples have the right to establish their own media in their own languages and to have access to all forms of non-indigenous media without discrimination.*

In this sense, in the case of indigenous peoples, it might be said that the right to network self-determination is an explicit right, as the Declaration recognizes their right to have their own media. This right necessarily implies access to the infrastructure required for its exercise, such as the radio spectrum, because, as noted in various articles of the Declaration itself (e.g. Articles 38 and 41), States and the organs and specialised agencies of the United Nations system must take the appropriate measures to achieve the ends of the Declaration and contribute to the full realisation of the provisions therein.

Several States such as Argentina, Ecuador, Bolivia, Honduras and Mexico have recognized in their legislation the right of indigenous peoples to access the spectrum. Perhaps one of the most emblematic cases is that of the Mexican State, as a large part of these regulations has been achieved after several lawsuits brought by the indigenous peoples and communities of this country seeking the recognition of their rights.

3.3.4 Ethical Treatment of Community Network Users Data

Privacy rights, ownership (property rights), security, and ethical use of community network users and network data must be considered transparently as well. While the circumstances of community network operators vary widely as do local laws, the ethical treatment of community network users and other community network data should follow the principles enumerated above for all community networks (Forrest et al., 2022).

3.4 International Recommendations and Commitments

The international commitments that can be useful for the development of community networks have to do mainly with access to —and the affordability of— information and communication technologies (ICT), and with the strategies for achieving this goal.

Thus, on the one hand, various instruments exist that define regional or global commitments to achieve full connectivity according to principles that allow attaining full development. On the other hand, there are specific strategies or actions that allow fulfilling these commitments, in the form of recommendations and best practices. Many such instruments exist and many of them coincide, so we will only name those we consider to be the most important and favour the development of community networks.

In the documents produced during the different phases of the World Summit on the Information Society (WSIS), both the Declaration of Principles and the Geneva Plan of Action, as well as the Tunis Commitments and other preceding documents, the countries assumed multiple commitments that have to do with increasing the population's access to ICTs. In relation to community networks, one of the most important elements of these documents is multistakeholder participation in the construction of the information society, particularly civil society and indigenous peoples. Consequently, countries should not only allow but also encourage the participation of civil society and indigenous peoples in the construction of the information society, which clearly establishes their agency in all matters relating to the information society, including its regulations, technological

developments, governance and the construction of networks.

The Sustainable Development Goals are another important commitment for the generation of policies that favour community networks. These goals are part of a fifteen-year global agenda to reduce poverty, protect the planet, generate prosperity and promote world peace. This agenda considers ICTs essential to the seventeen goals, but specifically mentions them in goals 8 and 9 in relation to affordable universal access to the Internet.[15] These commitments require that governments promote viable models for underserved areas, for example, community networks.

Likewise, as a result of the World Telecommunication Development Conference (2014), the International Telecommunications Union (ITU) modified Recommendation 19 on communication in remote areas, specifically in relation to community networks, which mentions the following:

> *10. that it is important to consider small and non-profit community operators, through appropriate regulatory measures that allow them to access basic infrastructure on fair terms, in order to provide broadband connectivity to users in rural and remote areas, taking advantage of technological advances;*
> *11. that it is also important that administrations, in their radio-spectrum planning and licensing activities, consider mechanisms to facilitate the deployment of broadband services in rural and remote areas by small and nonprofit community operators;*

This recommendation recognizes the role of community networks in serving remote areas and encourages supporting them and providing them with the necessary means for their existence and development, such as access to backbone networks and spectrum.

The last WTDC that took place in Kigali in 2022, expanded the discussion on technological autonomy of traditional communities (Resolution 82 on Preserving and promoting multilingualism on the

15 Goal 5, Gender Equality, is also a specific ICT-related action: *Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women.*

Internet for an inclusive information society) and included for the first time the reference to complementary access solutions, which is an umbrella term to local, community and non profit ISPs in resolution 37 on Bridging the Digital Divide. This resolution considers:

> *f) that using systems, such as low-cost wired and wireless technologies, such as the ones used for telecommunications/ICTs complementary access networks and solutions, can be an effective solution for connecting rural, remote, and underserved communities;*
>
> *g) that, in many ITU Member States, regulations have been adopted dealing with regulatory issues such as interconnection, determination of tariffs, universal service, etc., designed to bridge the digital divide at the national level;*
>
> *h) that it is necessary to coordinate the efforts of both the public and private sectors to ensure that opportunities arising from the information society yield benefits, especially for the most disadvantaged;*
>
> *i) that each region, country and area should tackle its own specific issues regarding the digital divide, while stressing the importance of cooperation in this area at regional and international level in order to benefit from experience gained*

The same term, (complementary access solutions) was added for the first time in a PP-ITU resolution (Resolution 139, Bucharest 2022, on the use of telecommunications/information and communication technologies to bridge the digital divide and build an inclusive information society).

In short, on the one hand, the international instruments discussed at the beginning, such as the World Summit on the Information Society, the Sustainable Development Goals and the agendas derived from such goals, establish not only the will of the States to bring ICTs to every person on the planet, but to do so through the participation of multiple stakeholders, including the communities themselves. On the other hand, instruments such as Recommendation ITU-D19

define the essential regulatory elements to allow communities to participate in achieving the benefits of the information society.

> While considering "that the provision of telecommunications, ICT services and applications can make significant contribution to the quality of life of the population living in rural and remote areas [and] that access to telecommunications/ICTs for all will maximise social welfare, increase productivity, conserve resources and will **contribute to safeguarding human rights**", the ITU recommends to its members "that enhancing local technical expertise and adoption are important for successful implementation of ICT services and applications in rural and remote areas. Attention should be paid to training, exchange of information, creation of shared maintenance facilities in order to achieve sustainability and viability". (International Telecommunication Union, 2010)

Considering the regulatory elements noted in this section, community networks are supported by a solid international legal framework that serves to justify the construction of local legislations or their legal defence in case their operation is impeded.

3.5 Additional rights-based approaches

Apart from the conventional aspects of the connection between the Internet and human rights – connectivity as a right vs. connectivity as a tool for exercising human rights (primarily freedom of expression) – the Dynamic Coalition on Community Connectivity has also endeavoured to foster new conceptualisation of right-based approaches to community networks. Most prominently, the right to network self-determination, mentioned above, but also other key complementary facets such as the right to co-create the Internet, the right to disconnect, the connection between community networks and the human right to science.

Altermundi's concept of 'co-creating the Internet' shifts the focus from Internet users as mere consumers, to users as citizens of the digital territory (Echániz, 2017). Claiming "access" is too generic – all stakeholder groups advocate for improved access. Some of their initiatives are actively hindering and preventing co-creation, including the standard broadband business model.

Rhizomatica, on the other hand, proposes a framework for opting out of connectivity. For the digital rights community to be truly inclusive, it has to consider those who choose not to use digital technologies. For example, the accelerated digitalisation process during the Covid-19 crisis gets widely celebrated, but leaves those not participating in the digital society even more excluded. The pandemic also accelerated the long ongoing efforts to close the digital divide. However, connectivity strategies and agendas rarely get questioned, leading to a situation where connectivity becomes an end to itself. Rhizomatica talks about 'networks' in a more nuanced way. A term often used as a synonym for Internet access, 'networks' can in fact be enablers of fundamental rights (such as communication and access to information), but also facilitate other social, economic and human rights.

Putting network design in the hands of users could also more structurally enable human rights to science, which includes both scientific freedom and scientific responsibility.[16] Community networks give people the opportunity to engage with networking technologies, and understanding how networks function can only be achieved by operating them. It is exactly the participatory nature of community networks that lets their users exercise this right to a full extent.

3.6 Challenges to the adoption of a human rights approach and limitations of the economic and developmental approach

International agencies, national governments, and policymakers developed a solid framework to assess the state of Internet Connectivity and demonstrate the serious impact faced by unconnected and under-connected communities worldwide. When it comes to concrete answers to the lack of connectivity, though, the Internet is seen as a service submitted to the market rules, whose influence is limited to society's economic and developmental levels. The outcomes are, as expected, insufficient.

When concrete strategies and action plans aim to address the issue of the unconnected population, the problem becomes a developmental

16 More details on this right are provided in another chapter of this issue.

one. The UN SDG frames universal connectivity under Goal 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation." Seeing connectivity as a way to increase economic development is limiting and outdated; it does not grasp all the relevance and influence of the Internet in today's society since it is now a prerequisite for a personal and collective agency.

Stating that everyone should have Internet connectivity – even as part of international recommendations or national laws – does not necessarily convert into concrete measures that facilitate and guarantee its implementation. Many countries still lack enforcement and accountability mechanisms to ensure that the law is followed by action, meaning when funding (like the Universal Service Fund present in many countries), infrastructure expansion, and other agreements are not met to achieve universal connectivity goals, there are few mechanisms to mitigate them. Some examples are the cost of Internet access, which has increased in areas where lack of access was already critical (United Nations Sustainable Development Goals, 2016) and the Internet infrastructure deployment speed, which was slowing before the pandemic started (ITU, 2019). Connectivity, limited to commercial offers from incumbent telecommunication companies became a service only a few can afford, especially in poorer countries (Alliance for Affordable Internet, 2021), reaching 15% to 25% of Gross National Income for 1 gigabyte in some African countries. As a reference, the average monthly data use per person in the United Kingdom is 4.5 gigabytes (Ofcom, 2021). In Latin America, the extreme reliance on zero-rating plans combined with high prices of data packages created a "subnetwork" of information via zero-rated apps such as WhatsApp, taking the place of the traditional media whose access would require data use. Disinformation actors exploited this configuration (Rennó & Novaes, 2022), especially during elections and the pandemic vaccination campaign.

Economic and commercial considerations provide a narrow scope of the benefits and the impact of connectivity in people's lives. The economic and social development focus might also ignore the intrinsic political issues behind inequalities that the digital divide increases, and provides a limited understanding of what Internet connectivity

is and can be in the future. Keeping Internet connectivity an issue to be managed mostly by the private sector will not change the inequalities since it is not up to the market to solve these kinds of issues that, as seen during the pandemic, can have a humanitarian nature. Commercial services are not meant to provide alternatives to communities seeking technological autonomy and their own voice in the digital sphere.

Expanding infrastructure is expensive, and the economic return for large operators in many areas is not profitable enough. The revenue opportunity for new base stations in rural or remote locations can be ten times lower than in an equivalent site in an urban area. The operating costs can be as much as three times higher, and the capital investment costs are up to two times higher (GSMA Intelligence, 2017). It created the current situation where connectivity is concentrated in urban areas, and even in urban areas, the distribution is uneven between richer and poorer neighbourhoods. People that already face a lack of access to essential services also face insufficient or no access to the Internet, something that will just become worse with the digitalisation of government (and social) services.

Keeping Internet connectivity a private sector concern will not address the inequalities, as the market does not solve issues of social nature. Governments should recognize the urgency to achieve universal connectivity for all people and plan the connectivity expansion beyond the economic approach. In that sense, it is important to allow the development of diverse technologies for the service provider and consider the roles of small, community, and non-profit operators in providing complementary connectivity for rural areas and minorities; this includes communities that do not participate (nor want to be part) in the formal economy, like traditional communities.

Universal access goals can only be achieved with a shift in understanding the relevance of Internet connectivity as a public good and its significance to human rights as part of non-discriminatory access to decent living standards. Governments must ask for concrete measures with specific deadlines, including the supervision of commitments and agreements made with the industry with the support of civil society. The Internet is not a tool limited to achieving social and economic development; by being at the center of a human

rights-enabling approach, it permeates almost all elements of life. Only if seen as a human rights enabler can Internet connectivity expansion plans acquire the urgency it deserves.

3.7 Conclusion

The community network journey of the past twenty years has demonstrated that people should have the choice to determine how they want to be connected and, even more importantly, that when they have sufficient information and basic assistance they might very well decide to create new digital infrastructures by themselves.

In this perspective, the conventional conceptualisation of "last-mile" connectivity infrastructure, usually provided by mainstream network operators, fails to consider the transformative potential of connectivity, relegating individuals and users to the passive role of consumers. On the contrary, we would like to stress the possibility and suitability of adopting a "first-mile" paradigm, where individuals and community are the protagonists of connectivity and, acting as producers of digital innovation, services, and culture. This latter vision seems indeed more suitable to support alternative and complementary strategies to bridge digital divides which are promoted with considerable energy by the CN communities.

Maintaining a conservative mentality, according to which investments by the private sector or subsidies by the public sector are the only options to address connectivity, clearly presents enormous limits to address the underlying issues of the digital divide. As DC3 has demonstrated over the past seven years[17], community networks represent an important complementary strategy that can foster not only connectivity but also sustainability and the full enjoyment of human rights. On the one hand, the development of new connectivity infrastructures, developed by the people for the people, leads to enormous empowerment of previously disconnected or poorly connected communities, thus demonstrating the importance of connectivity as a vector of information, education, productivity and participation do democratic life.

17 All DC3 publications can be found at www.comconnectivity.org.

On the other hand, letting communities design, develop and manage the network infrastructure, allows for more transparency and accountability, while also allowing communities to experiment with new forms of governance and multistakeholder partnerships, aimed at fostering connectivity and the consequent enhancement of human rights. As DC3 has been advocating for years, this is the true essence of Internet Governance, intended as "the development and application by governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet." (United Nations, 2005)

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4 5G, Community Networks, Standardization, and the Human Rights to Science and Technological Self Determination

Niels ten Oever

4.1 Introduction

Infrastructures reflect the values and interests of those who build them. We take this statement for granted in our understanding of public physical infrastructures in urban environments: how wide are the side walks? What are speed limits? Are these speed limits enforced (either infrastructurally through speed bumps or institutionally through fines)? Are there public parks? Infrastructures enable certain behaviors and dissuade other behaviors. A concrete example of this are hostile architectures (Licht, 2017), such as spikes on benches that prevent people from sleeping on them. This makes the city a less inhabitable place for people, and factually seeking to erase their visibility from the urban landscape, and with that their ability to shape the city.

4.2 Principles of Communication Networks

Also, information and communication infrastructures enable certain behaviors and make others harder. The rise of the internet can in part be attributed to the inability of telecommunication providers to facilitate innovation (Abbate, 1999), this is what contributed to the emergence of the main mantras in internet architecture development of 'the end-to-end principle' (Blumenthal & Clark, 2001; Saltzer et al., 1984) and 'permissionless innovation' (Cath, 2021; Dotson, 2015) that are still prevalent today in standard development bodies such as the Internet Engineering Task Force (IETF). The end-to-end principle described how the network just exists to transport data, instead of providing services, and that innovation should happen at the end-points of the network, rather than in the network itself (Internet Architecture Board, 1996). Permissionless innovation describes that the network should not provide any barrier to the implementation of new technologies.

4.3 Shifting Principles

It were architectural concepts like the end-to-end principle and permissionless innovation that led people to herald internet standardization as a democratic practice that would enable freedom, consumer choice, and innovation (Van Schewick, 2012). But thirty years after the privatization and commercialization of the internet (Abbate, 2010; Frischmann, 2001), neither the end-to-end principle nor permissionless innovation still stand. With the proliferation of fiber internet infrastructure, the only way to provide lower latencies in data networks is to locate data closer to users. This means that data is increasingly stored closer to end-users through so-called Content Distribution Networks (CDNs). This trend has been accelerated by both the protection that CDNs provide against Distributed Denial of Service (DDoS) attacks that have become commonplace against popular sites, as well as Covid-19 when CDNs ensured that network capacity was used efficiently and transit networks were not overburdended (ten Oever, 2021a).

At the same time, network ossification is making harder and harder to deploy new protocols on the internet, creating a kind of homogeneity in terms of internet protocols. The only actors that lead the development of new internet protocols are those who operate large networks and thus have an almost god-like view of what the internet looks like at all sides of the world at the same time. An example of this is the development of the QUIC protocol by Google (for a more detailed description of this case, see: (ten Oever, 2021b)).

4.4 Resurgence of the Telecommunications Paradigm

With the re-location of data storage and increasingly computing (to decrease latency) inside the network instead of at endpoint, modern communication networks start to look like telecommunication networks again. The merging of the internet and telecommunication architecture paradigm can also be observed in the global decrease of independent Internet Service Provides (ISPs) through their acquisition by telecommunication providers. This process is strengthened through the adoption of the IP and TCP protocols in

telecommunication standardization which happened through the practically only remaining global telecommunication standardization organization in the world; the 3rd Generation Partnership Project (3GPP) (ten Oever, 2022).

Aside from the adoption of IP and TCP in the development of new telecommunication networks, there is an increasing interest in telecommunication standardization to provide heterogeneous networks. This means that telecommunication networks are expected to deliver an increasing amount of services and functionalities. Examples that are provided for this new telecommunication paradigm that is brought about by 5G range from private 5G network to operate factories, the so-called Industrial Internet of Things (IIoT) to the operation of smart cities filled to the brim with sensors, screens, and devices. This shift has already been aptly characterized by Rhizomatica's Peter Bloom as 'the shift from connecting people to connecting things' (Bloom, 2019), and by scholar Laura DeNardis as the turn to the cyberphysical (DeNardis, 2020). However, this has not stopped the World Economic Forum from hailing 5G as a driver to meet the United Nations Sustainable Development Goals (SDGs) (Lwanda, 2019).

4.5 Private 5G networks

There has been little to no appetite among community networks to adopt 5G technologies, in part because of the costs that would be incurred, the complexity of 5G networks, and the limited advantages it would provide to network operators. At the same time Facebook and Amazon are providing management back-ends for 5G networks that make it easier for both companies and small telcos to provide 5G networks, there is even hardware available that makes the installation and operations of small telecommunications networks much simpler (see for example FreedomFi, a startup that was part of the Facebook Accelerator Program (Huang, 2020), which offers 'plug and play' gateways, indoor and outdoor small cell antennas and SIM cards).

It is quite fascinating to note that community radio operators have struggled for over a decade for the availability of spectrum, but with the deployment of private 5G networks there is a remarkable change in policies in different parts of the world.

The offering of plug and play private 5G networks powered by Amazon and Facebook could lead to "platformisation" of infrastructure, in which large platform companies offer services on lower parts of the stack to harness and galvanize their market share (Plantin et al., 2016). Platforms have known to come and go (remember MySpace anyone?), but infrastructure historically has a higher permanence, or staying power. (Edwards, 2021). What does this hold for community networks?

4.6 Community Networks and 5G

Where community networks are owned, designed, and operated by communities, 5G networks have been designed by corporations. This does not preclude private 5G networks from being run by communities, but as noted before, 5G networks do not really address the needs community networks have. This highlights the lack of representation by civil society in network technology standardization in general, but even more in telecommunication standardization specifically. This further entrenches the lack of digital, informational, and network self determination (Belli, 2018; Musiani, 2022; Vivarelli, 2020). What this means is that while people increasingly need digital communication networks to exercise their human rights to freedom of expression, access to information, political participation, and education, networks are hampering their human rights to privacy and self determination in doing this. This is not a necessary or inherent quality of the technology, but a consequence of the lack of configurability of these networks by users.

In the same manner, Network Address Translation (NAT) introduced network directionality and with that the creation of different classes of clients and servers, or users and producers (ten Oever, 2021b), 5G networks provide new network functionalities but put them in the hands of commercial network operators and affiliated service and content providers, and not in the hands of users and non-commercial networks.

4.7 Community Networks and the Human Right to Science

The increase of network functionality put in the hands of users could enable the deployment of local and temporary services that

enable freedom of assembly, freedom of expression, but also more structurally enable the human rights to science and network self determination (Belli, 2018). The human right to science, which includes both the scientific freedom and scientific responsibility, is enshrined in the 1948 Universal Declaration of Human Rights (UDHR), the 1966 International Covenant on Economic, Social and Cultural Rights (ICESCR), and various other international and regional instruments. Article 27 of the UDHR explicitly mentions the right of everyone to 'share in scientific advancement and its benefits', while Article 15 of the ICESCR enshrines the right to 'enjoy the benefits of scientific progress and its applications'.

With an increasing amount of conversations, services, and interactions being influenced, enabled, and mediated by digital communication networks, it is of crucial importance that people should have the ability to use, understand, and engage with networking technologies. Understanding how networks function cannot fully be obtained by reading theoretical papers or manuals, but solely by operating them. This is something that community networks do, and also why they are crucial in contemporary technological landscapes.

To fully realize the human rights to science it is not enough for community networks to exist, but to fully integrate them in the design of new telecommunications technologies. Standards bodies therefore should enable participation of non-commercial actors and prioritize their inputs in the standards process. Otherwise, their opinions will be easily sidelined next to commercial interests which have significantly more resources and experience in standardization.

4.8 Conclusion

The emergence of private 5G networks is a crucial moment for community networks. On the one hand this could be a leveraging point for community networks to show their expertise, experience, and translate this to new functionalities in telecommunication networks. On the other hand, these new 5G functionalities present the risk of replacing community networks with commercial private 5G platforms, and thereby undermining socio technical fabrics, non-commercial alternatives and replacing them by data extracting centralized networks.

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ANNEX I – POLICY ELEMENTS ON COMMUNITY NETWORKS

1.1 Connectivity

Connectivity is the ability to reach all endpoints connected to the Internet without any form of restriction on the data-packets exchanged, enabling end-users to run any application, as well as access and share any type of content and service via any device as long as this does not harm the rights of others. Connectivity is the goal of the Internet.

1.2 Community Networks

Community networks are a vehicle for transformation that increases the agency of all community members, including by fostering gender balance. Community networks are structured to be open, free, and to respect network neutrality.

Community networks are networks collectively owned and managed by the community for non-profit and community purposes. They are constituted by a local community to exercise its right to communicate, under the principles of democratic participation of their members, fairness, gender equality, diversity, and plurality.

Such networks rely on the active participation of local communities in the design, development, deployment, and management of shared infrastructure as a common resource, owned by the community, and operated in a democratic fashion. Community networks can be operationalised, wholly or partly, through individuals and local stakeholders, non-governmental organisations (NGOs), private sector entities, and/or public administrations. Community networks are recognised by:

a. Collective ownership: the network infrastructure is managed as a common resource by or on behalf of the community where it is deployed;

b. Social management: the network infrastructure is technically operated according to the governance model defined by the community;

c. Open design: the network implementation and management details are public and accessible to everyone;

d. Open participation: anyone is allowed to extend the network, as long as they abide by the principles and design of the network;

e. Promotion of peering and transit: community networks should, whenever possible, be open to settlement-free peering agreements;

f. Promotion of the consideration of security and privacy concerns while designing and operating the network;

g. Promotion of the development and circulation of local content and local applications and services in local languages, thus stimulating community interactions community development.

1.3 Community Network Participants

Community network members are considered active participants, and should be considered both producers and users of content, applications, and services. Notably, community network participants must:

a. Have the freedom to use the network for any purpose as long as they do not harm the operation of the network itself, overburden the network, the rights of other participants, or violate the principles of neutrality that allow content and services to flow without deliberate interference;

b. Have the right to know the technical details and operation of the network and its components, and to share knowledge of its mechanisms and principles;

c. Have the right to offer services and contents to the network, while establishing their own terms;

d. Have the right to join the network, and the obligation to extend this set of rights to anyone according to these same terms.

e. Promote full gender inclusion as well as the inclusion of marginalised groups and individuals with disabilities.

1.4 Policy Affecting Community Networks

National as well as international policy should facilitate the development of community connectivity and the deployment of community networks. National and international policy should:

a. Take into account individuals' human rights to freedom of expression and privacy;

b. Lower barriers that may hinder individuals' and communities' capability to create connectivity, including gender barriers;

c. Allow the commons-based use of existing unlicensed spectrum bands or unused licensed spectrum for public-interest purposes, and consider the growth in use of unlicensed spectrum bands and the establishment of special licenses which address the needs of community connectivity;

d. Incentivise the development and adoption of technologies based on open standards, free software, and open hardware to improve the replicability and resilience of community networks;

e. Allow for the deployment of technologies based on dynamic access of spectrum and other new technologies that do not necessarily have a full regulatory framework in place supporting them;

f. Promote the elaboration of appropriate frameworks and the utilisation of existing funds, such as universal service funds or other specific telecommunication development funds, towards advancing community connectivity.

1.5 Financing Programmes Supporting the Development of Community Networks

The financing, mentioned in this section, is understood as a complement to the internal economic management that each network organises for its day-to-day sustainability.

a. Annual funds should be used to allocate microcredit or grants for the initiation of community network funds, allowing initiators to meet the initial needs of acquiring equipment for infrastructure, technical support, and training processes;

b. Cooperation agencies and NGOs should develop financing strategies focused on collaboration and coordination for greater impact and benefit in the ecosystem of community networks and their beneficiary populations;

c. Clear and agile policies and mechanisms for the allocation of universal service funds[18] to community networks should be developed;

d. Objective studies should be financed to understand the costs of deploying community networks in underserved areas and to study their added social value;

e. Technology funding bodies and interested for-profit entities should partner in the development of novel technologies (both infrastructure and support) suited to community networks

1.6 Smart Use of Resources for Underserved Areas

Public entities, private operators, and other stakeholders that do not serve areas with scarce or deficient communications infrastructure should encourage and support community networks at little or no cost to themselves. This would enable community networks to keep reducing the connectivity gap while generating a high positive impact towards achieving obligations, mandates, and objectives in relation to the UN Sustainable Development Goals (SDGs) set in the 2030 Agenda as well as creating positive network effects for the Internet itself. To do so, smart resource allocation should be encouraged in the following areas:

a. **Idle bandwidth:** there are successful cases regarding the subject of idle bandwidth usage provided by academic entities, which make it available to community networks at times when the resource is being underutilised. These types of agreements could be adopted by various public or private actors, allowing for a more efficient use of the resource;

b. **Extension of public access points:** various government programmes create access points in public places in regions with little connectivity. These programmes should include community networks as a complement to extend connectivity to homes and other points of interest for the local community;

18 Universal Service is an economic, legal, and business term used primarily in regulated industries to refer to the practice of providing basic services to all residents of a country. In many states, the creation of universal service funds is the result of the need to reduce the digital divide between rural and urban communities, as well as between the rich and poor, which is generated by the use of private capital to finance telecommunications/ICT projects. see https://www.itu.int/dms_pub/itu-d/opb/stg/D-STG-SG01.05-2017-PDF-S.pdf (page 41)

c. **Community management of government plans:** States often deploy infrastructure plans in unattended areas without carrying out a process of popular adoption of technology within the community. This results in an underutilisation of local skills, which would extend the lifetime of the infrastructure;

d. **Access to infrastructure:** free access to towers, poles, pipelines, shelters, data centers, etc. represents a low cost for the entities that would provide access but high value for community networks, facilitating their deployment. In certain cases, this is a necessary condition for their existence;

e. **Free interconnection:** it is important that a regime of free peering between government networks and the community networks deployed in their territory be determined as a default policy in the region. Also, private actors concerned about the reduction of the digital divide could establish similar agreements, which consider the use of idle capacity. It would also be advisable that Internet exchange points (IXP) consider the cost-free participation of community networks;

f. **Transit**: Tier 1 networks with presence in a given region could offer community networks free global transit agreements. Government and private networks with national coverage could offer national or regional transit agreements under the same conditions;

g. **IP resources:** Regional Internet Registries (RIRs) should elaborate policies that would exempt community networks from the costs of obtaining and renewing IP resources and Autonomous System Numbers (ASNs);

h. **Technology Development:** most existing networking infrastructures, such as radios or user management software, is designed and built for traditional, privately owned networks. There is a robust need for novel technologies that are fundamentally designed to support decentralised, community ownership, operation, and maintenance.

i. **Energy & sustainbility:** Constant, reliable electricity is needed to power telecommunications infrastructure, thus Internet access itself will not be sustainable without a sustainable energy source. The challenge of generating reliable energy to power infrastructure continues to pose a significant barrier to

community networks as well as rural and remote communties more broadly, especially in establishing infrastructure, lowering access costs, and enabling networks to scale. Community networks can provide a hub within rural and remote communites disconnected from grid electricity and should be seen as a vehicle that can promote both connectivity as well sustainable energy consumption.

ANNEX II – COMMUNITY NETWORKS REGULATORY ELEMENTS

1 Legalisation

1.1 **Licensing:** clear and agile mechanisms must be established to facilitate access to the licenses and resources necessary for legally recognised operations, including Internet service provider (ISP), tower, and lawful intercept licenses;

1.2 **Declaration of transmitting stations**: the governments that require such a declaration, made by registered professionals, of transmitting stations and other network components, should facilitate the process and provide free access to the necessary professional services;

1.3 **Approval and harmonisation of equipment**: community networks often use ad-hoc, custom, or research equipment developed by them or other small-scale partners. Governments should facilitate the approval procedures for the technical components involved, eliminating economic barriers and encouraging innovation.

2 Spectrum

2.1 Spectrum planners should provide affordances for social, community, and indigenous uses;

2.2 Spectrum allocation processes should be agile, adequate, and free, for example: by direct assignment;

2.3 Regulators should implement and support mechanisms for efficient use and spectrum sharing, such as secondary use, dynamic access, and allocation of local or regional coverage;

2.4 Experimental licenses must easily transition to definitive licenses once the viability of the project has been demonstrated.

3 Tax Exemptions

3.1 Network, spectrum, and business taxes, fees, and charges, whether one-time or recurrent, should be reduced or eliminated, for type of networks;

3.2 Similarly, equipment import taxes should also be reduced or eliminated.

4 Strategic Goals

The widest possible number of stakeholders should continue working on common strategies in relation to:

4.1 **Training**: focusing on the creation of a network of community network schools and scholars that will contribute to the dissemination of information and tools necessary for the creation of new community networks as well as for continuing education and training for existing community network participants.

4.2 **Technology:** promote the creation of development laboratories that allow for better coordination and use of resources to meet collective needs and develop novel technical solutions.

4.3 **Regulatory impact:** promote the participation of community network representatives and association within regulatory bodies and other spaces of interest for our sector.

4.4 **Impact:** encourage the creation of reports focused on the social, economic, and technical value of community networks.

4.5 **Local content and services:** implement strategies that allow communities to strengthen and preserve their cultural and organisational heritage, safeguard traditional knowledge, and fully and effectively exercise the right to communication, freedom of expression, and self-determination. It is important that local content is shared using technology that is adapted to the possibility of each territory and its agreed licensing, in order to respect the decisions of each community.

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This book is the Official 2022 Outcome of the Dynamic Coalition on Community Connectivity (**DC3**) of the United Nations Internet Governance Forum (IGF). DC3 is a multistakeholder group, fostering a collaborative analysis of **community networks** (CNs), exploring how such initiatives can improve and expand connectivity while empowering Internet users.

As the DC3 has demonstrated over the past seven years, community networks represent an important complementary strategy that can foster not only connectivity but also sustainability and the full enjoyment of human rights. CNs are crowd-sourced collaborative networks, developed in a bottom-up fashion by groups of individuals – i.e., communities – that design, develop and manage the network infrastructure as a common resource. Hence, CNs are connectivity initiatives managed according to the governance models established by their community members, in a democratic fashion, and may be operated by groups of self-organised individuals or entities such as non-governmental organisations (NGOs), local businesses or public administrations.

CNs should not be considered as a competing or antagonistic model either to the state or to the market. On the contrary, they should be seen as a particularly interesting complementary solution to fill the existing connectivity gaps. All previous DC3 publications can be found at **www.comconnectivity.org.**