A TREE IS KNOWN BY ITS FRUIT: GROWING COMMUNITY-CENTRED CONNECTIVITY FOR INCLUSION, EQUALITY AND SUSTAINABILITY

A tree is known by its fruit:[1] Growing community-centred connectivity for inclusion, equality and sustainability

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1 "A tree is known by its fruit" is a Zulu proverb.

2 See the "Our team" section at https://www.apc.org/en/our-work/themes/digital-inclusion

Contents

1. Introduction

As the global push towards digital and ecological transitions intensifies, ensuring equitable access to resources and opportunities is a cornerstone of inclusive development. In an increasingly globalised digital economy – where the internet has become a gateway to education, communication, jobs, commerce, government services, improved livelihoods and life opportunities – the gap between those who benefit from meaningful connectivity and those who do not is rapidly widening, despite greater efforts to expand connectivity. These inequalities exist not simply between those online and offline, but between those who can use the internet optimally and those who are "barely" online.[3] The switch to digital that was accelerated by the COVID-19 pandemic has further deepened the digital divide[4] and underscored the need to improve broadband access in low-income and isolated communities.[5] This exacerbated social and economic inequality in turn limits the ability of the excluded to support the green transition and adapt to it.

The digital inequality paradox lies in the empirical observation that as more day-to-day transactions and interactions require access to digital technologies and the devices and skills needed to use them effectively, digital inequality is increasing because so many people are either still offline or "barely online".

Community networks and community-centred connectivity initiatives (CCCIs) stand at the critical intersection of digital transformation and sustainable development. They provide meaningful digital connectivity in marginalised regions while fostering local ownership, economic participation and social empowerment.

3 Research ICT Africa. (2024). After Access 2022-2023. Measuring digital inequality. Digital Africa Post the Pandemic. Paper presented at AfriSIG 2024. https://afrisig.org/sites/default/files/pdf/Acess-After-Access-AfriSIG-2024.pdf

4 Brito, C. (2020, 24 September). COVID-19 has intensified the digital divide. *World Economic Forum*. https://www.weforum.org/agenda/2020/09/covid-19-has-intensified-the-digital-divide

5 Even though the absolute number of people connected is slowly increasing, the impact of COVID-19 in driving services, employment and social interactions online has increased our overall societal dependence on digital infrastructure. This means that all those without affordable access are at an increasing disadvantage. Rising demand for broadband also means that those with only weak or unaffordable connectivity who might otherwise have been considered connected are still without meaningful access.

Unlike commercial internet service providers (ISPs), CCCIs operate with a mission-driven ethos, prioritising affordability and inclusivity over profit. In doing so, they directly address the dual challenge of reducing inequalities and driving sustainable development, which are central themes of the 2025 international conference of the EU-AFD Research Facility on Inequalities, entitled “Bridging Divides: Evidence-Based Policies for Inequality Reduction and Sustainable Development.”

This paper situates CCCIs within the broader dialogue on just transitions and innovative financing for inclusive growth. By leveraging local capacities and deploying participatory governance models, CCCIs offer evidence of how social and environmental objectives can be reconciled through community-led solutions. Moreover, the blended financial strategies and impact-focused approaches associated with CCCIs align with the conference’s call to explore equitable investment and value-sharing mechanisms in development. In examining the transformative potential of these initiatives, this paper contributes to the development of actionable, evidence-based policy recommendations aimed at bridging the digital divide and forging a more equitable, resilient and sustainable future.

In this research paper, we start by providing a historical perspective of how investments in the telecommunications industry have been made over the years and how effective they have been in closing the digital divide.

After establishing that a persistent digital divide remains, we look at complementary solutions that have been tested in recent years, highlighting their socioeconomic impact, with a special focus on their environmental-related impacts. We then present the results of identifying the financing needs of existing initiatives and consider to what extent these needs are similar to those of other industries in the social and solidarity economy (SSE) that have successfully developed financial sector support strategies. Given that a crucial challenge for financing SSE entities lies in the demonstration and quantification of social impact, which is essential for accessing diversified funding but remains difficult to measure and communicate effectively, we present the results of applying innovative methodologies for such quantification. We close the results section by addressing another common challenge of SSE entities: the lack of a methodologically sound study of the investment readiness of these initiatives.

We conclude the paper by providing recommendations for creating an enabling environment for CCCIs, as well as for designing different innovative financing strategies that could be used to scale these solutions.

2. Literature review

2.1 The telecoms industry is failing to close the digital divide

While efforts from the telecommunications industry have proven fundamental in providing the connectivity the world experiences today, where most upper- and middle-income groups are able to participate meaningfully in the digital economy, they have failed to offer meaningful connectivity to those with lower incomes in rural, remote and underserved areas.

According to the International Telecommunications Union (ITU), nearly one third of humanity has never used the internet.[6] Additionally, there are significant gender and geographical imbalances. It is estimated that 70% of men are connected to the internet, while only 65% of women are.[7] In low-income countries, only 16% of people living in rural areas and 33% of those in urban areas use the internet.[8]

Hence, even with public funds channelled through traditional Universal Service Fund (USF) models to improve operators' return on investment, a business case for these operators to offer affordable, uncapped high-speed services in areas with low average revenue per user (ARPU) remains absent. Even where sufficient numbers of users exist to justify the infrastructure investment, statistics from the GSMA
– the association representing mobile operators globally – show that in rural areas, traditional operators are only able to provide traffic-capped mobile data services, which are unaffordable for the general population in those areas.[9] Therefore, despite progress in achieving universal meaningful connectivity, a persistent digital divide prevents this goal from being fully realised.

6 ITU. (2024). *Measuring digital development: Facts and figures.* https://www.itu.int/dms_pub/itu-d/opb/ind/d-ind-ict_mdd-2024-4-pdf-e.pdf

7 Ibid.

8 Ibid.

9 In 2020, a mobile broadband subscription with a 1.5 GB data package cost less than 2% of gross national income (GNI) per capita (the affordability target set by the ITU) in only four least developed countries. (Shanahan, M., & Bahia, K. (2023). *The State of Mobile Internet Connectivity 2023*. GSMA. https://www.gsma.com/r/wp-content/uploads/2023/10/The-State-of-Mobile-Internet-Connectivity-Report-2023.pdf) Recent data shows that mobile data price declines for Africa are slowing steadily and tending to settle at about 4.5% of GNI per capita for a 2 GB/month connection (*https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/IPB.aspx*). Given the stark inequalities within countries and the increase on average data consumption, prices are clearly unaffordable for low-income populations to make meaningful use of the internet.

As the recent ITU Digital Infrastructure Investment Initiative report (launched in coordination with Brazil's G20 presidency) indicates, in order "for individuals in these locations to benefit from meaningful connectivity, stakeholders should think beyond the typical profit-seeking business plan."[10] Despite this evidence, and calls such as those from ITU Secretary-General Doreen Bogdan-Martin stressing that achieving universal meaningful connectivity requires moving beyond "business as usual",[11] most solutions for closing the persistent digital divide continue to focus on incentivising investments in large traditional commercial solutions.

2.2 Overview of financial initiatives to close the digital divide

Investment in the telecommunications industry has been a traditional private-led endeavour. As such, public finance from multilateral development banks (MDBs) for investment in the ICT sector has in general been relatively limited. A study by the Alliance for Affordable Internet (A4AI) showed that "only around 1% of MDB cumulative commitments to projects in low- and middle-income countries over the 2012-16 period were specifically targeted towards the ICT sector, or had ICT as a primary project component."[12] This means that only about USD 5 billion in cumulative funds were invested in the entire sector in that period. Among other things, the A4AI study stressed the need to "change the investment narrative within and outside of MDBs to re-establish the ICT sector as a priority sector."[13]

This narrative seems to be indeed changing, with initiatives such as the Digital Development Partnership (DDP) created in 2017 and coordinated by the World Bank. The DDP has raised USD 50 million from different donors since its inception, mainly in development aid from Global North governments.

10 ITU. (2025). *Digital Infrastructure Investment Initiative.* https://www.itu.int/hub/publication/s-dii-diii-whitepaper-2025/

11 ITU. (2020). *Connecting humanity: Assessing investment needs of connecting humanity to the internet by 2030.* https://www.itu.int/dms_pub/itu-d/opb/gen/D-GEN-INVEST.CON-2020-PDF-E.pdf

12 Zibi, G. (2018). *Closing the Investment Gap: How Multilateral Development Banks Can Contribute to Digital Inclusion.* World Wide Web Foundation & Alliance for Affordable Internet. https://a4ai.org/wp-content/uploads/2018/04/MDB-Investments-in-the-ICT-Sector.pdf

13 Ibid.

Its work has also led to leveraging over USD 10 billion in lending and investment operations,[14] primarily through its Digital Development Global Practice programme.[15] The World Bank is also committing USD 25 billion to connect all African governments, businesses and citizens to high-speed broadband by 2030, or through the inclusion of "enabling digitalization" as one of eight priority areas in their new vision of "a world free of poverty on a livable planet."[16] Other initiatives looking at financing telecommunications infrastructure in rural areas include the Global Gateway[17] recently launched by the European Commission, which aims to unlock EUR 300 billion for five key areas, one being digital infrastructure, and the G7-led Partnership for Global Infrastructure Investment, which seeks to mobilise USD 600 billion in energy, physical, digital, health and climate-resilient infrastructure in low- and middle-income countries by 2027.[18] Both initiatives are rooted in countering the influence of China, which was estimated to have already invested USD 79 billion in projects outside China by 2018 through the Digital Silk Road component of its ambitious Belt and Road Initiative.[19]

At the national level, the main mechanism used for closing the digital divide are the USFs.[20] Although progress has been made in terms of the number of countries establishing USFs, growth has been less than anticipated (only about 42% of ITU member states reported a fund in 2021).[21]

14 Digital Development Partnership. (2022). *Annual Review 2022: Towards Green, Resilient and Inclusive Digitalization.* World Bank. https://indd.adobe.com/view/6a1d7a70-3b72-498d-afba-64fb0f84a8e6

15 https://www.worldbank.org/en/topic/digitaldevelopment

16 Development Committee. (2023). *Ending Poverty on a Livable Planet: Report to Governors on World Bank Evolution.* World Bank. https://www.devcommittee.org/content/dam/sites/devcommittee/doc/documents/2023/Final%20Updated%20Evolution%20Paper%20DC2023-0003.pdf

17 https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/global-gateway_en

18 Keith, T. (2022, 26 June). Biden announced a $600 billion global infrastructure program to counter China's clout. *NPR.* https://www.npr.org/2022/06/26/1107701371/biden-announced-a-600-billion-global-infrastructure-program-to-counter-chinas-cl

19 https://en.wikipedia.org/wiki/Belt_and_Road_Initiative

20 USFs were first implemented when countries began to privatise and open up the telecommunications industry for greater competition. The aim was to impose a "universal service fee" based on a small proportion of the revenues of operators who had obtained licences in profitable areas. These funds were then to be used to offset the higher costs of provisioning infrastructure in rural areas, as well as providing a mechanism for attracting more providers to apply for licences for universal access.

21 https://datahub.itu.int/data/?e=LIE&i=100093&s=3183

In addition, as indicated in the 2022 report of the UN Inter-Agency Task Force on Financing for Development,[22] USF functioning is not meeting expectations in most countries, leading to many calls to reform them.[23]

Other recent efforts include the pledge platform of the Partner2Connect Digital Coalition (P2C),[24] a multistakeholder initiative launched by the ITU and the Office of the UN Secretary-General's Envoy on Technology, which has become a central space for expressing economic commitments to closing the digital divide. However, it lacks mechanisms for ensuring that those commitments are effectively met. Another innovative financial mechanism that is yet to show significant results is Giga, a UNICEF/ITU initiative that aims to mobilise USD 5 billion to provide connectivity in schools.[25]

What all these efforts have in common is that they are all supporting the same traditional for-profit actors whose business models are unable to close the digital divide. In this way, they have created many opportunities for private capital to profit from new innovations in mobile, satellite and fibre, both terrestrial and submarine, along with the explosion of Wi-Fi in the last mile, which has been dramatic. However, these investments tend to focus on capital-intensive, privately owned low Earth orbit (LEO) satellite companies, along with upgrades to 5G networks by mobile operators, which cater to the more profitable markets, such as 5G in urban areas and private networks in remote agricultural, farming and industrial compounds, maximising returns for their shareholders, but increasing digital inequality for those who cannot afford their prices.

22 Inter-agency Task Force on Financing for Development. (2022). *Financing for Sustainable Development Report 2022. Bridging the Finance Divide.* United Nations. https://www.un.org/ohrlls/sites/www.un.org.ohrlls/files/fsdr_2022.pdf

23 Working Group on 21st Century Financing Models for Sustainable Broadband Development. (2021). *21st Century Financing Models for Bridging Broadband Connectivity Gaps.* https://broadbandcommission.org/publication/21st-century-financing-models

24 https://www.itu.int/itu-d/sites/partner2connect/landing

25 https://giga.global/finance

2.3 Complementary solutions

The continued inability to meet universal service aspirations amply demonstrates that ensuring the World Summit on the Information Society (WSIS) vision of "a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilise and share information" cannot be left solely to traditional telecommunication incumbents to solve.

In recent years, community-centred approaches to connectivity have emerged, prioritising social and environmental returns by building the capacity of underserved users to deploy infrastructure to address their own communication needs. Recognition of these initiatives has recently grown, as reflected in the Organisation for Economic Co-operation and Development (OECD) Council's Recommendation on Broadband Connectivity[26] and ITU resolutions at the World Telecommunications Development Conference[27] and Plenipotentiary Conference,[28] as well as in the T20 policy recommendations by the Indonesian[29] and Brazilian[30] G20 presidencies. Similarly, the Global Digital Compact,[31] an Annex to the Pact for the Future, includes a commitment to invest in "local networks" to close digital divides, and many multilateral development banks[32] and other development agencies, including the Agence Française de Développement (AFD),[33] as well as the Broadband Commission,[34] recommend establishing innovative financing and investment models for community-centred operators to catalyse their impact.

26 https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0322

27 See Resolution 37: Bridging the digital divide. ITU. (2022). *World Telecommunication Development Conference (WTDC-22): Final Report.* https://www.itu.int/dms_pub/itu-d/opb/tdc/D-TDC-WTDC-2022-PDF-E.pdf

28 See Resolution 139: Use of telecommunications/information and communication technologies to bridge the digital divide and build an inclusive information society. ITU. (2022). *Final Acts of the Plenipotentiary Conference*. https://www.itu.int/dms_pub/itu-s/opb/conf/S-CONF-ACTF-2022-PDF-E.pdf

29 Think20 Indonesia. (2022). *T20 Communiqué Indonesia.* https://t20southafrica.org/wp-content/uploads/2024/12/T20-Communique-Indonesia.pdf

30 CEBRI, IPEA, & FUNAG. (2024). *T20 Brazil: Communiqué and Implementation Roadmaps.* https://t20southafrica.org/wp-content/uploads/2024/12/T20_Communique_Brasil.pdf

31 https://www.un.org/digital-emerging-technologies/global-digital-compact

32 García Zeballos, A., et al. (2021). *Development of National Broadband Plans in Latin America and the Caribbean.* Inter-American Development Bank. https://publications.iadb.org/en/publications/english/viewer/Development-of-National-Broadband-Plans-in-Latin-America-and-the-Caribbean.pdf; https://www.adb.org/sites/default/files/publication/847626/sdwp-083-last-mile-connectivity-affordability-frontier.pdf

33 Agence Française de Développement. (2021). *Digital Transition Strategy 2021-2025. Towards a Free, Accessible and Responsible Digital World.* https://www.afd.fr/en/ressources/digital-transition-2021-2025-strategy

34 Working Group on 21st Century Financing Models for Sustainable Broadband Development. (2012). Op. cit.

However, despite this greater recognition, and enabling policies in certain countries, discussions among policy makers, development experts, the philanthropy sector and corporations too often focus on how much money is needed[35] and how limited existing efforts are,[36] and not enough on how money needs to be used differently. Practical tools have been created to provide a foundation of understanding for funders and social impact investors about what community connectivity providers look like,[37] their various ownership and operating models and how they can be financed sustainably. Still, more granularity in relation to the solutions is required, and for that new evidence needs to be provided. This is precisely what we have aimed to accomplish with this paper.

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35 ITU. (2020). Op. cit.; ITU. (2025, 17 January). Digital Infrastructure Investment: USD 1.6 Trillion to Close the Gap. https://www.itu.int/hub/2025/01/digital-infrastructure-investment-usd-1-6-trillion-to-close-the-gap/

36 The UN Conference on Trade and Development's World Investment Report 2023 similarly concluded that the increased level of investment required is not taking place, stating that "the contribution of international investment to SDG [Sustainable Development Goal] 9.c (access to information and communication technology, and universal and affordable Internet coverage) remains limited." UNCTAD. (2023). *World Investment Report 2023: Investing in Sustainable Energy for All.* https://unctad.org/system/files/official-document/wir2023_en.pdf

37 Forster, J., Matranga, B., & Nagendra, A. (2022). *Financing Mechanisms for Locally Owned Internet Infrastructure.* APC, Connect Humanity, Connectivity Capital & Internet Society. https://www.apc.org/sites/default/files/financing-mechanisms-for-locally-owned-internet-infrastructure.pdf

3. Methodology

This paper is based on the experience of the APC-Rhizomatica Local Networks (LocNet) initiative[38] and its partners, which have worked with community-centred connectivity providers, policy makers and regulators to develop enabling frameworks since 2017. This experience is used to describe a range of community-centred connectivity approaches and their sustainability mechanisms, as well as their social and primarily environmental impacts.

These results are then framed in the context of the social and solidarity economy (SSE) and social impact finance. For this, we build on a survey study of more than 80 CCCIs that led to a comparative analysis of CCCI challenges with those of other fields of social impact, conducted by MCE Conseils,[39] a LocNet partner. Its experience and literature, accumulated over 30 years of work, was considered to explore similarities with SSE entities and recommendations. This was supported by different past assignments and involvement of MCE Conseils with social finance in general, local development, international cooperation, social economy and financing advocacy bodies and the UN Inter-Agency Task Force for Social and Solidarity Economy.[40]

A crucial challenge for financing SSE entities lies in the demonstration and quantification of social impact, which is essential for accessing a diversified funding, but remains difficult to measure and communicate effectively. In order to address this challenge, this paper summarises the results from a case study research conducted by the Institute for Social Entrepreneurship in Asia (ISEA) – an APC member and LocNet partner – on what may be considered significant practices among community connectivity initiatives in Asia and Africa, using development indexing (DI) as a tool to articulate the social impact of CCCIs, as well as their cost effectiveness, aided by the methodology of social return on investment (SROI).[41]

38 https://www.apc.org/en/our-work/themes/digital-inclusion

39 Dorion, C., et al. (2025). Breaking the financial divide of digital divide. In C. Rey-Moreno, L. Belli & S. Hadzic (Eds.), *Community Connectivity: Towards Self-Sustaining Financing Solutions.* Dynamic Coalition on Community Connectivity. https://www.isea-group.net/wp-content/uploads/2025/07/self-sustaining-financing-solutions.pdf

40 https://unsse.org/

41 Dacanay, M. L., Teo, A., & Lacsamana, J. B. (2025). *Towards Measuring the Social Impact and Cost Effectiveness of Community-Centred Connectivity Initiatives: Insights from Case Studies in Asia and Africa.* ISEA, APC & Rhizomatica. https://www.apc.org/sites/default/files/cccis-social-impact-study-integrative-report-finalized-layout2.pdf

Another of the common challenges faced by SSE entities, such as CCCIs, is the lack of a methodologically sound study of the investment readiness of these initiatives. To address this gap, we summarise the results of a study where Connect Humanity – another LocNet partner – applies its Investment Risk Framework to assess the viability and impact potential of broadband investments across nine community connectivity initiatives in the Global South.[42] They do so across five key dimensions: network technical risk; community engagement; business model strength; legal and compliance; and portfolio impact. Each dimension is evaluated through specific sub-factors and assigned a numerical score, with lower scores indicating lower risk.

The actionable recommendations for creating an enabling environment for CCCIs build on the revision of recommendations from multilateral agencies, such as the ITU and the Broadband Commission, as well as on an analysis of policy and regulatory frameworks in Brazil, Colombia, Indonesia, Kenya, Mexico, Philippines and South Africa.[43] This list of countries includes the four countries where the EU-funded Research Facility on Inequalities and its Extension focus, hence it is hoped that these recommendations will be especially relevant.[44]

The recommendations for innovative financing and investment mechanisms that could be used to scale these solutions also build on the revision and analysis described above. They are complemented by a dedicated analysis of the mechanisms used by a diversity of stakeholders to finance social enterprises in other sectors, contextualised for experiences in financing related to closing the digital divide. Particular recommendations are included in relation to the role the Global Gateway and other Team Europe initiatives can play in this ecosystem.

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42 Foditsch, N., Mesker, E., & Vo, B. Investment Committee Review of Community Networks in the Global South. In Rey-Moreno et al (Ed.). Op. cit.

43 Rey-Moreno, C. & Miliza, J. (Forthcoming). *Meaningful access and local economic development: The dual impact of enabling community centred connectivity. T20 South Africa Policy Brief.* (See accepted abstracts at: https://t20southafrica.org/wp-content/uploads/2025/03/T20-South-Africa_Accepted-Abstracts.pdf)

44 Agence Française de Développement. (n/d). *The Extension of the EU-AFD Research Facility (2020-2025).* https://www.afd.fr/en/research-facility-inequalities-extension

4. Results

4.1 Community-centred connectivity initiatives and their sustainability mechanisms

Decentralised, local, community-centred connectivity initiatives – where users are more directly involved in developing and deploying communications infrastructure – have proven successful and sustainable alternatives to national commercial networks.[45] Initiatives with a community focus range from networks that are deployed and operated entirely by community-based organisations to those set up by social enterprises, cooperatives and local governments, where community members participate at different stages of the telecommunications infrastructure value chain.[46] These networks offer unique advantages: they can begin at a small scale with minimal capital requirements while incorporating diverse ownership and operating models to ensure financial sustainability. Marketing costs are also minimised since community members are already familiar with the network. This participation contributes significantly to cost effectiveness and sustainability in delivering affordable meaningful connectivity.[47]

These initiatives can be seen as part of the ecosystem of micro, small and medium-sized enterprises (SMMEs), which are the lifeblood of many economies, especially in the developing world. As SMMEs, community networks also play a catalytic role in local economic ecosystems by enabling other SMMEs with access to connectivity and skills development. Apart from the readily apparent benefits for the public, this also strengthens the broader SMME sector by improving their access to information, market reach, efficiency tools and b2b, b2c and b2g services.

45 Rey-Moreno, C. (2024). *Typology of Community-Centred Connectivity Initiatives.* APC. https://www.apc.org/sites/default/files/typology-of-community-centred-connectivity-initiatives.pdf

46 Rey-Moreno, C., Greene, L. R., & Jensen, M. (2024). Innovative Financing Mechanisms to Bridge the Digital Divide. In A. Finlay (Ed.), *Global Information Society Watch 2024 Special Edition: WSIS+20: Reimagining horizons of dignity, equity and justice for our digital future.* APC. https://www.giswatch.org/sites/default/files/GS2024-carlos-greene-jensen.pdf

47 ITU. (2022). *Universal Service Financing Efficiency Toolkit*: *A Practical Guide for Impactful and Sustainable Universal Access and Service Implementation*. https://www.itu.int/itu-d/reports/regulatory-market/usf-financial-efficiency-toolkit/

Additionally, community-centred connectivity operators promote broader participation by diverse stakeholders, addressing needs beyond internet access – such as digital skills training and support for the creation of culturally relevant local content. The social inclusion and transformational impact of these services significantly increases social returns on investment, multiplying the benefits of every dollar spent.[48] In this way, these initiatives contribute to multiple Sustainable Development Goals (SDGs), beyond connectivity alone.

To address start-up costs, many community-centred operators fund raise internally, especially if there are some businesses or other organisational users willing to commit to being anchor tenants (ideally with an upfront payment for services). However, in most rural areas in the developing world, the resident population is unlikely to have the financial capacity to provide all of the needed resources, so in most cases some form of external funding is required. Grants and awards from charities and civil society organisations, the support of the technical community and corporate social responsibility (CSR) schemes donating equipment and premises to host equipment or towers have all contributed to lowering the outstanding capital expenditure necessary to set up a network.[49] Although largely untapped, there are also cases of national, state and local public administrations financing initial deployments.[50] Overall, however, while operational and maintenance costs can be sustained despite low ARPU, initial start-up costs will still require raising external funding, and this is where some innovative funding mechanisms and funding sources can be explored.

To address operational and maintenance costs, while some community-centred connectivity providers operate similarly to traditional commercial networks where user fees cover all the set-up and operating costs, others often reduce costs by drawing on the local community for volunteer labour, donations of upstream bandwidth and the permission to use high sites to erect towers. They are sometimes able to tap into subsidies from government and other commercial sources. Some also innovatively obtain funds by offering services such as e-payments, energy provision/charging and hosting local information servers or remote sensing equipment (weather, air quality, etc.) for a government programme or research agency.

48 Dacanay, M. L., Teo, A., & Lacsamana, J. B. (2025). Op. cit.

49 Bidwell, N. J., & Jensen, M. (2019). *Bottom-up connectivity strategies: Community-led small-scale telecommunication infrastructure networks in the global South.* APC, IT for Change, WACC Global & SIDA. https://www.apc.org/sites/default/files/bottom-up-connectivity-strategies_0.pdf

50 Forster, J., Matranga, B., & Nagendra, A. (2022). Op. cit.

The key point is that by being community-centred (structured as NGOs, social enterprises or community-owned networks), as opposed to profit-centred, most community-centred connectivity providers are not constrained by the need to deliver the kind of return on investment that commercial investors require. They also do not need to spend money on costly marketing or public relations, as there is typically a high level of awareness among community members about the network. As a result, substantially higher sign-up rates for community-centred ISPs as opposed to incumbents are often observed, which substantially (and favourably) changes the economics. This leads to a markedly lower cost of customer acquisition, again favourably improving the economics for community-centred providers.

In addition, with only a modest amount of training required, community-centred service providers can also build the capacity of community members to contribute, especially women. These trained community members are able to take responsibility for most tasks required by the operations, such as erecting towers and installing equipment on roofs, or even day-to-day technical and administrative tasks (troubleshooting, adding users, collecting fees, etc.), thereby significantly reducing their overall operating costs. Many of these providers have also used innovations in energy-efficient equipment powered by green energy, lowering their operating costs significantly. Last but not least, they are able to use a cross-subsidisation model, where local businesses pay a monthly fee that allows discounts for end users.

Beyond being more cost effective, these community-centred models allow broader participation of diverse community members, thus better addressing their needs, which tend to go beyond the provision of connectivity alone. For example, this includes building digital skills and creating local digital content that is culturally sensitive and relevant. Because of this, the case for community-centred connectivity providers has the added advantage of bringing many important social and economic benefits to the community and reducing structural inequalities. Connected populations can access online education services, vocational training, information on their rights and healthcare services. Thus, these projects support the empowerment of individuals, particularly women, youth and minorities, who are often the most affected by digital exclusion. By contributing to equal opportunities, connectivity becomes a key driver of a just transition.

4.2 Examples of the impact of CCCIs in the green transition

Community networks inherently embody the principles of sustainability and local involvement. They leverage the limited resources – yet unlimited ingenuity – of local people to address the inherent human need and desire to communicate and be informed. Due to these attributes, community networks are seen as key enablers of sustainable access.[51]The LocNet initiative has had the privilege of supporting community networks around the world and has seen first-hand how these networks address inequality, embodying and reproducing values of sustainable and participatory development. Community-based initiatives build on local knowledge that directly relates to land stewardship and traditional knowledge and they often engage in local economic activities drawing on degrowth, circular economies and upcycling. Not surprisingly, many community networks are located in regions affected by climate change, and being largely subsistence farming and agriculturally based, they are directly affected by deteriorating environmental conditions.

Since 2019, LocNet has been at least partially involved in supporting a wide range of projects undertaken in South and Southeast Asia, Latin America and Africa that have biodiversity preservation, climate resilience and environmental sustainability as their key goals.

Asia

For example, in India, the BAIF Development Research Foundation and IIT Bombay seeded the growth of community networks in a remote rural village in Maharashtra through the Gram Marg Broadband project. This initiative focused on using digital platforms to preserve and share Indigenous knowledge on agro-biodiversity, crop cultivation and cultural heritage, given the impact of climate change and weather patterns on crop yields and biodiversity. Women in the Pathardi community network played a leading role in gathering and disseminating information about biodiversity conservation practices, including seed preservation and traditional recipes.

51 Oghia, M. (2018). Community networks as a key enabler of sustainable access: A review. In A. Finlay (Ed.), *Global Information Society Watch 2018: Community Networks.* APC & IDRC. https://www.giswatch.org/en/infrastructure/community-networks-key-enabler-sustainable-access-review

The initiative also incorporated e-commerce tools to connect farmers directly with customers, enhancing economic sustainability and fostering local control over digital and agricultural resources.[52]

In Indonesia, Common Room and partners have been using community-centred connectivity initiatives to weave resilient Indigenous local knowledge in the face of climate uncertainty, which reduces crop cycles, diminishes yields and affects the reliability of traditional patterns. By having internet access, villagers can access weather and climate forecasts. As a result, they were able to incorporate climatic conditions, such as El Niño and La Niña, into their traditional farming calendars. This was particularly helpful for young people, who were unaware of shifting planting calendars. Young people were also exposed to new farming techniques, such as hydroponics, which could help improve their land's productivity. This has led them to install open-source internet-of-things-based weather stations that empower farmers by giving them direct access to microclimate data so they can plan irrigation, or fisherfolk, allowing them to track sea conditions, while reclaiming technological agency and ensuring long-term sustainability.[53]

Similarly, Common Room and partners, including village councils in Ciptagelar and Gelaralam, developed an internet-enabled village information and communication radio broadcast system to improve disaster preparedness. Previously, disaster alerts relied on rudimentary tools like bamboo poles and hand-held radios, leading to delays and inaccuracies. This new system, combined with internet provision by the CCCI, significantly enhanced the reliability and accuracy of information, earning villagers' trust and improving access to government aid during disasters. The system also facilitated clearer communication and more tailored post-disaster support. For instance, after a 2019 landslide, villagers successfully mobilised resources from local and international donors to rebuild homes, aided by digital banking and online crowdfunding. As a result, digital connectivity proved critical not only in enhancing early warning systems but also in enabling rapid mobilisation of resources and support for recovery efforts.[54]

52 "Connecting the Unconnected" project team. (2020). Community networks: A people- and environment-centred approach to connectivity. In A. Finlay (Ed.), *Global Information Society Watch 2020: Technology, the environment and a sustainable world: Responses from the global South.* APC & SIDA. https://giswatch.org/sites/default/files/gisw2020-th-cn.pdf

53 Dacanay, M. L., Teo, A., & Lacsamana, J. B. (2025) Op. cit.

54 Ibid.

The Philippine Rural Reconstruction Movement (PRRM) focused on improving internet connectivity for the Kayapa Organic Producers Association (KOPA), comprising 80 members, in partnership with Vizcaya Fresh, Inc. (VFI). The project designed a telecommunications network architecture to enhance the organic agriculture value chain. The infrastructure aims to enable real-time sharing of production data, weather information and marketing details between farmers and VFI, potentially reducing overhead costs and improving operational efficiency. The project emphasises community participation and includes capacity building for digital technologies, particularly targeting the needs of organic farmers in remote areas where traditional telecom signals are weak or non-interrupted.[55]

The Philippine Coffee Alliance (PCAi) implemented an innovative internet of things (IoT) system for coffee roasting machines in two community-based coffee enterprises in Kasibu, Nueva Vizcaya, and Lagawe, Ifugao. The project developed a "roasting machine bookkeeper model" that generates operational data and provides automated feedback reports through GSM and cloud-based systems. This technological upgrade aims to improve the efficiency of coffee processing operations while gathering valuable data on production, quality control and business operations. The system uses LoRaWAN technology to overcome connectivity challenges in remote areas and includes features for monitoring power consumption, roasting profiles and operational metrics.[56]

55 Institute for Social Entrepreneurship in Asia (ISEA). (2022). *Model building of community networks linked to social enterprise and sustainable local economic development.* https://apnic.foundation/projects/model-building-of-community-networks-linked-to-social-enterprise-and-sustainable-local-economic-development/

56 Ibid.

Latin America and the Caribbean

In Latin America, when a community network is planned, the communities focus on their traditional communication processes before even thinking about connectivity. For example, in the joint work carried out in Cuetzalan del Progreso, Puebla, Mexico with the Unión de Cooperativas Tosepan, the primary importance of communication has been the revitalisation of the Nahuatl and Tutunaku languages. A living Indigenous language such as Nahuatl constitutes a thought-feeling system where nature and the environment are at the centre and the human being is only one part of the ecosystem. In this context, language can be vital in caring for and defending the territory, so in that sense, a network that creates community through communication finds dialogue, knowledge, experiences, stories, needs and dreams that anchor it to the territory.

In Colombia, Colnodo has worked to create solutions for environmental monitoring via sensors for the protection of the environment by local communities. This approach is considered to be one of the essential components in strengthening environmental warning systems and moving towards sustainable development. These initiatives have not only improved the understanding of environmental problems, they have empowered local communities to take concrete actions to protect and conserve the environment. The data collected is part of the Environmental Alert System of the Sustainable Development Network's geographic information system (https://mapas.rds.org.co/).[57]

Many communities in remote parts of Latin America, predominantly Indigenous ones based in the Amazon region, are using the High-frequency Emergency and Rural Multimedia Exchange System, better known by its acronym, HERMES,[58] to provide affordable digital telecommunications over shortwave/HF radio using a simplified visual interface accessible via smartphones or computers, allowing for the transmission and reception of data (chat, audio, documents, photos, GPS coordinates, etc.). Having the ability to communicate secretly has allowed for important territorial monitoring and guardianship to take place more safely and effectively.

57 https://www.apc.org/en/environmental-justice-and-sustainability-grants-2023

58 https://www.rhizomatica.org/hermes/

During the COVID-19 pandemic, non-governmental organisation coordinators using HERMES stations in urban spaces were able to work with rural and riverine populations to help them stay safely isolated, remotely coordinating the delivery of food baskets and helping to maintain the shipping of locally produced goods, thereby ensuring the economic sustainability of the communities.[59]

In Brazil most CCCIs are located in traditional territories and/or managed by traditional populations, where the collective governance of territories serves as the basis for the collective governance of these initiatives. In this context, while community networks are common goods managed collectively by the community and its leaders, they also serve the purpose of ensuring that the other common goods of these territories – such as the preservation of the land, local culture, ways of life and traditional knowledge – benefit from online communications and advocacy, in an active and communal way. For these CCCIs, connectivity and the internet are not an end in themselves, and in most communities they are used as tools in socio-environmental struggles and to promote other human and environmental rights.[60]

Africa

In Africa, BOSCO in northern Uganda uses solar energy to power its community network, which spans over 400 kilometres across 13 districts. The network connects a total of 54 centres, which include schools, health clinics, community ICT hubs and local NGO and government offices. BOSCO has also established large energy systems (6 KW and 30 KW) powering three secondary schools. Youth from the communities are trained on how to operate and maintain the solar equipment.

59 Bloom, P., & Brock, N. (2020). *Digital communications to build autonomy and combat ecocide.* GISWatch. https://www.giswatch.org/node/6227

60 Zanolli, B. How to ensure that CN users have online safety and digital care? In L. Belli & S. Hadzic (Eds.), *Cybersecurity in Community Networks: Securing the Commons. Official outcome of the UN IGF dynamic coalition on community connectivity.* FGV Direito Rio. https://repositorio.fgv.br/server/api/core/bitstreams/29e2364e-b57a-4e52-b9d0-6c5f2014fb47/content

BOSCO emerged as a way to connect communities around messages of peace and hope, when local populations were unable to connect to the national radio or any form of communication with the outside world during the war that left many displaced in refugee camps. BOSCO was established to connect communities and transition them out of isolation. The development and use of solar energy emerged in BOSCO and several other community networks on the continent as an extension of ways to sustain life.[61] These solar hubs are having other impacts beyond the use of renewable energy, including the use (and resale) of refurbished computers and computer and training programs for community members on digital device repair, artificial intelligence, open-source tools, etc. When these are combined with hands-on mentorship and contextualised learning, they can drive sustainable development, inspire youth innovation and enhance adaptive capacity in the face of climate and social challenges.[62]

In Nigeria, the Media Awareness and Justice Initiative (MAJI) has worked on an environmental air quality network of 15 sensors deployed across various locations to support evidence-based campaigns, fact-oriented interventions and the development of policies that reflect the present environmental realities within rural Niger Delta communities. Data collected by these sensors is hosted on the DATACAB platform (www.datacab.org), an air-quality visualisation platform developed by MAJI.[63]

In South Africa, Zenzeleni also worked on a project to further usher in digital technologies as vital allies in the struggle to address climate change and food security challenges in the villages where Zenzeleni Community Networks is based and other surrounding villages. These technologies are aimed at empowering rural households by providing them with essential information, tools and resources to adapt to changing environmental conditions, manage resources efficiently and secure their livelihoods.

61 APCNews. (2024, 26 February). Community networks newsletter: Meet solar-powered hubs providing community-centred connectivity in Nigeria. APC. https://www.apc.org/en/news/community-networks-newsletter-meet-solar-powered-hubs-providing-community-centred-connectivity; APC. Project grants for local implementation of APC's strategic plan in 2020: Zenzeleni Networks NPC and Computer Aid International – Collaboration to enhance the impact and sustainability of community networks and Solar Learning Labs. https://www.apc.org/en/project-grants-local-implementation-apcs-strategic-plan-2020#zen

62 Innovation Fellowship and Clubs Report, Hello World. "End of Project – July 2024".

63 https://www.apc.org/en/environmental-justice-and-sustainability-grants-2023

The overall concept is that of an online platform for knowledge exchange on practices that ensure local environmental sustainability and encourage community members to contribute data on water sources, traditional medicinal plants and sustainable agricultural, food gardening and fishing practices.[64]

In Kenya, TandaNET has mobilised community engagement on sustainability issues by fostering environmental awareness. Social media campaigns and online educational programmes have encouraged community members to actively participate in environmental protection initiatives. Through increased enrolment in online courses and actions focused on environmental advocacy, the community is better equipped to address pressing ecological challenges and promote sustainable practices.[65]

These are only a subset of the examples on the diverse ways in which CCCIs can contribute to climate resilience and disaster preparedness. Many more can be found in the literature,[66] ranging from applied IoT in local community networks to monitor haze and forest fires in Thailand,[67] the use of Indigenous technology to map land as a way to obtain legal recognition in the Philippines or the use of community radio to share information on the impacts of climate change in Kenya[68] and the promotion of environmental sustainability in rural communities in Ghana.[69]

In summary, community-centred connectivity initiatives are much more than technical or infrastructural initiatives. They represent a powerful lever for ensuring that the transition to a sustainable economy is truly just and inclusive.

64 https://www.apc.org/en/environmental-justice-and-sustainability-grants-2023

65 Dacanay, M. L., Teo, A., & Lacsamana, J. B. (2025). Op. cit.

66 Belli, L., & Hadzic, S. (2023). *Community networks: Building digital sovereignty and environmental sustainability. Official outcome of the UN IGF dynamic coalition on community connectivity.* FGV Direito Rio. https://www.intgovforum.org/en/filedepot_download/45/26375

67 Toquero, A. R., Padong, G., Falcutila, C., & Rey-Moreno, C. (2025). *Understanding community-centred connectivity initiatives in Asia and the Pacific.* APC. https://www.apc.org/sites/default/files/cccis-in-asia_final.pdf

68 Carling, J., & de Chavez, R. (2020). *Indigenous peoples' perspectives on environmental sustainability and technology.* GISWatch. https://giswatch.org/node/6255

69 https://afrisig.org/sites/default/files/2025-05/Session%207.pdf

By reducing inequalities, promoting access to green economy opportunities and promoting participatory governance, connectivity not only enables disadvantaged populations to be part of the ongoing transformations, it allows them to become full participants in them. Provided they are designed equitably and adapted to local contexts, these initiatives can play a decisive role in building a sustainable and inclusive future.

4.3 Financial needs of CCCIs and parallelisms with social and solidarity economy and its financial mechanisms

Most of the initiatives documented above participated in the survey study by MCE Conseils, which presents new results regarding the financial performance and financial needs of community-centred connectivity initiatives. In spite of their documented social impact, CCCIs face major challenges in implementing their initiatives because of the capital intensive nature of connectivity infrastructure provision, limited access to funding opportunities and the economic sustainability of the business models based on maximising affordable access for users instead of profits for investors.

The CCCIs surveyed also expressed the need for external support for fundraising, as well as a diversification of their financial partners. In many cases, they also recognise the need for technical support, as well as training in management, business models, marketing and financial management.

The winning formula for solving the financial divide arising between high capitalisation needs and a mission of economic accessibility (reduced pricing strategy) remains the major challenge for the respondents of the survey. Finding equilibrium both between social mission and financial sustainability and between low capital and access to financial products at a low cost is central to CCCIs' path to growth for their mission impact.

This analysis has allowed us to make a clear case for defining CCCIs as social and solidarity economy entities (SSEs). The positive impact of SSEs has been widely recognised, including by United Nations resolutions and reports by the UN Secretary General.

The special elements that need to be considered for their financing and support have led to the creation of a technical working group on financial access and support (TWGFAS) for SSEs as part of the United Nations Inter-Agency Taskforce on the Social Solidarity Economy (UNTFSSE).[70]

In the case of CCCIs, after analysing their potential supply side, the lack of a "group culture" supporting SSE entities in other sectors is evident. This underlines the need for a financial supply ecosystem with complementary products emerging from a blended finance strategy, converging grants, loans, guarantees and quasi-equity mechanisms (such as subordinated debt with flexible capital repayment schedule and/or interest depending on the liquidity generated), thus increasing the availability of financial solutions and their accessibility at a lower cost. It also illustrates that non-financial support structures would help CCCIs to enhance their management and financial expertise in order to meet financial actors' expectations of high quality business plans and de-risking strategies on management and output.

The potential of impact investment in CCCIs is substantial, offering a unique combination of financial returns and positive societal contributions. By targeting investments that expand digital access, support sustainability and drive innovation, impact, social and environmental, social and governance (ESG) investors can help accelerate economic development, improve social welfare and contribute to a more inclusive, connected world. With the global push towards digital transformation, the CCCI sector holds immense promise in achieving long-term, meaningful impact.

4.4 Mechanisms of measurement

The analysis of four community-centred connectivity initiatives in Asia and Africa[71] using development indexing (DI) as a tool to articulate the social impact of CCCIs enabled the identification of shared key result areas (KRAs), while also reflecting unique priorities shaped by their local contexts and stakeholder needs. These can be summarised in the following six KRAs:

70 https://unsse.org/2024/09/10/launch-of-the-untfsse-technical-working-group-on-financial-access-and-support-for-sse-entities/

71 Kasepuhan Ciptagelar (Indonesia), Pathardi (India), TandaNET (Kenya) and Zenzeleni (South Africa).

- Improvement in the economic position and conditions of community stakeholders
- Increased levels of and capacities for inclusive human development
- Increased levels of and capacities for climate action and natural resource management
- Community empowerment to control, govern and manage internet and digital resources
- Inclusion and empowerment of women as stakeholders in digital transformation
- More effective preservation of the cultural identity, heritage and integrity of the community.The analysis also led to the identification of potential performance indicators for each of those KRAs. A table with the subset pertaining to the KRA more pertinent to just transition is shown below.

Potential key result areas (KRAs)	Potential performance indicators (PIs)
Increased levels of and capacities for climate action and natural resource management	1. Higher citizen participation in generating and validating data from the ground.
	2. More reliable and timely information dissemination with modern devices.
	3. More proactive risk management through dissemination of risk information, hazard models and vulnerability data.
	4. Improved capability to avoid or minimise loss of lives and property amid disasters.
	5. Greater awareness on climate challenges and disaster preparedness.
	6. Broader reach of information for resource mobilisation and improved access to appropriate assistance to recover and rebuild post disaster.
	7. Improved capacity to preserve, develop and propagate indigenous seed varieties.
	8. Improved capacity for crop diversification and increasing agricultural productivity.
	9. Increased engagement (e.g. through social media and online platforms) of community members on environmental issues and action.

The use of SROI methodology to assess the cost effectiveness of the cases studied showed that community connectivity initiatives provide social inclusion services and transformational services that generate significant social impacts beyond what commercial ISPs can offer, hence clearly demonstrating the value proposition for investing in CCCIs. As such, the SROI ratios over three years involving the cases studied were all above one and also had an upward trend every year, which demonstrates a consistent increase in social value created by these CCCIs over time.

Overall, the cases demonstrate that community connectivity initiatives are not only cost-effective interventions in bridging the digital divide; they also significantly contribute to accelerating the achievement of many of the SDGs as indicated by the multifaceted key result areas where significant impact in terms of depth and/or scale was observed. These results will hopefully inspire social impact investors to consider funding this type of initiatives to meet their foundational goals.

4.5 Investment readiness

Of the nine networks analysed, the majority were rated B (some risk) using Connect Humanity's Investment Risk Framework. Two achieved an A (low risk) rating, based on operational profitability, clean financials and scalable governance structures. The rest fell into the C category, reflecting material risks related to unclear ownership structures, undefined long-term sustainability or capacity gaps.

Risk category	ISP 1	ISP 2	ISP 3	ISP 4	ISP 5
Network technical	8/14	6/14	6/14	5/14	7 / 14
Community engagement	1/5	2/5	1/5	2/5	1 / 5
Business model	8/13	8/13	11/13	4/13	9 / 13
CH portfolio impact	7/17	13/17	12/17	8/17	12 / 17
Legal and compliance	9/17	10/17	12/17	9/17	9 / 17
Total risk score	**33**	**39**	**42**	**28**	**38**

Risk category	ISP 6	ISP 7	ISP 8	ISP 9	CH portfolio
Network technical	9/14	7/14	11/14	7/14	3.2/14
Community engagement	2/5	2/5	3/5	1/5	0.6/14
Business model	11/13	11/13	12/13	9/13	5/14
CH portfolio impact	11/17	9/17	9/17	12/17	9.8/14
Legal and compliance	11/17	9/17	14/17	9/17	9.2/14
Total risk score	**44**	**38**	**49**	**38**	**27.8**

The analysis of nine community networks reveals a consistent pattern of strong social alignment, moderate technical reliability and widely variable financial readiness. Across the five dimensions of Connect Humanity's Investment Risk Framework, the average total risk score was 38.8 (max 66) with a standard deviation of 6.1, placing most networks nearly between the "B – Some risk" and "C – Material risk" categories. While these networks are not yet fully investment grade by conventional standards, their risk profiles show that with appropriate financial structuring and technical assistance they are fundamentally viable.

When compared to Connect Humanity's existing portfolio of active investments, the nine community networks show both distinct strengths and predictable weaknesses. Notably, these community networks score similarly in the community engagement category, validating their core value proposition: trusted, locally governed infrastructure deeply aligned with digital equity outcomes.

However, the comparison also highlights meaningful gaps in investment readiness. The average score in the network technical risk category among the community networks is 4.1 points higher, with almost two deviations, indicating less redundancy, limited network automation and greater vulnerability to environmental disruptions. This suggests a need for investment not just in last-mile connectivity, but also in resilience and monitoring capacity at the network's core.

The most significant divergence lies in the business model dimension, with community networks almost two deviations higher in risk compared to the broader portfolio. This is attributable to reliance on grants, the absence of audited financials and limited experience with debt servicing or reserve planning. Other common challenges included regulatory bottlenecks and limited access to patient, flexible capital.

However, most networks had real and growing user bases, with take-rates between 30% and 50% and demonstrated ability to monetise service via prepaid or subscription models. Addressing this gap will require pairing capital with technical assistance to build budgeting, pricing and revenue management capabilities.

Together, these insights disaggregate prior held perceptions that community networks are not investable. Rather, community networks present a spectrum of organisations, some immediately investable while others requiring more scaffolding than traditional ISPs. The commonality is that they require investments structured differently and more aligned with their specific challenges. Their high social impact, strong demand and small capital needs make them ideally suited for tailored, milestone-linked financing, especially when paired with patient, blended capital.

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5. Recommendations

5.1 Creating an enabling regulatory framework for CCCIs

Although the 2005 WSIS Tunis Agenda already includes the importance of "supporting [...] networking initiatives based on local communities," the reality is that over the last 20 years, progress has been slow, and community-centred connectivity initiatives have for the most part emerged despite relatively challenging environments. The majority of policy makers, regulators and financiers in the sector have not extended their approach beyond the narrative that large commercial enterprises are the primary model for the provision of telecommunication services. Hence, licensing frameworks and financing instruments continue to privilege private sector participation in the industry. While this approach has undoubtedly led to competitively driven extension of infrastructure in urban areas, it has not been effective in closing the digital divide, which still leaves the majority of the world's population with either no connectivity or connections that are unaffordable.

As long as policy makers and regulators continue to rely on traditional players and private investment approaches that prioritise profitability, these divides will continue to widen. Clearly we need an approach different from that of traditional development finance, as well as additional sources of finance from non-traditional investors using innovative and flexible financial mechanisms, along with a regulatory environment that allows for the emergence of complementary network operators that are socially focused on bridging the digital divide, as opposed to solely focused on profitability. Ultimately, to improve the balance between profit maximisation and the goal of reaching universal access, the time has come to assess socially driven investments in depth and review how effective they are at addressing digital inclusion.

As mentioned above, while some community-centred connectivity providers are steadily building solutions to persistent digital divides, their relatively small size and limited numbers underscore the struggle to access capital to expand or seed new networks. While there have been some good examples of innovative financing mechanisms for supporting community-centred connectivity providers, the financial resources currently available are insufficient to help them scale up.

The evidence from this paper indicates that this is an opportune moment for those stakeholders willing to help close digital divides to recognise that community-centred models are not receiving enough attention and that there needs to be more proactive engagement in supporting these complementary solutions that are critical to ensuring the inclusion of rural communities and marginalised groups, such as women and Indigenous communities, as well as the most financially disadvantaged.

In order to be successful, effective financing mechanisms need to be part of a general enabling environment for community-centred operators. But the centrality played by private companies in the telecommunications sector, and their success in expanding services to the market frontier, distracts from the need to also create an enabling environment for other alternatives. Because of this, it is critical that digital exclusion be considered by all financial actors and public entities as a development problem that transcends the dynamics of the commercial telecommunications industry. Despite the growing recognition that community-centred approaches are effective, as discussed in the introduction, much needs to be done to raise awareness of community-driven alternatives for bridging the digital divide, and how to create innovative, affordable and flexible financial products that enable them to sustain their businesses.

To address these funding constraints, there is a strong need to create an enabling and flexible policy, regulatory and financing environment that encourages the emergence of more community-led initiatives, as well as more innovative local and regional investment models for these providers that allows them to expand and operate cost-effectively. The key elements that have emerged from LocNet's experience working with CCCIs, policy makers and regulators to ensure an enabling financial and regulatory environment are:

- Deepening insight into the value of a diversified ecosystem. Acknowledging the failure of traditional operator models to close digital gaps and exploring complementary efforts with business models more tailored to underserved areas is critical.

For example, the Communications Authority in Kenya[72] and Anatel in Brazil[73] have commissioned work to explore enablers for community-centred connectivity initiatives. Similarly, the Data Services Market Inquiry from the Competition Commission in South Africa recommended incentivising diversity via community networks.[74] Anatel has gone one step further, creating a working group in 2023 (the GT RCom) that supports continued dialogue with these initiatives to operationalise enablers for them.[75]

- Reducing regulatory requirements for these providers. Hefty licence fees and compliance requirements for network operators exist in most countries in the Global South. This contrasts with regulatory frameworks in developed markets, which are characterised by a simple authorisation or registration systems permitting internet service provision without a licence. Lowering licence fees, or waiving them, and reducing administrative burdens are among the most important incentives.[76] In Kenya, most of those incentives exist via a new community network and service licence.[77] In South Africa, initiatives have used the license-exempt regulations, while a more robust framework is being designed.[78]

72 Communications Authority of Kenya. (2021). *Licensing and Shared Spectrum Framework for Community Networks.* https://repository.ca.go.ke/bitstream/handle/123456789/47/Licensing-and-Shared-Spectrum-Framework-for-Community-Networks-May-2021.pdf?sequence=1

73 Labardini Inzunza, A., & Zanolli, B. (2021). *Policy brief and recommendations for an enabling environment for community networks in Brazil.* APC. https://sei.anatel.gov.br/sei/modulos/pesquisa/md_pesq_documento_consulta_externa.php?eEP-wqk1skrd8hSlk5Z3rN4EVg9uLJqrLYJw_9INcO7Pwj-3IV1I7IHgYMB-bbrYeBUxe1cWNVSkPuk8jN_6nkpj_OiAnYbrUD2KgGMhro4XY785bcVkb50mNt5TGB4F

74 Competition Commission of South Africa. (2019). *Data Services Market Inquiry Final Report: Summary of Findings and Recommendations.* http://www.compcom.co.za/wp-content/uploads/2019/12/Data-Market-Inquiry-SUMMARY.pdf

75 https://www.gov.br/anatel/pt-br/composicao/grupos-de-trabalho/gt-rcom

76 ITU. (2021) *Global Symposium for Regulators 2021. Best Practice Guidelines.* https://www.itu.int/en/ITU-D/Conferences/GSR/2021/Documents/GSR-21_Best-Practice-Guidelines_FINAL_E_V2.pdf

77 https://www.ca.go.ke/sites/default/files/CA/Licenses%20Templatses/Community%20Network%20and%20Service%20Provider%20Licence.pdf

78 Government of South Africa. (2024). *Next-Generation Radio Frequency Spectrum for Economic Development.* South African Government Gazette No. 50725. https://www.gov.za/sites/default/files/gcis_document/202407/50725proc166.pdf

This is the case in the Philippines too,[79] and in Brazil an authorisation is available under a restricted interest service category.[80] In Colombia, the government has issued a decree establishing a special regime for these initiatives, with a five-year exemption of official fees.[81]

- Adopting innovative mechanisms to allow community-centred connectivity providers access to radio frequency spectrum that is either unused or unassigned in underserved areas. Mobile spectrum sharing has become widespread in the Global North,[82] but its adoption is still the exception in the Global South, where it is most needed.[83] Nevertheless there are some examples of this that set important precedents for other countries. For example, Mexico has pioneered a social purpose mobile spectrum licence,[84] and in Colombia experiments have been authorised and monitored by the relevant authorities to enable this possibility.[85] In Brazil, an authorisation for mobile spectrum on a secondary basis was issued recently.[86] South Africa has also enacted policy to enable community-centred connectivity initiatives to access unused mobile spectrum.[87]

79 Senate of the Philippines. (2025, 6 February). Press release: Cayetano-sponsored bill for nationwide internet access gets Senate nod. https://legacy.senate.gov.ph/press_release/2025/0206_cayetanoa2.asp

80 Agência Nacional de Telecomunicações. (2024, 17 May). Redes Comunitárias: Universalização das Redes de Telecomunicações. https://www.gov.br/anatel/pt-br/regulado/universalizacao/redes-comunitarias

81 Ministerio de Tecnologías de la Información y las Comunicaciones. (2023, 5 July). Publicación Decreto Internet Comunitario Fijo. https://www.mintic.gov.co/portal/inicio/Sala-de-prensa/Noticias/276726:Publicacion-decreto-internet-comunitario-fijo

82 Innovation, Science and Economic Development Canada. (2025, 19 March). *Decision on Non-Competitive Local Licensing Framework, Including Spectrum in the 3900-3980 MHz Band.* https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/spectrum-allocation/decision-non-competitive-local-licensing-framework-including-spectrum-3900-3980-mhz-band-and

83 Working Group on 21st Century Financing Models for Sustainable Broadband Development. (2021). Op. cit.

84 Song, S., Rey-Moreno, C., & Jensen, M. (2019). *Innovations in Spectrum Management. Enabling community networks and small operators to connect the unconnected.* APC. https://www.internetsociety.org/wp-content/uploads/2019/03/InnovationsinSpectrumManagement_March2019-EN-1.pdf

85 Agencia Nacional del Espectro. (2022). *Documento de Análisis de Impacto Normativo.* https://www.ane.gov.co/Sliders/archivos/GestionTecnica/Estudios%20de%20gesti%C3%B3n%20y%20planeaci%C3%B3n/Maximizar%20el%20uso%20de%20espectro/Documentos%20para%20consulta/Documento%20AIN_Alternativas_Maximizacion.pdf

86 https://informacoes.anatel.gov.br/legislacao/atos-de-requisitos-tecnicos-de-gestao-do-espectro/2024/1999-ato-17985=

87 Government of South Africa. (2024). Op. cit.

- Ensuring affordable access to backhaul networks. Securing sufficient backhaul capacity is often the single largest cost element for small networks, especially where affordable access to national backbones and middle-mile fibre networks is limited or not competitively priced for small-scale operators. Examples of this enabler are scarce, with the notable exception of the Palapa Ring in Indonesia.[88]

- Raising awareness and building capacity. These are required to develop the pipeline of socially driven initiatives that could effectively use the aforementioned incentives to close the digital divide. Examples of efforts to raise awareness exist in Brazil, with a website on community networks maintained by the regulator,[89] and similarly in Colombia.[90] The LocNet Initiative[91] and the Internet Society[92] maintain similar resources and facilitate capacity building. Courses available in the ITU Academy are also critical.[93]

5.2 Innovative financing and investment models to enable CCCIs

The last element of this enabling framework is to establish innovative financing and investment models for community-centred operators to catalyse their impact. With the financial profile showcased in earlier sections, CCCIs will need to engage with social investment networks. These institutions are a mixture of socially minded financial institutions grouped in Europe, for example, in the European Federation of Ethical and Alternative Banks and Financiers (FEBEA) and in alternative banks, or, more broadly, in the Global Alliance for Banking on Values (GABV). These institutions share many operational frameworks with the impact investment sector, but have a more dedicated focus on social impact and accept sub-market financial or concessionary returns and conditions.[94]

88 https://prb.net.id/

89 Agência Nacional de Telecomunicações. (2024, 17 May). Op. cit.

90 https://www.redescomunitarias.co/

91 https://cnlearning.apc.org/

92 https://www.internetsociety.org/resources/community-network-diy-toolkit/

93 https://www.itu.int/en/ITU-D/Digital-Inclusion/Indigenous-Peoples/Pages/default.aspx

94 Although there are no examples yet for connectivity, the RISQ in Quebec finances SSE with no-guarantee loans of five years at a rate of 8%, which is normally an asset-guaranteed market rate. It financed 350 SSE enterprises and currently manages a portfolio of CAD 20 million. See https://www.risq.quebec/ for more details.

They are often non-profit or cooperative banks, but also include social enterprises, incorporated as private companies but with a clear social mission. Although these institutions are relatively small compared with impact investment entities, they could be a starting point for broadening the dialogue.

An additional advantage provided by impact actors is that they can disburse and manage funds in amounts that can be more effectively absorbed by community-centred connectivity providers, something that is much more difficult for large investors, which are designed to manage multi-million dollar disbursements. It is important to note that specialised intermediaries are already pervasive in many other sectors of development finance and financial assistance, and there is now an opportunity to incentivise them to add digital inclusion to their portfolio with support from public finance. This has special potential in the case of performance/revenue-based loans considering that real-time data on performance can be made available directly to the lender. Performance-based loans, or development/social bonds, have already been used by municipalities in the United States to build community-centred networks.[95] Still, attention needs to be paid to the realities of CCCIs when designing them so as to avoid poor results when traditional operators use them.[96]

In relation to public finance, while this paper has focused on the potential of private impact investment, research indicates a significant positive impact on GDP growth in regions where connectivity is developed, making it a clear argument for more public investment and development finance with a potential for fiscal return. National governments can in turn support these funds via tax incentives as well or other government mechanisms, in addition to using tools such as guarantee pools, first loss investments and other credit guarantees. This will allow new social investors to expand the range of their integrated capital mechanisms to be more effectively applied here. This resonates with the Country Climate and Development Platforms (CPs) being discussed by the B20 South Africa Finance and Infrastructure Working Group. These country platforms have been mainly focused on climate action, for example, under South Africa's Just Energy Transition Investment Plan (JETP).

95 Forster, J., Matranga, B., & Nagendra, A. (2022). Op. cit.

96 Gilbert, L. (2022). *Open Philanthropy Shallow Investigation: Telecommunications in LMICs.* Effective Altruism Forum. https://forum.effectivealtruism.org/posts/H6GhXkbfAy949xhGf/open-philanthropy-shallow-investigation-telecommunications

However, the approach is increasingly used in other areas, such as poverty reduction and social development, and in the mobilisation of private finance for particular projects. As such it could be used in the context of closing the digital divide, given how this topic is being prioritised in B20 discussions.

This goes beyond the current advocacy efforts for governments to fund CCCIs via USFs, which should be strategically designed and implemented to address key barriers to meaningful connectivity, including gender and socioeconomic gaps. The UN Broadband Commission has already recommended that community networks be funded by USFs,[97] as has the ITU.[98] Argentina was a pioneer in this approach,[99] Brazil[100] and Kenya[101] have recently authorised it and Indonesian initiatives are supported by Village Funds from the Ministry of Villages for connectivity projects.[102] In Colombia, the European Commission's Global Gateway is funding community-centred connectivity in demilitarised zones under the peace process.[103] Also critical are the role of the public sector in ensuring that there is an enabling telecommunications policy and regulatory environment for these CCCIs, as described in the previous section, and the presence of financial and capacity-building resources to help establish and sustain the operator providing the connectivity, towards achieving long-term economic autonomy.

97 Working Group on 21st Century Financing Models for Sustainable Broadband Development. (2021). Op. cit.

98 ITU. (2022). *Universal Service Financing Efficiency Toolkit*: *A Practical Guide for Impactful and Sustainable Universal Access and Service Implementation.* https://www.itu.int/itu-d/reports/regulatory-market/usf-financial-efficiency-toolkit/

99 ENACOM (Ente Nacional de Comunicaciones). (2022). *Informe de gestión.* https://www.enacom.gob.ar/multimedia/noticias/archivos/202305/archivo_20230523045957_7544.pdf

100 Julião, H. (2025, 26 March). GT da Anatel quer redes comunitárias entre projetos financiáveis pelo Fust. *Teletime.* https://teletime.com.br/26/03/2025/gt-da-anatel-quer-redes-comunitarias-entre-projetos-financiaveis-pelo-fust/

101 Communications Authority of Kenya. (2023). *Universal Service Fund Strategy 2023-2027.* https://www.ca.go.ke/sites/default/files/CA/USF%20Strategy/Universal%20Service%20Fund%20Strategy%202023-2027.pdf

102 BPK Regulation Database. (2020). *Peraturan Menteri Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi Nomor 13 Tahun 2020 tentang Prioritas Penggunaan Dana Desa Tahun 2021.* https://peraturan.bpk.go.id/Details/151181/permendes-pdtt-no-13-tahun-2020

103 Ministerio de Tecnologías de la Información y las Comunicaciones (MinTIC). (2025, 9 May). "Conectando a los no conectados", proyecto del Ministerio TIC con la Unión Europea y Colnodo para la reducción de la brecha digital en zonas rurales de Colombia. https://www.mintic.gov.co/portal/inicio/Sala-de-prensa/Noticias/401110:Conectando-a-los-no-conectados-proyecto-del-Ministerio-TIC-con-la-Union-Europea-y-Colnodo-para-la-reduccion-de-la-brecha-digital-en-zonas-rurales-de-Colombia

The example above from Colombia and similar examples of investment in CCCIs in Argentina[104] are well aligned with the EU-LAC Global Gateway Investment Agenda on Inclusive Digital Transformation, which focuses on last-kilometre connectivity.[105] Similarly the Working Group on Connectivity from the D4DHub is interested in learning more about financing mechanisms for these solutions.

One option could be to explore the creation of a facility similar to the Digital Investment Facility (DIF) funded by the European Commission, Germany and Finland and implemented by GIZ and HAUS,[106] but focused on social and solidarity economy entities providing last-kilometre connectivity that is green and secure. Beyond the contribution to wide social, environmental and development objectives, this could position the Global Gateway strategically in what some analysts consider to be a geostrategic opportunity.[107]

One last stakeholder to consider in this ecosystem is philanthropy. Its potential role in unlocking supporting funds should also not be underestimated. Although it has been observed that their role in the digital sector is currently relatively small,[108] with, for example, only 0.05% of US philanthropy going to digital equity related projects,[109] some charities are starting to take much-welcomed action[110] and could play a more central role in addressing digital exclusion through their engagement in social innovation.[111]

104 The Global Gateway project entitled "Rural Development Programme (PROSAP V): investments in rural roads, irrigation, rural electrification, fire risk management, rural internet connectivity and rural marketplaces" in Gran Chaco, Argentina (https://international-partnerships.ec.europa.eu/system/files/2023-07/EU- Argentina-partnership_en_0.pdf) contains a CCCI component related to the Nanum Mujeres Conectadas project (https://mujeresnanum.org/)

105 https://international-partnerships.ec.europa.eu/policies/global-gateway/eu-lac-global-gateway-investment-agenda_en#an-inclusive-digital-transformation

106 D4D Hub. (2024, 25 September). Turning African Opportunities into Reality: Digital Investment Facility Launches Expressions of Interest for Infrastructure Projects. https://d4dhub.eu/news/turning-african-opportunities-into-reality-digital-investment-facility-launches-expressions-of-interest-for-infrastructure-projects

107 Ben-Avie, J., & Thibaut, K. (2025, 19 March). Connecting the other half of humanity is the deal of the century. *Digital Forensic Research Lab.* https://dfrlab.org/2025/03/19/connecting-the-other-half-of-humanity-is-the-deal-of-the-century/

108 Gilbert, L. (2022). Op. cit.

109 Connect Humanity. (2022). *Funding to bridge the digital divide: U.S. philanthropic giving to digital equity causes.* https://connecthumanity.fund/research-philanthropic-giving-to-digital-equity/

110 Notably the Internet Society Foundation, 48% Foundation, APNIC Foundation and the Association for Progressive Communications.

111 Government Council for Social Innovation Summit. (2025). *Philanthropy's Role in Unlocking Social Innovation: A Strategic Partner for Governments.* https://ppy.issuelab.org/resources/44943/44943.pdf

While philanthropic dollars have traditionally been used to support digital skills, they can be used as catalytic investments for blended finance, or social impact funds, to support investments[112] in community-centred connectivity initiatives and their contribution to sustainable development.

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112 Cafferkey, P., Gianoncelli, A., Hanses, H., & Surmatz, H. (2024). *Philanthropic organisations using the entire toolbox for more impact: Paper on foundation practice, as well as regulatory and policy environment.* Philea. https://search.issuelab.org/resource/philanthropic-organisations-using-the-entire-toolbox-for-more-impact-paper-on-foundation-practice-as-well-as-regulatory-and-policy-environment.html

6. Conclusion

With this paper we hope to have contributed to respond to the question the AFD-EU International Conference aims to answer, by describing innovative solutions, such as community-centred connectivity initiatives (CCCIs), to address inequality. Through this paper we have demonstrated the transformative potential of CCCIs in advancing digital inclusion, economic participation and social impact through green connectivity. As such, CCCIs are an integral part of any strategy to create a greener and more just world and may offer one of the few real prospects for allowing the barely connected and the unconnected to participate more meaningfully in the defence of the planet.

Despite the high capital requirements and operational challenges these initiatives face, their ability to provide meaningful connectivity and bridge the digital divide in a more cost-effective way, and foster local ownership, sets them apart as powerful drivers of equitable digital transformation and sustainable development.

To unlock their full potential, governments and other stakeholders must move swiftly to create enabling environments – through tailored regulation, innovative financing mechanisms, infrastructure access and capacity building. These steps will ensure that these initiatives can thrive, closing the digital divide and bringing the benefits of connectivity and the digital economy to everyone, everywhere, while safeguarding the natural world that sustains us all.

A TREE IS KNOWN BY ITS FRUIT: GROWING COMMUNITY-CENTRED CONNECTIVITY FOR INCLUSION, EQUALITY AND SUSTAINABILITY