UNDERSTANDING COMMUNITY-CENTRED CONNECTIVITY INITIATIVES IN ASIA AND THE PACIFIC

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EXECUTIVE SUMMARY

Approximately 67% of the population in Asia and the Pacific uses the internet. However, the digital divide in the region remains a persistent challenge, with connectivity gaps existing both between and within countries, and between urban and rural areas. Disparities in access to digital technologies and the internet are also evident among different socioeconomic groups, with poor and far-flung communities particularly far behind. Hence, the economic and social implications for people living in these communities are profound, affecting everything from educational opportunities to economic growth and social development.

In recent years, community-centred connectivity initiatives (CCCIs) have become increasingly recognised as an innovative, bottom-up solution to address the persistent digital divide. They provide connectivity that is shaped by the community itself in a manner that reflects the different interests and relationships within the community, even if the community does not directly provide the infrastructure and services itself. Community-centred connectivity initiatives are complementary to the internet access offered by commercial service providers and state-sponsored public access networks. Studies in Africa and Latin America reveal how significant CCCIs have been in reducing the digital inequalities in these regions. However, little is known about how CCCIs in Asia and the Pacific have evolved and have contributed to addressing the digital and technological disparities in the region. Hence this report on research commissioned to better understand how CCCIs promote internet access in poor and remote communities, and to build awareness of their contribution to economic and social development in the region. As such, this study sought to

- Map CCCIs in the Asia-Pacific region, and
- Describe selected CCCI models and approaches.

The mapping started with a secondary literature review that led to identifying 331 projects providing community-centred connectivity, and inviting them to participate in an online survey designed to gather information about their CCCI models. From this group, 31 organisations were selected for structured interviews and detailed analysis. As a result of those engagements 1,417 CCCIs were initially identified. They are mostly located in South and Southwest Asia (54.13%), followed by Southeast Asia (38.53%) and the Pacific (5.93%), with a very minimal presence in Central and North Asia (1.34%), and East and Northeast Asia (0.07%).[1] The responses to the survey point to CCCIs being a relatively a recent phenomenon in the region, as a majority of them were established from 2021 onwards and are still active, offering internet connectivity primarily.

The analysis indicates that CCCIs in Asia and the Pacific have become catalysts for social and economic transformation, particularly in geographically isolated and disadvantaged areas (GIDAs). In addition, they have demonstrated success in improving access to education, healthcare services and economic opportunities. Both the survey and key informants (representing over 40% of the total CCCIs identified) validate LocNet's 13 principles[2] and typology of CCCIs.[3]

1 For this study, the list of countries from Asia and the Pacific are the members of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), and the sub-regions considered here are those defined by UNESCAP. A full list of countries per sub-region can be found in Appendix 6..

2 https://www.apc.org/en/pubs/principles-community-centred-connectivity-initiatives

3 https://www.apc.org/en/pubs/typology-community-centred-connectivity-initiatives

The CCCIs involved in the more in-depth key informant interviews (KIIs) may be classified into three categories: self-provision, social business or entrepreneurial non-profit. Some have later formed local social cooperatives. There are initiatives currently financed by the local municipal government. All the CCCIs analysed are community-centred, operating in mostly low-income and geographically isolated communities where internet access was either unreliable, costly, or non-existent.[4]

Two major motivations emerge from these CCCIs. For most, the provision of stable and affordable connectivity to communities was the ultimate reason for setting up the networks. In the process of providing connectivity, value-added services have been integrated to ensure that social inclusion and/or sustainability are achieved. On the other hand, entrepreneurial non-profit entities with existing social enterprises (SEs) have integrated connectivity efforts primarily to improve the productivity, incomes, social impact and sustainability of their enterprises. Almost all involve community organisations or members as service providers, resellers, and/or end users, and some involve partner communities in managing the passive telecommunications infrastructure.

The capital expenditures for most of the initiatives were externally funded through grants or donations. Many of the initiatives combined a myriad of investors – from locals themselves, to grants from development partners, to public finance, while most of the social businesses combined their own resources with grant support from external sources. In terms of operational expenses, most self-initiated and entrepreneurial non-profit organisations rely on user fees and/or grants, and two initiatives, which are now self-sustaining, rely on government support or user fees to cover the cost of operations. Social businesses mostly rely on advertisements or user fees to cover their CCCI services. For those who charge fees for connectivity services, prices are usually set below or equal to the market price.

The establishment of CCCIs has resulted in a number of social, economic and environmental gains for the communities covered. In terms of social benefits, they are no longer isolated from the outside world and are now digitally connected. Community centres have become gathering places where the residents can safely catch up, learn together, and discuss community matters. Moreover, they have been enabled to access government services that are otherwise difficult to access or inaccessible. Beyond accessing government portals online, the communities also see connectivity as a tool to influence the government and help make it more accountable. In addition, being online has allowed them to create and access educational and learning tools, as well as materials promoting their culture and traditions, especially for Indigenous communities. At the same time, the online networks have led to better coordination and security, safer communities, and faster emergency response during calamities and disasters.

In terms of economic benefits, the online content developed by the locals has stirred up tourism in several communities. Entrepreneurial non-profits in Southeast Asia have utilised CCCIs to improve the efficiency, market reach, productivity and incomes of the enterprises they implement and/or support. Others have found income sources by marketing their products online, engaging in the Piso

4 For the purpose of the mapping of CCCIs, member countries of UNESCAP that are also members of the Organisation for Economic Co-operation and Development (OECD), namely Australia, Japan, New Zealand, the Republic of Korea and Türkiye, were not considered given their level of economic development.

(coin) Wi-Fi machine rental and print services, selling internet vouchers, and practising sustainable agriculture technologies learned online. Meanwhile, several initiators note income-generating opportunities seized by users, on their own, due to the accessibility of the online network. The low cost of connectivity offered by most CCCIs has forced other local telecom players in the area to lower the cost of their own services.

The CCCIs have also contributed to environmental protection through promotion of sustainable agriculture; use of internet of things (IoT) technology to monitor agricultural processes, water distribution and environmental factors; and reliance on renewable energy to power their internet connections.

Regardless of legal form or CCCI classification, all the CCCIs were established primarily for social impact, adopting, knowingly and unknowingly, a social enterprise (SE) model. SEs are entities that seek to achieve both social and financial benefits from their services. Unlike traditional businesses that seek profit mainly to enrich the owners of capital, SEs contribute to resolving social and environmental problems while also distributing the wealth created to a broader constituency, especially those from the poor and disadvantaged communities and sectors.[5] Government support is necessary to ensure that there is a conducive policy and regulatory environment for these CCCIs, as well as the presence of financial and capacity-building resources to help establish and sustain the operator providing the connectivity.

The CCCIs studied in North and Central Asia have the financial viability, community empowerment and government support to sustain their initiatives over a long period. For the rest of the regions, the social businesses are doing well in terms of wealth creation but may need to better involve the villages they serve, with more local involvement. The self-initiated and entrepreneurial non-profit initiatives in other parts of Asia and the Pacific, meanwhile, have fully involved their partner communities in the management and operations of the network initiatives, but most still lack the mechanisms for achieving financial viability.

All CCCIs have raised concerns over the lack of enabling policies or vague regulations governing CCCIs, difficult and complicated licensing processes, and corruption in the regulatory system. Other challenges include unreliable power supply, possible competition in connectivity services, lack of community interest and support, impact of climate change, limitations in technically equipped human resources, and the need to strengthen the people's capacity to promote and market their products.

To thrive and fully achieve sustainability, CCCIs need startup resources and an enabling environment. Hence, governments and funders need to support CCCIs not only for their important potential to help connect the unconnected, but also as a segment of SE that seeks to create wealth and social impact for the poorest and most marginalised sectors. To address sustainability concerns and other challenges, the following recommendations are proposed:

5 Dacanay, M. L. (2013). *Social Enterprises with the Poor as Primary Stakeholders: Responding to State and Market Failures in the South.* EMES-SOCENT Conference Selected Papers. http://emes.net/content/uploads/publications/Dacanay_ECSP-LG13-67.pdf

Recommendations for government and policy makers: Create an enabling regulatory environment that supports CCCI development, and encourages investment. This includes:

- Recognising the role of CCCIs in closing the digital divide by integrating them into national broadband strategies and digital policies.
- Simplifying and streamlining licensing regulations and procedures for CCCIs.
- Establishing clear policies for affordable spectrum access and infrastructure sharing
- Creating transparent wholesale open access to backhaul capacity.
- Providing fiscal incentives such as waivers on import duties and taxes for investors.
- Contributing financially to CCCI development, such as through universal service fund allocations.
- Supporting technical assistance and capacity building for CCCIs.
- Involving government departments, such as education and health, which can benefit from CCCI-provided connectivity as anchor clients and premises providers.

Recommendations for funders: Unlock additional funding for CCCIs that are financially sustainable and generate significant social impact. This includes:

- Reducing the burdens on CCCIs for obtaining subsidies and grants – increase project implementation periods, simplify impact metrics and streamline reporting requirements.
- Considering one-time grants to offset equipment costs.
- Using staged grant-making strategies that encourage CCCIs to move to new sustainability milestones that unlock larger funds at each stage.
- Using innovative financial instruments – blended finance, revenue-based financing, concessional loans, crowdfunding and credit guarantees, etc.
- Adopting schemes for financing end-user devices such as micro loans.
- Supporting elements of the meaningful connectivity ecosystem beyond infrastructure such as teaching and learning materials and applications in local languages, etc.
- Prioritising support for connectivity in vulnerable populations, including Indigenous communities, women-led social enterprises, those with disabilities and refugees.

Recommendations for CCCIs and stakeholders: Prioritising cost-effective deployments and efficient management to achieve financial sustainability and maximise impact. This includes:

- Adopting a hybrid funding approach, combining initial grant funding with sustainable revenue-based loans to cover initial operating expenses.
- Pushing for the prioritisation of resilient, climate-adapted solutions in infrastructure development to address impacts of climate change on exposed and vulnerable groups.
- Supporting capacity development programmes for CCCIs, and including platforms for learning exchanges to address common challenges.
- Integrating gender-responsive approaches from the planning stage, which includes safe spaces for internet access, women-focused technical training programmes and local applications, and connectivity initiatives with women's entrepreneurship opportunities.
- Promoting community ownership and governance among CCCIs, involving communities from the planning stage and transferring responsibilities to local stakeholders.
- Targeting older people to acquire digital skills.

- Situating network access points and administrative operations in places that are accessible to diverse genders, physical abilities, ethnicities, classes, castes, etc.

The future of CCCIs in Asia and the Pacific depends on their ability to balance social impact with financial sustainability while navigating complex regulatory environments. Success will require continued innovation in both technical solutions and business models, always keeping community needs and empowerment at the centre of these initiatives. Given these challenges, the entry of the social enterprise sector as stakeholders in community-centred connectivity initiatives is a significant development in the region, as they pursue innovative and sustainable solutions towards bridging the digital divide.

Glossary of terms[6]

Active infrastructure	Electronic equipment needed to encode information sent over the network into physical signals. It typically has a lifespan of five to15 years. Examples are case stations, wireless access points, switches, routers and servers.
Capital expenditures	The money an organisation or corporate entity spends to buy, construct, maintain or improve its fixed assets, such as buildings, towers, vehicles, equipment and/or land.
Civil society organisations	Formal and informal organisations such as non-governmental organisations (NGOs), community-based organisations (CBOs), Indigenous peoples' organisations (IPOs), academia, journalist associations, faith-based organisations, trade unions and trade associations. UNDP defines civil society organisations in its policy of engagement with CSOs (2001) as "non-state actors whose aims are neither to generate profits nor to seek governing power. CSOs unite people to advance shared goals and interests."
Community	People with common ties residing in a common geographic area, whether in urban, rural or remote areas.
Community-centred connectivity	Use of the internet connectivity being focused on the needs of the community; or, as stated in the first principle for community-centred connectivity, initiatives that provide "meaningful internet communications infrastructure or services to communities [...] that respond to the diverse needs and interests of communities so that they can be empowered to participate in their own development."

6 Most definitions were borrowed from the *Typology of community-centred connectivity initiatives* developed by the Local Networks initiative, led by APC and Rhizomatica. https://www.apc.org/sites/default/files/typology-of-community-centred-connectivity-initiatives.pdf

Community development	A process where community members come together to take collective action and generate solutions to common problems.
Internet service provider	An organisation that provides myriad services related to accessing, using, managing or participating in the internet. Internet service providers (ISPs) can be organised in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned.
Local government	Institutional units whose fiscal, legislative and executive authority extends over the smallest geographical areas distinguished for administrative and political purposes.
Operational costs	Ongoing expenses that are inherent to the operation of the assets and services.
Passive infrastructure	Physical non-electronic medium over which information can be transmitted. It typically has a lifespan of >50 years. Examples are ducts, masts, poles, network operations centre (NOC) and fibre.
Postpaid/subscription	A subscription refers to a service where a customer is billed for the service on a monthly basis at the end of each monthly billing cycle, after consuming services they are entitled to use.
Public service	Any service intended to address specific needs pertaining to the aggregate members of a community.
Social enterprise	Social mission-driven organisations that create wealth and contribute to social well-being and ecological sustainability, with many focused on poverty reduction and improving the quality of life of marginalised sectors, including providing them with meaningful connectivity.
Social inclusion services	These are oriented towards addressing digital exclusion. They relate to services addressing meaningful connectivity, or other factors behind the “usage gap”. Examples include affordable internet services in local languages or to meet other community needs (content), access to shared devices (i.e. computer labs or hubs), environmental sensors and other internet of things (IoT) networks that bring meaning to the connectivity and address communities’ needs, and training for digital skills.

Transactional services	These relate to connectivity services that can be accessed via payment of money or other form of agreed transaction in exchange for the service.
Transformational services	These are oriented at enabling local people to become actors in their own development. These are services that build their capability to own, govern and manage digital resources in a way that could positively impact on their lives and the lives of their families and communities. Transformational services enable the poor and excluded to be co-owners, supervisors, managers and decision makers or to become leaders and stakeholders of the social enterprises that provide digital-related services and ensure meaningful connectivity.
Usage based (prepaid)	The standard pricing system for consumer connectivity services in low- and middle-income countries. Here the consumer pays for data services through a prepaid pay-as-you-go model. This can take the form of very low-cost incremental pricing, offering users time-based packages for internet connectivity.
Value-added services	Operating expenses are covered by services other than data usage, such as value-added services that subsidise data provision (e.g. printing, internet cafes, training, device charging and repair, and access to information systems). In some cases, the income comes from selling services to other operators (e.g. capacity in the backbone/backhaul or space on their towers).

INTRODUCTION

Community-centred connectivity initiatives (CCCIs) have emerged as a promising approach to bridge the digital divide globally. They provide connectivity that is shaped by the community itself in a manner that reflects the different interests and relationships within the community, even if the community does not directly provide the infrastructure and services itself. They are complementary to the internet access offered by commercial service providers and state-sponsored public access networks. Such initiatives may just be the response needed to address the stark contrasts in the digital landscape and digitalisation journey of Asia and the Pacific, with rapidly advancing technologies co-existing alongside significant connectivity gaps. This paradox underscores the pressing need to address the digital divide in a region poised for tremendous growth yet hindered by uneven access to digital resources.

Connectivity serves as a cornerstone for economic growth in the Asia-Pacific region. Access to digital technologies and the internet is crucial for businesses to participate in the global economy, increase productivity and tap into new markets. The digital divide, however, continues to hinder economic progress, especially in rural and isolated areas, creating a cycle of disadvantage for unconnected communities. While urban centres often enjoy high-speed internet and advanced digital infrastructure, rural and remote areas continue to lag behind. This urban-rural divide is a key factor driving the overall digital divide in the region. Disparities in access to digital technologies and the internet are evident not only between urban and rural areas but also among different socioeconomic groups. These inequalities extend beyond mere access to include factors such as affordability, digital literacy and the relevance of available content. The economic and social implications of this divide are more profound, affecting everything from educational opportunities to economic growth and social development.

According to the International Telecommunication Union (ITU), approximately 67% of the population in Asia and the Pacific uses the internet, in line with the global average. However, this statistic masks significant disparities within the region. The digital divide remains a persistent challenge, with connectivity gaps existing both between and within countries. Affordability of internet services and the lack of adequate infrastructure remain significant barriers to closing the digital divide. In many parts of Asia Pacific, the cost of internet access relative to income levels is still prohibitively high for a large section of the population. Additionally, the deployment of infrastructure, particularly in geographically challenging areas, continues to be a major hurdle. Beyond physical access, the digital divide in Asia Pacific is also characterised by disparities in digital literacy and skills. Even where internet access is available, lack of digital skills can prevent individuals and communities from fully leveraging digital technologies for economic and social benefit.

The persistent digital divide in Asia Pacific is due to a combination of factors including geographic challenges, economic disparities, and varying levels of government prioritisation and investment in digital infrastructure. The rapid pace of technological advancement also means that as some gaps are closed, new ones emerge, creating a moving target for policy makers and stakeholders. Infrastructure development continues to be a key challenge, particularly in remote and rural areas.

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7 https://www.itu.int/itu-d/reports/statistics/2022/11/24/ff22-internet-use/#:~:text=Approximately%20two-thirds%20of%20the%20population%20in%20the%20Arab,is%20just%2040%20per%20cent%20of%20the%20population

8 Kim, J. Y., Park, J., & Jun, S. (2022). *Digital transformation landscape in Asia and the Pacific: Aggravated digital divide and widening growth gap*. ESCAP. https://www.unescap.org/kp/2022/digital-transformation-landscape-asia-and-pacific-aggravated-digital-divide-and-widening

Geographical barriers often make traditional connectivity solutions economically unfeasible, necessitating innovative approaches. Access to radio spectrum, energy infrastructure, and land for towers and equipment installation further complicate the deployment of connectivity solutions. Regulatory barriers, including restrictive licensing regimes and complex administrative processes, also impede progress. The twin issues of affordability and digital literacy present significant barriers to connectivity in many parts of Asia Pacific. High costs of internet access and digital devices, coupled with low levels of digital skills, prevent many from fully participating in the digital economy.

In addressing the persistent digital divide in Asia Pacific, innovative approaches have emerged that complement traditional top-down solutions,[9] particularly targeting those disproportionately impacted by the lack of access to and ability to use digital tools and services, such as Indigenous peoples, women-led social enterprises, and migrants. Among these, social enterprises (SEs) acting as CCCIs stand out as particularly promising and relevant to the region's diverse challenges and have been identified as unique and potentially impactful players in addressing connectivity challenges in Asia Pacific. These organisations combine business principles with social goals, offering innovative solutions to bridge the digital divide while creating sustainable economic opportunities. The link between connectivity and social enterprises in the region is multifaceted. Improved connectivity can enable the growth and impact of social enterprises, while these organisations can play a crucial role in developing and implementing innovative connectivity solutions for underserved communities.

Meanwhile, many CCCIs take on or associate themselves with a social enterprise form and practice. By adopting an SE model, these community-centred initiatives can ensure financial sustainability while maintaining their primary focus on social impact. This approach allows them to be more agile, responsive to local needs, and capable of navigating the complex regulatory and cultural landscapes of the Asia Pacific region. The SE model is particularly well-suited to address the multifaceted nature of the digital divide. While traditional approaches often focus primarily on infrastructure deployment, SEs can simultaneously tackle issues of affordability, digital literacy, and content relevance. For instance, a community-centred project operating as a social enterprise might not only set up a local network but also provide digital skills training and develop platforms for local content creation, thereby addressing multiple dimensions of the digital divide concurrently.

While universal access has been a primary goal for many governments and institutions, there is growing recognition that meaningful access is equally important. This shift in focus emphasises not just the availability of internet connections, but also the quality, affordability and relevance of digital services to users' lives. While mobile internet has become the primary means of access for most people in the region, with smartphones far outnumbering fixed line subscriptions, many still lack meaningful connectivity – a concept that goes beyond mere access to encompass factors such as speed, device quality, data allowance and regularity of use. SEs and CCCIs are well-positioned to deliver this meaningful access, as they are inherently focused on creating value for the communities they serve.

9 The Internet Society has developed a DIY toolkit that provides a step-by-step guide to developing such solutions, in particular, community networks. See: https://www.internetsociety.org/resources/community-network-diy-toolkit

The role of public-private partnerships in expanding connectivity has gained increasing attention, with SEs often serving as valuable intermediaries between large corporations, governments, and local communities. Cross-border cooperation in Asia Pacific is also essential for addressing connectivity challenges, particularly for landlocked countries and small island developing states. In this context, SEs with their flexible and innovative approaches can play a crucial role in facilitating and implementing regional initiatives.

This research hopes to provide an overview and understanding of the current digital landscape in Asia Pacific, and the role of SEs and CCCIs in addressing the digital divide in the region. These models may offer a pathway to not just universal access, but meaningful access – ensuring that connectivity translates into tangible benefits for communities across the diverse Asia Pacific region. This study primarily sought to:

- Map existing CCCIs in the Asia-Pacific region, and
- Examine various models and strategies for connecting last-mile users.

METHODOLOGY

In order to map community-centred connectivity initiatives (CCCIs), the different elements of the term need to be unpacked.

Initiatives at the community level are the unit of analysis in this study. In this context, community is defined as "people with common ties residing in a common geographic area,"[10] whether in urban, rural or remote areas. The common geographic area may be governed by tribal or Indigenous authorities, or a democratically elected administration. In this sense, community members have institutions in common, and have strong social ties, and shared identities and actions tied to a particular place.

"Community-centred connectivity" refers to the use of internet connectivity being focused on the needs of the community; or, similarly, one that provides meaningful internet communications infrastructure or services to communities that respond to the diverse needs and interests of communities so that they can be empowered to participate in their own development.

This is also a reflection of the growing recognition that there are many types of initiatives that, without being developed by the community itself, can be "community-centred". These initiatives are often established in communities by what can be considered long-term "partners", and besides providing very necessary connectivity services, they have other positive social impacts such as training and hiring people from the community, procuring services from the community and reducing access costs considerably. They have a "social mission" or, as included in the principles, are concerned with the "well-being" of the community. Besides this, it is acknowledged that there will be communities not interested or able (with a rational use of resources) to provide connectivity to themselves sustainably. This includes private businesses that were created (or evolved) to have a strong social mission and are generating benefits to the communities and who felt excluded from the community networks movement.

At the same time, this new conceptualisation also embraces the "complementary access networks and solutions" language that has been incorporated in different resolutions of the International Telecommunication Union (ITU),[11] complementing it by nuancing and delineating those networks and solutions. All models presented here complement other efforts made by the telecommunications industry to provide meaningful connectivity, and in no way aim at replacing them.

Building the database

The mapping started with a secondary literature review that included reviewing grants recipients from the Internet Society,[12] the APNIC Foundation,[13] and the Association for Progressive Communications, among others. Access to the database of projects created by 1 World Connected[14] was granted and their projects in the region added. In addition, the proceedings of regional

10 MacQueen, K. M., et al. (2001). What is community? An evidence-based definition for participatory public health. *American Journal of Public Health*, 91(12), 1929-1938. https://doi.org/10.2105/AJPH.91.12.1929

11 Resolution 37 (Rev. Kigali, 2022): Bridging the digital divide. https://www.itu.int/md/meetingdoc.asp?lang=en&parent=D18-WTDC21-C-0103 and Resolution 139 on Use of Telecommunications/ICTs to bridge the digital divide and build an inclusive information society. https://www.itu.int/pub/S-CONF-ACTF-2022

12 https://www.internetsociety.org/funding-areas/connecting-the-unconnected/2

13 https://apnic.foundation

14 https://1worldconnected.org

conferences such as the Asia Pacific regional Internet Governance Forum and the Community Network Exchange[15] were reviewed to further identify organisations and projects. That initial effort led to identifying 331 projects and organisations which had the potential to be providing community-centred connectivity. This database became the basis for reaching out and inviting all CCCIs identified to participate in an online survey designed to collect basic information about their organisations and the digital services they provide to communities.

Online survey

The survey questionnaire was made up of 18 questions revolving around project details such as duration, location, status and service provided, among others. Moreover, it asked respondents to rate the connectivity initiatives based on pre-identified principles. The survey started with a confidentiality clause to seek consent from its respondents. Towards the end of the tool, open-ended questions about community involvement in the projects as well as referrals to similar projects for further data collection were asked. A total of 276 respondents from Asia and the Pacific completed the online survey which also came translated in Bahasa.[16]

Key informant interviews

There were 31 key informants (KI) representing projects and organisations involved in the development of community-centred connectivity in the region. These KIs were engaged between July and September 2024 to better understand the initiatives they were involved with. In total the KIs selected had been involved in over 42% (599) of the total initiatives identified. The CCCIs were selected based on three categories:

- CCCIs set up less than three years ago, those that are existing, or are setting up new CCCIs based on innovative models.
- CCCIs set up more than three years ago and have developed a self-sustaining model for the initiative.
- CCCIs set up more than three years ago and are dependent on funding for their growth and expansion.

There was an effort to engage KIs who were deploying different technologies and sustainability models. Meanwhile, the SEs engaged in CCCIs were selected based on the list provided by the Institute for Social Entrepreneurship in Asia (ISEA). For the final KI list, representation from the different regions in Asia and the Pacific was also considered, resulting in 13 in Southeast Asia, 11 in South and Southwest Asia, three in the Pacific, three in North and Central Asia, and one in East and Northeast Asia (see Table 1 for a country breakdown). In most of the engagements with the KIs, a structured interview format was followed.[17] Request for permission to use the KI's input for the report was sought once the report was in its final draft form.[18]

15 https://www.cnxapac.org

16 Please refer to Appendix 1 for a copy of the online survey.

17 Please refer to Appendix 2 for a copy of the KII guide questions.

18 One of them requested anonymity and hence the work of 30 organisations, instead of 31, is included in the tables below.

Data analysis

Descriptive statistics were used to analyse the quantitative responses from the survey while qualitative data were examined through the identification of the distinct features, as well as patterns and themes, arising from the interviews. The identification of patterns and themes was guided by the Local Network (LocNet) initiative's Typology of CCCIs and Principles for CCCIs.[19]

19 Both documents were developed through an extensive consultation process with community-centred connectivity initiatives working in different communities across the global South, with participants and partners in the Local Networks (LocNet) initiative run by the Association for Progressive Communications (APC) and Rhizomatica, and with APC members, all of whom have internet rights at the core of their activities. The process included a survey, a face-to-face group discussion, and email and online consultations. Please refer to Appendices 3 and 4 to learn more about the Principles for CCCIs and Typology of CCCIs, respectively.

RESULTS AND DISCUSSION

Overview of CCCIs in Asia

As a result of the steps outlined above, 1,417 CCCIs were identified. They are mostly located in South and Southwest Asia (54.13%), followed by Southeast Asia (38.53%) and the Pacific (5.98%), and very minimal presence in Central and North Asia (0.43%), and East and Northeast Asia (0.07%).[20] The country distribution is shown in Table 1.

Table 1. CCCI distribution per sub-region and country

UNESCAP sub-region	Country	Number of CCCIs identified
North and Central Asia	Armenia	7
	Georgia	8
	Kyrgyzstan	4
East and Northeast Asia	China	1
Pacific	Cook Islands	6
	Kiribati	3
	Federated States of Micronesia	7
	Papua New Guinea	27
	Samoa	1
	Solomon Islands	10
	Vanuatu	30
South and Southwest Asia	Afghanistan	1
	Bangladesh	138
	Bhutan	2
	India	536
	Nepal	30
	Pakistan	59
	Sri Lanka	1

20 For this study, the list of countries from Asia and the Pacific comprises members of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), and the sub-regions considered here are those defined by UNESCAP. A full list of countries per sub-region can be found in Appendix 6.

UNESCAP sub-region	Country	Number of CCCIs identified
Southeast Asia	Cambodia	1
	Timor-Leste	3
	Indonesia	23
	Lao People's Democratic Republic	1
	Malaysia	3
	Myanmar	271
	Philippines	93
	Thailand	52
	Viet Nam	99

The relatively high number of initiatives in some countries can be attributed to efforts from some internet pioneers from those countries such as those from Dr. Kanchana Kanchanasut in Thailand,[21] Mahabir Pun in Nepal,[22] Onno Purbo in Indonesia,[23] or initial efforts in India from AirJaldi and initial supporters, who organised a summit in Dharamsala in 2006 to discuss the advantages that wireless networks can provide through, among other things, enhancing the quality of education, governance and health care, increasing economic development and promoting cultural exchange.[24] These efforts, and those who followed them, supported in part by the Internet Society's Wireless for Communities (W4C) programme, and the Information Society Innovation Fund (ISIF) from APNIC, set the foundations for the developments that followed.

Beyond the concentration in certain regions and countries, it is noticeable that no initiatives were identified in 23 countries in the region. This is the first attempt of mapping community-centred connectivity initiatives in Asia Pacific, and as such some initiatives might not have been included in this map. This is the case of CCCIs initiated by governments at national level, through their universal services and access plans, and the local level, especially in countries where local government units (the Philippines) or village-owned enterprises (Indonesia) are enabled to establish connectivity projects. Similarly, efforts around smart villages could not be included. In future versions of this work, special focus attention will be given to these initiatives.

21 https://www.internethalloffame.org/inductee/kanchana-kanchanasut

22 https://www.internethalloffame.org/inductee/mahabir-pun

23 https://id.wikipedia.org/wiki/Onno_W._Purbo

24 Association for Progressive Communications. (2006, 29 November). Wi4D, techies and campaigners look at potential for the social world. https://www.apc.org/en/news/wi4d-techies-and-campaigners-look-potential-social-world

Despite some of the identified initiatives dating back to the beginning of the century, the survey reveals that the majority of the CCCIs were established in 2021 onwards and are still active, offering internet connectivity primarily. Most employ a household or office Wi-Fi hotspot while a little over one third deploy a public Wi-Fi hotspot to link communities online. Others provide services through community-owned public access centres or cybercafés, school-hosted public access centres, and mobile 2/3/4G networks. About a tenth provide online access through other facilities such as clinic, community centre, library, private cybercafé, etc.

On top of delivering online communication, most CCCIs are involved in enhancing the capacity of communities to use the internet through digital literacy and technical training. Online-related services are also provided such as intranet for the locality, financial/payment facilities, personal support for online services, cybercafé or computer centre. Some offer device charging, school connectivity, voice calls, offline connectivity and community radio services. A very small portion uses the connectivity for monitoring and collecting data on environmental conditions.

When asked to rate their services against CCCI principles from zero (not at all aligned with) to 10 (completely aligned with), most of the CCCIs affirm that their connectivity support is in line with the principles.[25] The CCCIs have an average score of above nine in the following areas:

Principle 1	Provision of connectivity to rural, remote and/or marginalised communities (9.92).
Principle 2	Allowing the community to shape the local connectivity they build and use in ways that are positive for the well-being of the community while actively minimising the risk of potential harm to the community (9.90).
Principle 3	Allowing the community to shape the local connectivity they build and use in ways that are affordable, aiming to strengthen local economies, rights, languages and cultures (9.90).
Principle 5	Allowing the community to participate in deploying and operating the infrastructure they build (9.89).
Principle 6	Adding value to people's personal, social, political and/or economic lives, particularly people in the community who are poorer and more marginalised than the majority (9.36).
Principle 4	Allowing the community to shape the local connectivity they build and use in ways that reflect the interests and relationships within the community, including when the community does not directly provide the physical infrastructure and services itself (9.34).
Principle 8	Striving for operational and financial viability/sustainability, local ownership, and community participation in the governance of the network (9.05).

25 This exercise was part of the development of the *Principles for community-centred connectivity initiatives* produced by the LocNet initiative: https://www.apc.org/node/40458

On the other hand, the CCCIs have given themselves an average score of above eight on the following concerns:

Principle 7	Taking into account the dynamics of power and gender (8.84).
Principle 10	Supporting collective action to influence, diversify and shape wider internet access markets, including building awareness and use of environmentally and socially sustainable solutions (8.18).
Principle 9	Interest in being a part of a broader national and global ecosystem that shares experiences and supports initiatives with similar principles (8.14).

The foregoing results reveal that the services provided by the CCCIs to the communities go beyond internet access. They involve the community in the process of establishing and managing the initiatives as well. When asked to specify the involvement of partner communities, the survey reveals that they are significantly involved in the management and operations of the initiatives at varying levels – from approval of the initiative, to resource contribution to set it up, to setting the directions on how the connectivity could be best utilised, to managing the daily operations, to the provision of technical support, to monitoring and assessing the results, to the promotion of the online network locally, and to serving as the main users of the internet connection, either for free or through paid/subsidised services. Many of the initiators have started with capacity-building efforts to ensure that partner communities are technically equipped to use/optimise the connectivity and/or manage the CCCI's operations.[26]

In-depth look at CCCI models and approaches

The CCCIs in focus

Out of the 1,417 CCCIs mapped in Asia, 599 initiatives where the 31 key informants were involved were looked into to provide a better and more detailed understanding of the emerging models and approaches of community-centred connectivity in the continent. Table 2 gives an overview of these initiatives and the organisations driving them, clustered by sub-region.[27] All are implemented in mostly low-income countries with a GDP per capita below the 2023 global average of USD 13,920.[28] Most communities where these initiatives are providing services are made up of informal settlers, farmers, fishers, labourers or Indigenous people – mostly belonging to low-income households. Some communities covered have diverse populations belonging to different tribes, religions or castes. All the CCCIs are directly providing internet and other services to the communities primarily to achieve social impact and make the lives of community members better.

26 Refer to Appendix 5 for the detailed results of the survey.

27 https://www.unescap.org/sites/default/files/Country_names_grouping_ESCAP_SYB2016_SDG_baseline_report.pdf

28 Rao, P. (2023, 29 March). Ranked: The World's 25 Richest Countries by GDP per Capita. *Visual Capitalist*. https://www.visualcapitalist.com/worlds-richest-countries-2023-gdp-per-capita/?form=MG0AV3

Except for the Department of Science and Technology (DOST) in the Philippines, which is a national government agency piloting CCCIs in remote schools and communities, almost all the drivers of the initiatives are either social business, self-provision, or entrepreneurial non-profit. Some have later formed or involved local social cooperatives to ensure community engagement and sustainability. There are at least two currently financed by the local government (public municipal) but these were primarily established by self-provision and entrepreneurial non-profit actors and evolved into a publicly financed scheme in recognition of the internet as a public good. Meanwhile, eight entrepreneurial non-profits have been managing and/or supporting social enterprises (SEs) prior to being engaged in CCCIs. These include BAIF Development Research Foundation and DHAN Foundation in India; Common Room Networks Foundation and Dompet Dhuafa in Indonesia; Philippine Coffee Alliance, Inc. and Philippine Rural Reconstruction Movement in the Philippines; Net2Home (previously called TakNet) in Thailand; and Sources for Action in China.

Table 2. Brief description of connectivity initiatives

	Initiative/initiator/ Year established	Country	Location/s	Brief description of the connectivity initiative
South and Southwest Asia (SSWA)				
1	AirJaldi 2009 (officially as a private limited company)	India	38 networks in 9 states covering 35 districts, and serving various and diverse groups in rural to semi-rural areas in India	Private limited ISP company offering a combined wireless (25%) and fibre (75%) network, providing rural households fast and affordable internet services through the use of new, existing, and innovative infrastructure and technologies; develops, pilot-tests, and shares new technologies to help small to medium-scale ISPs provide uninterrupted services and trains locals to be hired as workers.
2	BAIF Development Research Foundation 2019	India	13 villages in Palghar District, Maharashtra State, Western India	Non-profit organisation doing research and creating opportunities for marginalised groups. In partnership with Institute of Technology Bombay (IIT Bombay), has enabled internet connectivity through a SIM card-based cellular router in Pathardi Village. It used SIM cards from Vodafone and Reliance Jio ISPs.
3	Community Radio (CR) Bolo (Jadeite Solutions Pvt Ltd with Radio Bulbul) 2021	India	Radio Bulbul in the rural Bhadrak District of Orissa, in partnership with 3 local schools	Private limited company partnering with a CSO-managed local radio in managing combined online and offline mesh networks; uses Interactive Voice Response (IVR) to store free broadcast and educational content which can be accessed offline through the land network using pre-recorded voice messages where users dial a number through a GSM band and follow instructions for access.

Initiative/initiator/ Year established		Country	Location/s	Brief description of the connectivity initiative
4	DHAN Foundation 1997	India	Mysore, Karnataka, India; Poor families in 16 states of India	A social enterprise institution that empowers community-based organisations with the goal of helping poor people get out of poverty. It implements the ICT for Poor Programme which has helped establish community resource centres in villages where people can use equipment (e.g. laptops, printers) and connect via the internet to access digital resources and other e-services.
5	Digital Empowerment Foundation (DEF) 2002	India	1,500 Community Information Resource Centres (CIRCs) in 135 districts across 24 states and union territories; 1 tea tribe community (Adivasi) in Assam	Non-profit initiating the establishment of CIRCs, which are community-driven and -managed public spaces with access to the internet, digital literacy training, and various digital tools to support education, health, livelihood, and public service delivery.
6	Digital Dera (Agriculture Republic) 2021[29]	Pakistan	Chak 26 S/P, Pakpattan District in Punjab (one of the most fertile regions in Pakistan)	Private limited operating a solar-powered community service centre that provides access to digital tools and climate-smart agricultural data and practices to smallholding farmers, youth and women.
7	Foundation for Architecture and Community Equity (FACE) 2023	Bangladesh	Ukhiya Upazila of Cox's Bazar	Non-profit organisation assisting women from Rohingya camps to improve their livelihood through the creation of fashionable items and connecting them to possible partners and market; internet connectivity provided through a router connected to the local network. Access points built to connect to the router and spread Wi-Fi signals to users.
8	Hello World 2012	Nepal	24 communities along Kathmandu Valley, mostly belonging to the Tamang ethnic group found in Central Region (18 hubs), Western Region (3 hubs), and Far Eastern Region (1 hub)	Non-profit global organisation building "Hello Hubs" – outdoor, solar-powered internet kiosks that communities can build, manage and maintain themselves. The hubs provide access to the internet, with the bandwidth varying from hub to hub but a minimum of 10 Mbps is ensured with maximum bandwidth reaching up to 120 Mbps. Fourteen of the 24 hubs are hosted by schools. The rest are located in community halls/centres and chautaris (Nepali word referring to communal resting places where people can rest, take shelter, and socialise).

29 A common term in South Asia referring to a shared space where villagers gather and discuss community concerns over a cup of tea.

Initiative/initiator/ Year established		Country	Location/s	Brief description of the connectivity initiative
9	Janata Wifi 2018	Bangladesh	20 villages scattered across Bangladesh, mostly in rural areas	Private company providing free 4G open Wi-Fi hotspot access by strategically placing Wi-Fi nodes in local shops situated in areas with limited broadband access, enabling them to engage in digital financial services and offering free internet to community members in exchange for viewing brief advertisements. The system has a remote monitoring system to determine connection problems even before users realise them. Local ISPs provide the broadband backhaul and community hotspots comprise Wi-Fi access points, wireless access gateway, broadband backhaul, innovative software and power backup to ensure high-bandwidth, uninterrupted internet connection without data usage limits.
10	Nepal Internet Foundation / Everest Community Network 2022	Nepal	2 villages in the Everest region, 4,000 metres above sea level	Non-profit providing free fibre internet access to local schools, hospitals, clubs and community centres, as well as subsidised rates for household connection, towards the promotion of eco-friendly tourism and natural and cultural environment protection.
11	Welfare Association for New Generation (WANG) Connectivity 2022	Pakistan	Village Ahmed Abad Wang, Lasbela, Balochistan, serving 15 to 20 surrounding villages	Non-profit implementing the WANG Lab of Innovation (WALI), a centre equipping children and youth, especially girls, and farmers, with digital literacy skills. Through WALI, WANG invites artists to record, perform and create their content. WANG also manages a website for job-sharing in Balochistan.
Southeast Asia				
12	Central Visayas Information Sharing Network (CVISNET) 1997	Philippines	3 island villages (barangays) in Cebu; with expansion areas in 4 island barangays, Bohol	NGO collaborating with the government and private sector to improve digital infrastructure and connectivity in small islands through online solutions and web hosting, internet connectivity, disaster communications, e-education, e-health and e-governance solutions for local government units.
13	Common Room Networks Foundation 2016	Indonesia	Kasepuhan Ciptagelar, a Sundanese Indigenous village, within the Sukabumi Regency, West Java Province	NGO providing internet connectivity to foster innovation, creativity and entrepreneurship.

Initiative/initiator/ Year established		Country	Location/s	Brief description of the connectivity initiative
14	Davao Medical School Foundation (DMSF) 1976	Philippines	5 villages (barangays)	Non-profit partnering with people's organisations (POs),[30] rural health units and schools to ensure access to education, health services, affordable internet connectivity (through Piso or coin Wi-Fi machines connected through Starlink) and sustainable livelihoods.
15	Village Base Station (VBTS) Project 2018 and Resilient Education Information Infrastructure for the New Normal (REIINN) (Department of Science and Technology or DOST) 2022	Philippines	VBTS: 2 LGUs in Auroral Province REINN: 4 communities (barangays): San Andres, Tanay, Rizal; Looc, Castillejos, Zambales; Naguey, Atok, Benguet; Yabbi, Dupax Del Norte, Nueva Vizcaya.	The VBTS is a national government project implemented by DOST to bridge the digital divide through voice and SMS communication services using 2G GSM cellular technology in rural areas. The VBTS supports the REINN initiative, which is school-based and focuses on the development of application frameworks and infrastructures to supplement face-to-face classes and activities through the development and deployment of community LTE networks (LokaLTE); and utilising datacasting technology to supplement educational experiences of students (RuralCasting).
16	Dompet Dhuafa 1993	Indonesia	Cipanjalu, Cilengkrang, Bandung	Dompet Dhuafa is a humanitarian institution that conducts empowerment programmes among the "mustahik" or beneficiaries across the country. The institution implements initiatives like the Desa Tani programme, a community empowerment programme that aims to improve the economic well-being of smallholder farmers. An important aspect of the Desa Tani programme is the development of an internet of things (IoT)-based farmer village that provides necessary farm information and more efficient processes to its users.
17	Community Connect for LGUs (Nexlogic Tele-communications Network Inc.) 2005	Philippines	Pilot: Municipality of Pulilan, Bulacan (Prefers not to mention numbers of ongoing expansion areas)	Private telecommunications service provider offering free internet services to poor and low-income households (10 to 200 MB, renewable daily) in partnership with local government units (LGUs) and civil society organisations in the Philippines, primarily to ensure the poor's access to education and government services; incentivises digital participation in community/local governance (reporting of pipes leaking, attending health seminars) by earning points for tasks completed.

30 People's organisations (POs) in the Philippines are either community-based or sector-based organisations with members that belong to marginalised groups, communities or sectors.

Initiative/initiator/ Year established		Country	Location/s	Brief description of the connectivity initiative
18	PapuaCom	Indonesia (West Papua)	Bokondini	Entrepreneurial endeavour involving mobile data connectivity.
19	Philippine Coffee Alliance, Inc. 2011 CCCI: 2023	Philippines	Coffee-based enterprises in Kasibu, Nueva Vizcaya and Lagawe, Ifugao	Non-profit network of smallholder coffee farmers, spearheading the development of an IoT/information communications technology (ICT)-operated roasting machines using Arduino and Lorawan systems towards digitalising roasting, and collecting crucial information to enable farmers and Indigenous people to make informed decisions about their farm productivity and efficiency.
20	Philippine Rural Reconstruction Movement 1952 CCCI: 2023	Philippines	Brgy Pangawan,Tidang Village, and Bayombong Town in Nueva Vizcaya	NGO employing CCCI to facilitate digital networking and marketing among organic vegetable farmers as well as to assist organised small-scale producers (women and men) engaged in sustainable agriculture to improve enterprise efficiency and productivity. Utilised the connectivity to for additional income using Starlink and Piso Wi-Fi stations.
21	redEsperansa.tl 2023	Timor-Leste	Naroman Esperansa Higher Education Institute and School and East Timor Coffee Institute (ETCI) in Gleno	Non-profit initiative intended to provide outdoor Wi-Fi hotspots to facilitate engagement with locals, especially on the Naroman Esperansa Campus; work on completing links (fibre or radio) at critical locations to ensure better connectivity; develop servers to provide content services for schools and universities; focus on building community networks to ensure internet access in remote areas; deploy IoT applications for real-use cases such as weather stations and energy infrastructure; translate open-source software and other content into Tetum, the local language.
22	Net2Home (previously called TakNet) 2013	Thailand	50 clusters/ communities (1 in Chiangdao, 42 in Tak, 6 in Saphanburi, 1 in Bangkok)	Net2Home provides internet connectivity to 50 communities through WMN routers installed in various houses and public locations; applied IoT on local community networks to monitor haze and forest fires; developed an online marketing platform for community products.
23	University of Technology Sarawak (UTS) 2013	Malaysia	The Iban community in Bawang Assan with 9 longhouses (1 longhouse is made up of 15 families) connected	State university working with Sarawak Energy and Datasonic Berhad implementing the Broadband over Powerline (BPL) Project to provide internet connectivity to the Iban community for education, tourism, and homestay promotion, using existing electrical infrastructure.

	Initiative/initiator/ Year established	Country	Location/s	Brief description of the connectivity initiative
The Pacific				
24	iBoom 2021	Federated States of Micronesia (FSM)	20 villages in Yap	Private and licensed telecommunications company in FSM that provides free broadband internet access directly to households by building out Yap's internal core infrastructure, as well as a second set of extremely complex and larger internal core infrastructure in Guam.
25	Kacific 2013	Headquarters in Singapore, with most CCCIs in the Pacific	82 villages across the Pacific Islands and 100 more in the pipeline	Private, for-profit, next-generation broadband satellite operator offering affordable satellite broadband, including unlimited broadband and community Wi-Fi solutions for unconnected rural communities all over the Pacific Islands, breaking it down to very affordable bite-sized systems and training the local communities to become installers and distributors to connect their villages, optimising the network for job creation.
26	Data Garden (Satsol Limited) 2017	Solomon Islands	School with 256 simultaneous users	Private, limited, locally owned ISP company implementing the Data Garden involving a portable "data garden"[31] that can be easily transported to any remote location. The base is a school, which acts as an agent for digital cash (http://iumi.cash), an independent platform developed, approved and now well established in the Solomon Islands; Villagers may use the internet, make voice calls, charge devices and avail themselves of online financial services (3 components: 4G for dispersed villages, financial technology in partnership with IumiCash, and smart solar power technology).
North and Central Asia (NCA)				
27	Community Networks Development Foundation (CNDF) 2021	Armenia	7 communities in Shaghap, Ararat Region	Non-profit providing affordable and high-speed fibre optic internet connection and TV channels to households in rural communities, where network operators do not usually operate; free for local school and teachers from other schools.
28	Mountain Community Network (MCN) (Tusheti Development Fund) 2017	Georgia	7-8 small settlements separated by gorges in the mountainous region of Tusheti	Non-profit and independent locally operated wireless internet service providing end-user services of up to 15 Mbps.

31 LTE micro cell installed in a solar-powered mobile trailer with Ka-band or Starlink backhaul and digital wallet platform used for payments.

	Initiative/initiator/ Year established	Country	Location/s	Brief description of the connectivity initiative
29	Zardaly (Internet Society Kyrgyz Chapter with local communities) 2014	Kyrgyztan	4 mountainous communities (Suusamyr, Nookat, Zardaly, Kyrchyn	Locally initiated and owned with school as a hub for hotspot for everyone to use in Zardaly; while the three others have direct connection (households, local school, hospital and businesses).
East and Northeast Asia (ENEA)				
30	Sources for Action - China CCCI: 2023	China	Meide (Virtue) Village and Queniao (Sparrow) Village, Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province	NGO working with rural communities to preserve and share their cultural heritage and traditional practices using the app, Origin of Food Talks, housed in the Weixin App and accessible on digital and physical platforms.

Motivations for the establishment of CCCIs

Two major motivations emerge from the CCCI models in focus. For social business and self-provision initiatives, connecting communities to a stable and affordable internet was the ultimate reason for setting up the networks. In the process of providing connectivity, value-added services have been integrated to ensure that social impact and/or sustainability are achieved. On the other hand, the eight entrepreneurial non-profits engaged in SEs have integrated connectivity efforts primarily to improve the productivity, income and social impact of their enterprises.

For the CCCIs that sought to primarily provide internet connection to communities, the reception was either unreliable or too costly, or was non-existent prior to the establishment of CCCIs. Almost all the communities covered are geographically isolated and disadvantaged areas (GIDAs). These are small islands, mountainous terrains, or far-flung areas with limited roads or electricity. Hence, going there is in itself a major hurdle. The two villages covered by the Nepal Internet Foundation/Everest Community Network in the Everest Region, for instance, are 4,000 metres above sea level. One can suffer from altitude sickness when visiting these areas. There are no roads leading there and the only affordable way to reach these villages is through hiking. Similarly, the area of Zardaly in Kyrgyzstan is an isolated village made up of 150 people which can only be accessed by means of a mountain trail, with donkeys as mode of transportation.[32]

The need for a reliable connection for these marginalised and isolated communities became even more apparent when mobility restrictions were imposed during the COVID-19 pandemic – people could not receive information and updates on the pandemic; farmers, fishers and micro-enterprises could no longer trade; students, especially girls, had no access to online classes and educational materials; and families living apart simply had no way to reach out to each other. Unlike boys, girls in rural Pakistan were not able to continue studying as they could not travel to the city where internet connection was available. These experiences highlighted that digital connectivity is a fundamental

32 Farah, L. (2022, 7 February). A Perilous Plight: Connecting an isolated village in Southern Kyrgyzstan to the Internet. *UNICEF Kyrgyzstan*. https://www.unicef.org/kyrgyzstan/stories/perilous-plight-connecting-isolated-village-southern-kyrgyzstan-internet?form=MG0AV3

right that all people must access and benefit from. Being cut off from the digital world was depriving people of life essentials and opportunities for growth. Hence, the pandemic was a driving force for most of the CCCIs to be established.

By enabling people and communities to uphold and claim their right to network access, other services have been integrated to address the need of partner communities for

- Knowledge and information
- Cultural enrichment
- Access to payment systems/digital financing and government services
- Collection and monitoring of data for environmental concerns and efficiency of enterprise operations through internet of things (IoT), and
- Sustainable economic growth and development (including agriculture and ecotourism), especially for the rural poor.

Several have also been motivated to address the gender gap, facilitating internet access, capacity development and livelihood opportunities of women and girls towards equity and empowerment.

For the entrepreneurial non-profits that have opted to engage in CCCIs, the process of setting up community networks is reversed. The creation of wealth and social benefits towards improving the quality of life of the poorest and most marginalised sectors was the primary motivation. Since they have long served as partners of these sectors in delivering basic social services, providing jobs and sustainable livelihoods, empowering women, protecting the environment, and building their capacities to become actors in their own development, the engagement in CCCIs is seen as a necessary service or diversification of service to help ensure and enhance the efforts towards wealth and value creation. Dompet Dhuafa in Indonesia, for instance, has been implementing its Desa Tani programme to increase the income of small local farmers through the practice and promotion of sustainable agriculture. Through the programme, smallholder farmers have been encouraged and trained to increase agricultural productivity. To do that, CCCIs have been established in the farms to enable them to adopt IoT technology in land cultivation. IoT devices and systems have been installed to provide real-time data on soil moisture, temperature, and other environmental factors; automate irrigation for optimal water use; and monitor crop and livestock health. Through the installation of CCCIs, farming has become more efficient and effective, helping ensure better income and quality of life for the farmers involved in the programme. In the same manner, two community-based coffee enterprises (CBCEs) supported by the Philippine Coffee Alliance (PCAi) have integrated IoT in their operations to digitise roasting and collect crucial information towards enabling smallholder coffee farmers to make informed decisions about farm productivity and efficiency. In Bangladesh, the Foundation for Architecture and Community Equity (FACE) has linked Rohingya women refugees with a fair trade organisation which is now helping these women to access the internet towards building networks in the fashion industry, connecting to more customers and seeking other economic opportunities.

Role of communities as partners

Except for the CCCIs in North and Central Asia, none of the initiatives involve communities as partners in managing the passive telecommunications infrastructure yet. However, almost all involve community organisations/members as service providers, resellers, and/or end users. Similar to the survey results, the services provided by the communities primarily entail maintenance of the active

infrastructure and/or user's hardware and gadgets; management of daily operations (especially for digital hubs, centres, radio stations, etc.); preparation and uploading of on/offline content; serving as agents for financial and other online platforms; internet voucher resellers; and/or facilitation of digital learning for community members. Entrepreneurial non-profits engaged in CCCIs use online technology to enhance the income and productivity of the poor and marginalised sectors they serve.

Meanwhile, AirJaldi in India primarily engages the communities as end users but 80% of its workers are from partner communities, directly recruited and trained by the company. It has also developed and piloted internet technologies to help small to medium ISPs provide faster and uninterrupted connectivity to rural areas. On the other hand, iBoom in the Federated States of Micronesia (FSM) engages the locals as advisors – consulting them, seeking their approval, and ensuring that the community uses the connectivity as a tool to enrich local traditions and culture, environment, and the economy.

Table 3. Role of communities as partners

Initiator Initiative		Country	Role	Role description
South and Southwest Asia				
1	AirJaldi: Connectivity Bridges Initiative	India	Workers End users	80% of AirJaldi employees are from local communities, recruited and trained by the company.
2	BAIF Development Research Foundation	India	Service provider End users	Pune-based R&D NGO provides initial infrastructure and builds capacity of villagers to maintain the operations of the infrastructure and conduct revenue-generating activities, including e-DOST programme, a women-led enterprise to start a digital ecosystem in the Pathardi village.
3	Community Radio (CR) Bolo (Jadeite Solutions Pvt Ltd with Radio Bulbul)	India	Service provider End users	Radio Bulbul operates and manages the network on a day-to-day basis along with local school teachers who use the network for sharing content. Radio Bulbul and local schools also manage the content uploaded in the IVR system. Schools and community members within the network mesh can communicate and access content.
4	DHAN Foundation	India	Service provider End users	Women from the community are trained to manage the community resource centres.
5	Digital Empowerment Foundation (DEF)	India	Service provider End users	Partner communities supervise the operations, maintain the active infrastructure, and do minor repairs; DEF provides the Wi-Fi hotspot, conducts an initial training and sends an expert to the site to fix complex technical problems.

Initiator Initiative		Country	Role	Role description
6	Digital Dera (Agriculture Republic)	Pakistan	Service provider End users	Local champions from the community have managed the digitally equipped multipurpose centre where trained young people get vital information (e.g. weather patterns, climate change impacts, prices of agricultural inputs) from the internet to relay to farmers. Farmers rely on the information to decide on actions regarding agricultural activities such as procurement of farm inputs, production, harvesting or marketing. At the same time, children and young people are encouraged to go to the centre anytime for any information needed for their education, enterprises, etc.
7	Foundation for Architecture and Community Equity (FACE)	Bangladesh	Service provider End users	The community, trained on entrepreneurship, uses the internet to build networks in the industry, connect to more customers and seek other economic opportunities.
8	Hello World	Nepal	Service provider End users	Technology For All, implementation partner of Hello World, oversees Hello Hub operations and digital capacity-building of served communities. Community support officers, appointed by the Hub Management Committee, handle day-to-day tasks such as data tracking, maintenance and repairs, serving as key liaisons between the management committee, Hello World and local partners. Local NGO Tech For All will shortly assume full operational responsibility for the Nepal hubs.
9	Janata Wifi	Bangladesh	Service provider End users	Micro-merchants with small shops in low-income communities host and market the Wi-Fi hotspot.
10	Nepal Internet Foundation / Everest Community Network	Nepal	Service provider Resellers End users	Operations managed by partner communities.
11	Welfare Association for New Generation (WANG) Connectivity	Pakistan	Service provider End users	Partner community has co-managed all the aspects of the telecommunications value chain, from designing to maintenance, to the provision and use of services. The land and building for the centre, as well as the equipment and devices, have been managed by the community. For technical issues, the community has hired an expert who fixes the issues when needed.

Initiator Initiative		Country	Role	Role description
Southeast Asia				
12	Central Visayas Information Sharing Network (CVISNET)	Philippines	Service provider End users	Local cooperatives (which started as POs) handle the operational and financial aspects of the CCCIs and related enterprises (e.g. coin internet) while the local government is the main client/buyer of the bandwidth.
13	Common Room Networks Foundation	Indonesia	Service provider Resellers End users	Common Room supports capacity building and technical development while facilitating the agreement with the local ISP. The community maintains the internet infrastructure and is in charge of resource mobilisation, internet voucher distribution and provides local technical assistance.
14	Davao Medical School Foundation	Philippines	Service provider End users	Registered POs (existing prior to the initiative) have been involved at the onset to ensure ownership and management of the initiative. They are mainly responsible for the maintenance and sustainability of the active infrastructure and business centre operations. They operate as cooperatives, and members receive patronage and dividends by the end of the year.
15	VBTS and REINN Projects by the Department of Science and Technology (DOST)	Philippines	Service provider End users	Under the VBTS, local villagers, mostly men, are trained to manage the connectivity equipment. Under REINN, school teachers, mostly women, are trained to manage the equipment and serve as information, communication, and technology (ICT) coordinators for the school-based CCCI.
16	Dompet Dhuafa	Indonesia	Service provider End users	Farmer groups involved in the Desa Tani programme have been organised into cooperatives and trained to use IoT to monitor crop and livestock health, automate irrigation and keep track of environmental factors affecting soil fertility.
17	Nexlogic Tele-communications Network Inc. 2005	Philippines	Workers End users	Local people are trained and hired to install connectivity to the households.
18	PapuaCom	Indonesia (West Papua)	Service provider End users	Partner school has a paid technician/ trainer who teaches students on installing and maintaining the connection; resellers (vouchers). Community protects the antenna.

Initiator Initiative		Country	Role	Role description
19	Philippine Coffee Alliance, Inc.	Philippines	Service provider End users	Partner CBCEs are trained to use the roasting machines in their respective facilities. Once trained, users can operate the machines themselves and monitor the data generated from these machines.
20	Philippine Rural Reconstruction Movement	Philippines	Service provider	The community is able to avail itself of internet connectivity through the Piso Wi-Fi stations. Partner organisations use the internet in their organisational and business operations.
21	redEsperansa.tl	Timor-Leste	Service provider End users	
22	Net2Home (previously called TakNet)	Thailand	Service provider	Net2Home is a unit of NIC.th which supports communities with mesh Wi-Fi infrastructure and establishing local support and bill collecting agents.
23	University of Technology Sarawak (UTS)	Malaysia	Service provider End users	Each of the nine longhouses has an existing committee that oversees and manages the longhouse. The same committees manage the daily operation of the CCCI.
The Pacific				
24	iBoom	Federated States of Micronesia (FSM)	Workers advisor End users	Approval of connectivity, and ensures appropriateness of internet access given their needs and culture
25	Kacific	Singapore	End users	Kacific's high-performance satellite capacity is sold to ISP partners, which are CSOs based in the country, but outside the communities, who manage the infrastructure.
26	Satsol Limited	Solomon Islands	Service provider End users	A school hosts the data garden, a community committee oversees the project, and a team of community volunteers are incentivised to help with community surveys, capacity building, and demonstrating the potentials to the community. The school acts as an agent for the digital cash which facilitates payments and digital transactions.
North and Central Asia				
27	Community Networks Development Foundation	Armenia	Integrated operator Service provider End users	The community installed over 18 kilometres of fibre optic cables to bring connectivity to Shaghap from the nearby village of Vedy, and then laid another two kilometres within the village to connect several homes and buildings, including the local school.
28	Mountain Community Network	Georgia	Workers End users	Local NGO is part of the MoU behind the network, local people are employed to maintain the network.

Initiator Initiative		Country	Role	Role description
29	Zardaly (Internet Society Kyrgyz Chapter with local communities)	Kyrgyzstan	Different models per community, depending on the context: Integrated operator Open access operator Service provider End users	Kyrchyn: infrastructure transferred to a local internet service provider because the community lacks technical capacity, but the community has subsidised subscription fees while the internet provider gets the fixed assets. Nookat: owned by a local private entrepreneur investing his own funds. Suusamyr: a community organisation (non-government organisation) has been established to manage the network; the licence belongs to the ISP but the infrastructure belongs to the local community. Zardaly: residents decided in a town hall meeting that only the local school will be connected, with Wi-Fi hotspot where anybody can come and connect for free; municipal government handles operations as well as cost from its own budget.
East and Northeast Asia (ENEA)				
30	Sources for Action - China	China	Service provider	Community provides content about their cultural practices and educational programmes. Tour guides from the community also use the platform to educate visitors about their culture.

Multi-organisational arrangements

Most of the initiators of the CCCIs are registered entities from outside the community entailing multi-organisational arrangements. These multi-organisational arrangements may include financial grants from global development organisations or government institutions to catalyse the endeavour; provision and management of passive and active infrastructure by the private sector (usually telecommunications company, electric company and/or government) or CSO (in the case of Kacific where its ISP partners are CSOs); provision of material resources and capacity development interventions by corporate social responsibility (CSR) arm of companies or CSOs; joint research endeavours and testing of new technologies (as in the case of the Village Base Station or VBTS Project implemented by the Department of Science and Technology in the Philippines in partnership with state universities and universities in the United States); and/or management and maintenance by the community.

The CCCIs in North Asia (Armenia and Georgia) were initiated directly by community members with support from external actors, similar to the multi-organisational arrangements described above.

Only the Central Visayas Information Sharing Network Foundation Inc. (CVISNET) in the Philippines evolved from a government-driven project with multi-organisational arrangements, and is now a non-stock, non-profit foundation.

Table 4. Role of partners in the CCCIs

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
South and Southwest Asia			
1	AirJaldi: Connectivity Bridges Initiative	Asia-Pacific Network Information Centre (APNIC) Foundation	Funder for the development of internet technologies to make internet speed faster and reliable in rural areas.
		Ford Foundation	Funder for building rural networks
		Facebook, Google, Microsoft, USAID	Funder for building and expanding connectivity infrastructure and technologies in rural areas; support to local capacity development.
		Local governments	Establishment of common service centres
2	BAIF Development Research Foundation	APC	Funder
		Government of Maharashtra	Helped in facilitation and convergence support
		Tata Motors Limited	Funder
		IIT Bombay	Provision of knowledge and technical assistance
		National Payments Corporation - India	Provision of knowledge and technical assistance
		BAIF Institute for Sustainable Livelihood and Development	Assisted in facilitation and project implementation
3	Community Radio (CR) Bolo	Radio Bulbul	Local community radio partner serving as a hub for creating and sharing local content, hosting the wireless mesh network that connects schools, self-help groups (SHGs) and other community members within a five to seven kilometre radius.
		ISOC	Initial funding
		Jadeite Solutions Pvt Ltd	Developed the hybrid connectivity model which combines online and offline wireless mesh networks to provide internet access.
		Local schools	Content creation
4	DHAN Foundation	Oxfam Novib	Implemented the ICT for Poor project
		Oracle	Implemented a project that established ICT-enabled community resource centres that empower rural women.
		Nasscom Foundation	Implemented a project that empowers women to be agripreneurs; provided digital literacy training among women agripreneurs.

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
5	Digital Empowerment Foundation (DEF)	Local community	Provision of the land/space for the community centre.
		Tata Trus, Nokia, ISOC, APC, 48% Foundation	Funders
		Local CIRC coordinators/ Entrepreneurs (women preferred)	Provision of services
6	Digital Dera (Agriculture Republic)	Accountability Lab	Partner in projects that leverage technology to improve transparency and citizen participation, including use of digital tools for reporting issues, accessing information or engaging with local governments.
		Agriculture Republic	Policy think tank
		Hayat Farms	Provision of land for the main transmission line.
		ISOC	Funder
		PTCL Pakistan Telecommunication Limited (state-owned)	ISP
7	Foundation for Architecture and Community Equity (FACE)	APNIC Foundation	Funder
		iDE Bangladesh	Helped in developing new product lines through research and development.
		ISEA	Provided facilitation and technical support.
		Prokritee	Fair trade organisation; assisted in selling products from the community.
		University students	Helped in IT-related activities.
8	Hello World	Technology for All	Oversees Hello Hub operations and digital capacity building of serving communities
		World Link	Local ISP (in areas without World Link, a partnership with a local ISP is established; covers cost of bandwidth in some hubs (Hello World covers the cost of others).
9	Janata Wifi	APNIC Foundation	Grant to establish the initiative
		Microsoft	
		National and Local ISPs (e.g. Linktree)	Use of ISP licence and backhaul (Janata provides the modified hardware, access point and software stacks.
		Local shop owners	Hosting of nodes
		Private companies	Advertisers

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
10	Nepal Internet Foundation/ Everest Community Network	ISOC	Funder
11	Welfare Association for New Generation (WANG) Connectivity (non-profit organisation)	Community	Provision of land where the innovation lab is set up
		ISOC	Provision of grant to spearhead the CCCI
		Other funding agencies (e.g. Canada Fund)	Provision of grant for training support, e.g. training of local young leaders on digital skills and literacy.
		Schools	
Southeast Asia			
12	Central Visayas Information Sharing Network (CVISNET)	APNIC Foundation	Funder
		Local Cooperatives	Operator of Piso Wi-Fi machines and maintenance of equipment.
		Department of Science and Technology	Spearheaded the initiative through the IsletConnect Project: Internet for Sustainability in Education and Tourism from DOST and Seed4Com
		Unconnected.org	Provision of bandwidth through Starlink
		LACS-Japan	Development of online platform for livelihood, e-commerce, education, eco-tourism, DRR information.
13	Common Room Networks Foundation	APC, ISOC, APNIC Foundation, others	Funder
		Awinet	Local ISP; provision of local internet infrastructure, development, bandwidth and licences, technical support, maintenance, knowledge and skill transfer
		Common Room	Initiator, capacity development of the community (digital literacy, managing the CCCI, content creation, etc.)
		Ciptagelar Village Council	Served as voice of the Kasepuhan Ciptagelar, signed agreements to build internet infrastructure.

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
14	Davao Medical School Foundation	APNIC Foundation	Funder
		Child Fund Japan	
		Local government (barangay)	Signatory to the MOA between DMSF and POs; provision of technical persons for the training and coaching of barangay health workers (BHWs) for the use of their reporting system; ensures the security of the technical infrastructure of the project.
		Raj Communications	Served as ISP during the first phase of the initiative; offered vouchers/tickets for customers to access the internet for a certain number of hours.
		Starlink	Connected Wi-Fi vendor machines that are solar powered (during the second and third phases).
15	VBTS and REINN Projects by the Department of Science and Technology (DOST)	VBTS Aurora State College of Technology	Local counterpart in terms of research and technology provision.
		Dikap Savers Association (local cooperative)	Trained to manage and maintain the connectivity equipment and infrastructure.
		Local government units (LGUs) in Aurora (municipal and barangay levels)	Ensured that the project is supported by at the local level.
		University of California, Berkeley (UC Berkeley)	Pilot testing and deployment of technology in the Philippines.
		University of California, Davis (UC Davis)	Conduct of study on the community's capacity to pay and the effects of first-time communication access in quantifying economic development.
		University of the Philippines (UP) - College of Engineering-Electrical and Electronic Engineering Institute and Department of Computer Science	Provided technological support for the project
		UP - College of Social Sciences and Philosophy (CSSP) - Department of Sociology	Provided technical support in community and social mobilisation
		University of Washington	Research partner
		REINN	
		Ateneo de Manila University (ADMU)	Mobile apps and games for learning mathematics
		Department of Education (DepEd)	Content integration

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
		DOST-Science and Technology Information Institute (DOST-STII)	Science and Technology Academic and Research-Based Openly Operated Kiosks (STARBOOKs), a free stand-alone supplemental tool for research, teaching and learning needs of users even without connection launched in 2011, provides hundreds of thousands of digitised science and technology resources in text, audio and video formats.
		DOST Regional Offices and partner LGUs	Deployment assistance of REINN technologies in the identified pilot sites.
		USAID-Better Access and Connectivity (BEACON) Project	Assistance in crafting policies on last-mile connectivity.
16	Dompet Dhuafa	Yayasan Baitul Maal Brilian	Funder
		Ministry of Economic Affairs (Kementerian Koordinator Bidang Perekonomian)	Government office
		PT Perkebunan Nusantara VIII	State-owned enterprise managing the land where producer-cooperatives rent for their farming activities.
		Baituzzakah Pertamina	Funder
		Ministry of Agriculture (Kementerian Pertanian)	Government office
		Bank Sentral Republik Indonesia	Funder
		Farmers' cooperatives	Community-based organisations organised for Dompet Dhuafa's Desa Tani initiative. They produce and manage a market hub for their products, manage the working capital provided by Dompet Dhuafa, and manage capacity building on farm management and other technical requirements for member-farmers.
17	Nexlogic Tele-communications Network Inc.	Big corporations	Advertisers
		LGUs	Pay for the installation in households, help in finding local people to be hired and trained to do the installation.
18	PapuaCom	School (missionaries)	Provision of hydro and solar power source
19	Philippine Coffee Alliance, Inc.	APNIC Foundation	Funder
		Bote Central	Provision of technical support, exclusive distributor and main user of the roasting machine.
		ISEA	Facilitation and technical support

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
20	Philippine Rural Reconstruction Movement	APNIC Foundation	Funder
		ISEA	Facilitation and technical support
		Nueva Vizcaya State University	Provision of technical know-how in the setting up of the internet infrastructure
		Vizcaya Fresh, Inc. (VFI)	Facilitation and logistical support in marketing the products of organic vegetable farmers.
		LGUs	Assistance in facilitation
21	redEsperansa.tl	ANC (telecommunications regulator)	
		APNIC Foundation	Provision of grant and support through the Information Society Innovation Fund (ISIF Asia).
		East Timor Coffee Institute (ETCI)	Contributes to capacity building and education initiatives.
		ICT-TL & FDSL (Fundasaun Dezenvolvimento Software Livre)	Work on various aspects of the project, including capacity building and community network development
22	Net2Home (previously called TakNet)	Asian Institute of Technology (AIT)	Spearheading and implementation of the project, conduct of research.
		Network Startup Resource Centre	Donation of equipment
		Thai Network Information Centre Foundation	Funder
23	University of Technology Sarawak (UTS)	Sarawak Cable and Wireless Facilities Sdn Bhd (SACOFA)	ISP
		Sarawak Energy	Energy provider
		Datasonic Berhad	Technology provider
Pacific			
24	iBoom	APNIC Foundation	Funder
		Champions	Additional financial and technical support
25	Kacific	APNIC Foundation	Funder
		Asian Development Bank (ADB)	Provision of loan to start launch KACiFic1 infrastructure for the Community Wi-Fi Initiative
		GuarantCo	Provision of grant to subsidise the distribution of satellite communication systems (KACiFic1) to rural health posts and clinics across the Asia-Pacific region during the COVID-19 pandemic.
		Local governments, churches, NGOs	Selection of communities; ISPs

Initiator/Initiative		Multi-organisational arrangements	
		Partner	Role
26	Satsol Limited	APNIC Foundation	Funder
		School	Serves as base/hub for the data garden
North and Central Asia			
27	Community Networks Development Foundation	Arpinet (local network operator)	Infrastructure planning and use and provision of free internet to the school
		Armenian Electronic Network	Infrastructure planning and use, provision of 400 pillars from electricity grid.
		Community	Provision of 100 pillars, fibre
		ISOC/ISOC Foundation	Funder
		ITU	Support to develop digital skills: training on basic skills initially, then business development and promotion based on the internet, internet safety and social media management course, leveraging the natural resources and opening bed and breakfast.
		GNC Alfa CJSC	Donation of robotics lab at the school.
28	Mountain Community Network (with MoU among various actors; MoU between ISOC European Bureau, the local chapter and the Ministry of Economy to replicate that, 2018 EuroDIG, and the Association Ucha.	ISOC European Bureau	Grant for the hardware
		ISOC Georgian Chapter	Grant
		Community	Installation of fibre
		Georgian National Communication Commission	Signatories of MoU behind the initiative.
		Local government	
		Ministry of Economy and Sustainable Development	
		Small and Medium Telecom Operators Association of Georgia (TOA)	
		Tusheti Development Fund (TDF)	
29	Zardaly (Internet Society Kyrgyz Chapter with local communities)	ISOC	Funder
		Local ISPs	Holds the licence
East and Northeast Asia (ENEA)			
30	Sources for Action - China	APNIC Foundation	Funder
		ISEA	Facilitation and technical support
		Slow Food China	Provision of content
		Cihai Environmental Conservation Foundation	Provision of content

Infrastructure and technology

The passive infrastructure used by CCCIs in Asia and the Pacific (e.g., masts, poles, fibre) is usually provided by the ISP or already exists. Most of the initiators and locals take care of the active infrastructure such as cellular routers, point-to-point links and Wi-Fi nodes. Similar arrangements exist in Southeast Asia but most self-provided and entrepreneurial non-profit CCCIs in the Philippines have switched to satellite connection (Starlink) as the cost is more affordable than P2P or fibre optic technology.

CCCIs covered in the Pacific islands have combined the passive infrastructure established by the governments with their own. Kacific has invested in satellite broadband internet and community Wi-Fi, along with their partner local ISPs. Meanwhile, iBoom built from the existing government infrastructure and added internal core infrastructure for the installation of broadband internet in 20 villages in Yap, Federated States of Micronesia (FSM). Satsol has works in the Solomon Islands for its Data Garden, which uses LTE micro cell installed in a solar-powered mobile trailer with Ka-band or Starlink backhaul.

There are exceptional cases where additional passive infrastructure was set up by the initiators and locals themselves as no one was investing to establish such in far-flung and isolated areas. These include the initiatives of Nepal Internet Foundation/Everest Community Network in the Everest Region in Nepal; Common Room Networks Foundation in Kasepuhan Ciptagelar, in West Java Province, Indonesia; Department of Science and Technology (DOST) in the Philippines; and the CCCIs in North and Central Asia – Community Networks Development Foundation (CNDF) in Armenia; Mountain Community Network (MCN) in Georgia; and four villages in Kyrgyzstan, led by Zardaly. The establishment of passive and active infrastructures in the last three areas were extremely challenging due to their isolated and mountainous terrains.

There are also innovative technology solutions to link the communities, whether online or offline. These include the combined online and offline mesh networks that use Interactive Voice Response (IVR) to store free broadcast and educational contents which can be accessed offline by Community Radio (CR) Bolo in India; combined broadband backhaul (provided by ISPs) and community hotspots with Wi-Fi access points, wireless access gateway, broadband backhaul, innovative software, and power backup set up by Janata Wifi in Bangladesh; community LTE networks (LokaLTE) utilising datacasting technology to supplement educational experiences of students (RuralCasting) by DOST Philippines; and the DUMBO firmware that can be installed on off-the-shelf routers that creates self-configuring and self-healing Community Wireless Mesh Network (CWMN) used by Net2Home (previously called TakNet) in Thailand.

Please refer to Table 5 for the infrastructure and technology solutions adopted by the CCCIs.

Table 5. Connectivity infrastructure and technology

	Initiative/Initiator/ Year established	Country and location	CCCI infrastructure and technology
South Asia			
1	AirJaldi 2009 (officially as a private limited company)	India 38 networks in nine states covering 35 districts, and serving various and diverse groups in rural to semi-rural areas in India.	Sets up its own infrastructure (or uses existing ones) and offers a combined wireless (25%) and fibre optic (75%) network.
2	BAIF Development Research Foundation 2019	India 13 villages in Palghar District, Maharashtra State, Western India	Connectivity through a SIM card-based cellular router in the Pathardi Village; SIM cards from ISP providers, Vodafone and Reliance Jio.
3	Community Radio (CR) Bolo (Jadeite Solutions Pvt Ltd with Radio Bulbul) 2021	India Radio Bulbul in the rural Bhadrak district of Orissa, in partnership with three local schools	Three point-to-point links and hotspots and a computer with a local server. Mobile connection provided by Jio, and connection is distributed to one school. Land network is open-source coupled with IVR app that worked with GSM band is used for offline system, using a device with four SIM slots – two for GSM band, one for IVR connected to a webpage through IVR band which is open source and one slot for broadcasting. Live broadcast content can also be stored in the loop which can then be broadcasted offline through the land network. For IVR, pre-recorded voice messages are used where users dial a number through a GSM band and follow instructions to access a local network for webpage content. IVR is accessible to anyone in the community, and it is estimated to serve around 2,000 individuals, including 1,000 students. The IVR is a plug and play system where the content is managed in a local server, at two levels. At the CR station, they can record contents that are important and delete obsolete content. At schools they can create content and update them.
4	DHAN Foundation 1997	India Mysore, Karnataka, India; Poor families in 16 states of India	Community resource centres in collaboration with local ISPs, aimed to enhance digital access and provide various services to the community, including internet connectivity, training and support for local development initiatives. The partnership with local ISPs helps ensure that these communities have reliable access to the internet, which is crucial for education, information dissemination and economic development.

Initiative/Initiator/ Year established		Country and location	CCCI infrastructure and technology
5	Digital Empowerment Foundation (DEF) 2002	India 1,500 Community Information Resource Centres (CIRCs) in 135 districts across 24 states and union territories; 1 tea tribe community (Adivasi) in Assam	Community Information Resource Centres (CIRCs) designed to promote digital literacy and empower local communities through access to information and communication technologies.
6	Digital Dera (Agriculture Republic) 2021	Pakistan Chak 26 S/P, Pakpattan District in Punjab (1 of the most fertile grounds in Pakistan)	Designed as a wireless mesh network, with a leading transmission site connecting Chak 26 S/P and four other villages through receiving network bridges. The leading transmission site was installed at Hayat Farms which was already equipped with essential utilities. It is powered by solar energy. With the nearest ISP exchange located 15 kilometres away, there was no direct access to backhaul. Instead, local champions established a point-to-point link of 7 Mbps from the exchange tower to Hayat Farms, near the village.
7	Foundation for Architecture and Community Equity (FACE) 2023	Bangladesh Ukhiya Upazila of Cox's Bazar	Internet connectivity provided through a router connected to the local network. Access points built to connect to the router and spread Wi-Fi signals to users.
8	Hello World 2012	Nepal 24 communities along Kathmandu Valley, mostly belonging to the Tamang ethnic group found in Central Region (18 hubs), Western Region (3 hubs) and Far Eastern Region (1 hub)	The hubs provide access to the internet, with the bandwidth varying from hub to hub but a minimum of 10 Mbps is ensured with maximum bandwidth reaching up to 120 Mbps. ISP partners: WorldLink, MICET Foundation on and Arrownet; Hello World covers OPEX, maintenance and battery replacements, ISPs cover the bandwidth.
9	Janata Wifi 2018	Bangladesh 20 villages scattered across Bangladesh, mostly in rural areas	Private company providing free 4G open Wi-Fi hotspot access by strategically placing Wi-Fi nodes in local shops situated in areas with limited broadband access; has a remote monitoring system to determine connection problems even before users realise them. Local ISPs provide the broadband backhaul and community hotspots comprise Wi-Fi access points, wireless access gateway, broadband backhaul, innovative software, and power backup to ensure high-bandwidth uninterrupted internet connection without data usage limits.

Initiative/Initiator/ Year established		Country and location	CCCI infrastructure and technology
10	Nepal Internet Foundation / Everest Community Network 2022	Nepal Two villages in the Everest region, 4,000 metres above sea level	Non-profit providing free fibre internet access to local schools, hospitals, clubs and community centres, and cultural environment protection. Connectivity established from the nearest absorption point. The pole used for this setup was designed for fibre, with a six-foot stand. From that pole, houses and lodges were connected to fibre. From there, connection is relayed to the school. The school has two towers, which helped extend the network further. The fibre has been laid using ring topology. This layout was designed in a ring structure, ensuring better connectivity and redundancy. RFP was created, which included a failover system for the Everest Community Network. In the event of a fibre break, there is a backup wireless connection and 4G connectivity via a SIM card inserted into the router. The SIM card, provided by Nepal Telecom (NTC), ensures continuous internet access.
11	Welfare Association for New Generation (WANG) Connectivity 2022	Pakistan Village Ahmed Abad Wang, Lasbela, Balochistan serving 15 to 20 surrounding villages	Bandwidth and tower procured from Pakistan Telecommunication Company Limited (PTCL); WANG linked from main connection (four to five kilometres from the city) through point-to-point connectivity; Wi-Fi set up within the lab (10 Mbps) active infrastructure paid by WANG through funding from ISOC; CCCI is solar-powered.
Southeast Asia			
12	Central Visayas Information Sharing Network (CVISNET) 1997	Philippines Three island villages (barangays) in Cebu; 4 island barangays in Bohol	Switched from mainly P2P connection to Starlink's satellite internet service because the latter is cheaper and more stable. Most have two-four, media converters, access points, one eight-port switch and one router.
13	Common Room Networks Foundation 2016	Indonesia Kasepuhan Ciptagelar, a Sundanese Indigenous village, within the Sukabumi Regency, West Java Province.	Wireless hub-and-spoke network consisting of 542 public Wi-Fi hotspots and 10 private ones in 2024.
14	Davao Medical School Foundation (DMSF) 1976	Philippines Five villages (barangays)	First phase involved Raj Communications (P2P) as the ISP. It offered vouchers/tickets for customers to access the internet for a certain number of hours. Second and third phases use Starlink (wireless/satellite). One-time package rate of USD 1,364 paid to Raj communications, inclusive of the one-time payment for the installation and monthly service (P2P connection). Monthly charges of USD 46 paid to Starlink.

Initiative/Initiator/ Year established		Country and location	CCCI infrastructure and technology
15	Village Base Station (VBTS) Project 2018 and Resilient Education Information Infrastructure for the New Normal (REIINN) (Department of Science and Technology or DOST) 2022	Philippines VBTS: two LGUs in Auroral Province REINN: four communities (barangays): San Andres, Tanay, Rizal; Looc, Castillejos. Zambales; Naguey, Atok, Benguet; Yabbi, Dupax Del Norte, Nueva Vizcaya.	VBTS: voice and SMS communication services using 2G GSM cellular technology in rural areas. Entailed the deployment of seven passive infrastructures composed of the tower and some equipment in the lighthouse. There is a solar-powered doghouse that houses the equipment, with batteries inside that could power the system for three days without charging. Transitioned from 2G to Wi-Fi connection at the end of the project (2020) so that the backhaul has been transformed it into purely internet service. In 2023, has been transformed into a commercial cell site. REINN: community LTE networks (LokaLTE); and utilising datacasting technology to supplement educational experiences of students (RuralCasting). Entailed the deployment of three towers with different infrastructure. Power comes from grid connection. There are three local servers, each of them has one high power access point for the community. Then, the school gets one access point.
16	Dompet Dhuafa 1993	Indonesia Cipanjalu, Cilengkrang, Bandung	Connected to a local ISP, which pays for the passive infrastructure.
17	Community Connect for LGUs (Nexlogic Tele-communications Network Inc.) 2005	Philippines	Fixed broadband connected to households.
18	PapuaCom	Indonesia (West Papua) Bokondini	
19	Philippine Coffee Alliance, Inc. 2011 CCCI: 2023	Philippines Coffee-based enterprises in Kasibu, Nueva Vizcaya and Lagawe, Ifugao	Developing an IoT/ICT feature upgrade for the roasting machines on a digital platform using Arduino and LoRawan systems. The IoT/ICT system is connected and linked to the coffee roasting hardware and software system.
20	Philippine Rural Reconstruction Movement 1952 CCCI: 2023	Philippines Pangawan Barangay, Tidang Village, and Bayombong Town in Nueva Vizcaya	Connection provided by Starlink.

Initiative/Initiator/ Year established		Country and location	CCCI infrastructure and technology
21	redEsperansa.tl 2023	Timor-Leste Naroman Esperansa Higher Education Institute & School and East Timor Coffee Institute (ETCI) in Gleno	Outdoor Wi-Fi hotspots linked to fibre optic cables that connect locals, schools and universities, and other remote areas.
22	Net2Home (previously called TakNet) 2013	Thailand 50 clusters/ communities (one in Chiangdao, 42 in Tak, six in Saphanburi, one in Bangkok)	Net2Home employs a decentralised wireless mesh network, utilising community-owned, low-cost equipment and open-source software to ensure sustainable and reliable access. It also emphasises training local members for network management. It now combines fibre optic and wireless solutions to provide high-speed internet, focusing on last-mile connectivity and establishing community Wi-Fi hotspots.
23	University of Technology Sarawak (UTS) 2013	Malaysia The Iban community in Bawang Assan with nine longhouses (one longhouse made up of 15 families) connected.	Initially used broadband connection but switched to Wi-Fi hotspot system, using SIM card from school in 2021. Active infrastructure (router, old computers, etc.) brought in by UTS.
The Pacific			
24	iBoom 2021	Federated States of Micronesia (FSM) 20 villages in Yap	Free broadband internet by building Yap's internal core infrastructure, as well as a second set of extremely complex and larger internal core infrastructure in Guam.
25	Kacific 2013	New Zealand 82 villages across the Pacific Islands and 100 more in the pipeline	Satellite broadband including unlimited broadband and Community Wi-Fi solutions; Kacific provides the equipment and hotspot – a satellite outdoor unit and a Wi-Fi hotspot while local ISPs provide direct connectivity. Spectrum licences acquired in Pacific islands, Timor-Leste and Micronesia.
26	Data Garden (Satsol Limited) 2017	Solomon Islands School with 256 simultaneous users.	Three components: 4G for dispersed villages, financial technology in partnership with iumiCash, and smart solar power technology. Towers built by the government; LTE micro cell installed in a solar-powered mobile trailer with Ka-band or Starlink backhaul and digital wallet platform used for payments.

	Initiative/Initiator/ Year established	Country and location	CCCI infrastructure and technology
North and Central Asia			
27	Community Networks Development Foundation (CNDF) 2021	Armenia Seven communities in Shaghap, Ararat Region	High-speed fibre optic internet connection and TV channels. The community installed over 18 kilometres of fibre optic cables to bring connectivity to Shaghap from the nearby village of Vedi, and then laid another two kilometres within the village to connect several homes and buildings, including the local school.
28	Mountain Community Network (MCN) (Tusheti Development Fund) 2017	Georgia Seven or eight small settlements separated by gorges in the mountainous region of Tusheti.	Independent, locally operated wireless internet service providing end-user services of up to 15 Mbps. 5.8 GHz long distance wireless transmission equipment mounted to link a tall mast in the town of Ruispiri with a mast in the Abano Pass, the highest road in Georgia, at an altitude of more than 2,800 metres. TOA member LTD "FreeNet", is an ISP in Kakheti which has donated free co-location on its 15-metre mast in Ruispiri village and offered free IP peering and transit – to the upstream internet at cost (without charge). The signal was then beamed across Tusheti which required that masts be constructed at high points across the region. Equipment and solar panels installed were designed to withstand intense thunder/lightning, wind, very low temperatures (max -40 C) and snow. In total, six masts with wireless radio equipment were installed.
29	Zardaly (Internet Society Kyrgyz Chapter) 2014	Kyrgyzstan Four mountainous communities (Suusamyr, Nookat, Zardaly, Kyrchyn)	Locally initiated and owned with school as a hub for hotspot for everyone to use in Zardaly; while the three others have direct connection (households, local school, hospital and businesses). Zardaly: hoisted a solar panel up the mountain and linked it to a car battery.
East and Northeast Asia (ENEA)			
30	Sources for Action – China CCCI: 2023	China Meide (Virtue) Village and Queniao (Sparrow) Village, Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province	Connectivity infrastructure provided by state-controlled ISP. Virtual platform employs cellular router systems for artisan communities with both online and offline connectivity.

Financing and pricing

As shown in Table 4, the capital expenditures for most of the initiatives were externally funded by global development organisations through grant or donation. The self-provided networks in North Asia combined a myriad of investors – from locals themselves, to grants from development donors, to public budget. On the other hand, social businesses such as iBoom, Airjaldi Kacific and NexLogic combined their own resources with grant support from external sources.

In Southeast Asia, non-profit organisations combine users' fees and grants to cover the costs of operations. Common Room in Indonesia, however, has now primarily relied on users' fees to cover the cost of operations. Social businesses rely on advertisements or users' fees to cover their costs. Among the CCCIs in the Pacific, operational costs are covered by both users' fees and grants. Since rural communities are price sensitive, Kacific had to adopt new ways to provide affordable rural connectivity, which has been to break down to bite-size, pay-as-you-use vouchers. Some grant funders and government agencies fund the terminal cost and this helps make the infrastructure more accessible for these rural communities. Meanwhile, iBoom has not yet become fully operational but intends to obtain funds for operations from action-based payments such government or advertisement subsidised access.

Meanwhile, sources of operational expenses for the self-provided CCCIs in North and Central Asia come from the internet fees paid by the villagers. One network operator in Armenia subsidises the internet fees of one village as the number of users is not sufficient to cover the cost. In Zardaly, Kyrgyzstan, the upstream internet connection is free because the municipal government pays for it. In South and Southwest Asia, most entrepreneurial non-profits rely on grants to pay for operational expenses while social businesses rely on subscription fees or advertisements. BAIF Development Research Foundation (BAIF) is the only entrepreneurial non-profit that no longer relies on grants to sustain the operations of the CCCI it helped establish in Pathardi and nearby villages in the Palghar district, in Maharashtra state, Western India. The panchayat village government has recognised that internet connectivity is a common good that should be provided for free to the villagers. Hence, the village government now allocates funds annually through the Gram Panchayat Development Plan to pay for the connectivity service in the 13 villages covered by the initiative.

For those that accept fees for the connectivity services, prices are usually set below or equal to the market price. Hence, the CCCIs usually study the pricing of competitors to determine if prices could be lowered. Meanwhile, the Mountain Community Network in Georgia is not allowed to earn profits exceeding 10% of all capital and operational expenses, to keep prices as low as possible.
The connectivity provided by most entrepreneurial non-profit organisations in South and Southwest Asia is usually free.

Refer to Table 6 for sources of operational expenses and pricing.

Table 6. Source of operational expenses and pricing

Initiator/Initiative		Source of operational expenses	Pricing
South Asia			
1	AirJaldi	Users' fees	Follows market price or slightly lower but as a commercial strategy.
2	BAIF Development Research Foundation	Users' fees	Depends on the services that will be availed; availing digital services offered through an e-DOST in the villages earn about USD 48 to USD 72 monthly.
3	Community Radio (CR) Bolo (Jadeite Solutions Pvt Ltd with Radio Bulbul)	Grants	Services are provided for free; there is a charge to access some particular content.
4	DHAN Foundation	Grants	
5	Digital Empowerment Foundation (DEF)	Users' fees, grants	Bundled prices covering connectivity and the time.
6	Digital Dera (Agriculture Republic)	Grants; profits from corporate farms	Managing corporate farms with a profitability ratio of 20:80%.
7	Foundation for Architecture and Community Equity (FACE)	Grants Product and service fees	
8	Hello World	Grants	Free
9	Janata Wifi	Advertisements, sales from automation products	Advertisement-based; selling of automation products.
10	Nepal Internet Foundation / Everest Community Network	Users' fees, grants	Free for centres, households pay 25% less than government or ISP price.
11	Welfare Association for New Generation (WANG) Connectivity	Grants	
Southeast Asia (SEA)			
12	Central Visayas Information Sharing Network (CVISNET)	Users' fees	USD 0.086 per 30 minutes, sometimes for an hour, depending on the prices set by competitors; private investors forced to lower prices. For ISLET Connect Vouchering System: USD 0.34 for 24-hour connection for one device USD 0.17 for 12-hour connection for one device USD 0.086 for 6-hour connection for one device
13	Common Room Networks Foundation	Users' fees	USD 0.70 for unlimited bandwidth of 2 Mbps for 24 hours.

Initiator/Initiative		Source of operational expenses	Pricing
14	Davao Medical School Foundation	Grants, users' fees, fees from related services (printing, computer rental, etc.)	USD 0.017 per hour (at least 5 Mbps per user) via the Piso (coin) Wi-Fi machines, cheaper than the USD .043 offered by competitors.
15	Department of Science and Technology (DOST)	Public funds	Free for the project duration but estimation of market process and communities' capability to pay were determined as part of the project.
16	Dompet Dhuafa	Zakat, Infaq, Sadaqah and Waqf (Ziswaf), and other social funds	
17	Nexlogic Telecommunications Network Inc.	Model relies on advertisements to pay for operational costs and games to increase speed	9,000 or 75% of indigent households, as well as selected schools with free internet access, servicing 60,000 people while 2,000 households are paying (charge per paying household confidential).
18	PapuaCom	Users' fees	Five times the cost (USD 3.17 per 1 gigabyte) offered by mobile network operators (MNO) to cover the backhaul cost; could be lowered to just twice the cost with backhaul cost decreasing.
19	Philippine Coffee Alliance, Inc.	Users' fees	
20	Philippine Rural Reconstruction Movement	Users' fees	USD 0.17 per hour via the Piso (coin) Wi-Fi machines.
21	redEsperansa.tl	Grants	
22	Net2Home (previously called TakNet)	Users' fees	Up to USD 7 per month of fibre connection.
23	University of Technology Sarawak (UTS)	Users' fees, grants	USD 20.55 (90 ringgits), payment decided by the families within the longhouses, they have their own system.
Pacific Islands			
24	iBoom	Users' fees, grants, and currently creating a programme on cybersecurity for action-based payments.	Higher paying customers subsidise those with lower income.
25	Kacific	Users' fees, grants, government projects	Price determined with the community and local ISP, usually by reviewing the current market price of one gigabyte of mobile broadband per country and matching such with Kacific price; different pricing in the Philippines due to high level of competitiveness, focus on businesses and government units instead.
26	Satsol Limited	Users' fees, grants	USD 8; checks out prices of competitors.

	Initiator/Initiative	Source of operational expenses	Pricing
North and Central Asia			
27	Community Networks Development Foundation (CNDF)	Users' fees, subsidised from the fees of paying customers	The backbone infrastructure for broadband internet access established by CNDF is available to network operators interested in providing internet services in rural areas, enabling local service provision and expanding connectivity options for residents and businesses. The user fees offered by network operators are slightly lower than those in big cities, ranging from approximately USD 13 to USD 25, depending on the services preferred by customers, i.e. internet speed, TV channels etc.
28	Mountain Community Network	Users' fees	USD 12 per month for 20GB, and USD 20 for 50GB for families; the government's price is double but not very high; CCCI profit is not allowed to exceed 10% of all capital and operational expenses to keep prices as low as possible.
29	Zardaly (Internet Society Kyrgyz Chapter with local communities)	Users' fees	Kyrchyn: based on a general price rate in neighbouring communities, but those covered by the community network has more bandwidth. Nookat: price is three times lower than the major player which charges USD 50. Suusamyr: price determined in a town hall meeting; prices for businesses are higher. Zardaly: internet service is free, paid for by the municipal government.
East and Northeast Asia			
30	Sources for Action – China	Grants	Use of app is free.

Other services to the community

As shown in Table 7, the initiatives do not treat the community members as just clients or end users paying for online access. All provide social inclusion services to their partner communities, providing interventions to optimise the use of free/affordable connectivity in their lives. Almost all CCCIs provide digital payment/banking services while some directly facilitate the gathering of data and information needed by community members. Social businesses also provide technical training (on infrastructure management and maintenance, digital business training, etc.) and two of them (AirJaldi and NexLogic) hire the locals they train in the company, enabling these locals to serve their communities.

On the other hand, most entrepreneurial non-profits combine social inclusion support with transformational services, treating the locals as co-owners at the onset and providing capacity development interventions toward this end. Entrepreneurial non-profits integrating CCCIs in their SEs have been socially inclusive and transformational in their endeavours, even before their digitalisation. In this respect a CCCI adds value to support the SEs' efforts to increase efficiency, widen their networks and market, and enhance income and social impact. In the case of the CCCIs based in

North and Central Asia, the communities have been the drivers and co-owners since the initiative started, with external actors assisting along the way. For CVISNET, the government, through DOST, initiated the CCCI, and later helped establish CVISNET to sustain and expand services to island communities. DOST remains a strong partner in the foundation's current connectivity engagements.

Table 7. Other services provided by the CCCIs

Initiator/Initiative		Other services to the community
South and Southwest Asia (SSWA)		
1	AirJaldi	• Training and hiring local people for deployment and management of networks focusing on rural connectivity and internships. • Digital business training solely for women • Digital training and connectivity to NGOs, self-help groups (SHGs) managed by the state, and schools catering to communities.
2	BAIF Development Research Foundation	• Training on the use of digital platforms; women trained to be digital entrepreneurs. • Training, capturing and producing content and uploading it to online platforms. • Digital payments, e-governance services, scanning, photocopying, printing.
3	Community Radio (CR) Bolo (Jadeite Solutions Pvt Ltd with Radio Bulbul)	• Development of content for information and educational purposes, accessible online or offline. • Trained key people on the daily operations of the community radio and updating the Interactive Voice Response (IVR) system (e.g. creating a folder, uploading content); on how to look after the wireless equipment and perform minimal trouble-shooting; on the use of the IVR platform. • The network is also used by SHGs (made up of women who are frontline workers, non-literate or low-literacy, housewives) to market their products locally and to share information about different loan or financial schemes or any other information they want to share with other fellow SHG groups.
4	DHAN Foundation	• Training on digital literacy, entrepreneurship and financial literacy • Training on how to manage the community resource centres
5	Digital Empowerment Foundation (DEF)	• Regular capacity building for district coordinators and local entrepreneurs on operating Digital Community Information Resource Centres (CIRCs) and maintaining connectivity and infrastructure. • Access to health and health information and services, finance and financial services, e-government services, agriculture services, education, jobs and opportunities.
6	Digital Dera (Agriculture Republic)	• Provision of agriculture-related data and information to farmers and training on sustainable agriculture. • Hosting regular learning sessions for women on food processing through tutorial YouTube videos. • Use of computers and printing facility.
7	Foundation for Architecture and Community Equity (FACE)	• Training on product development and marketing • Learning session about digital literacy, internet access, smartphone usage, e-commerce and online marketplaces, cybersecurity and online safety. • Exhibits organised to showcase the products of the women.

Initiator/Initiative		Other services to the community
8	Hello World	• Local capacity building: training on the basic use of connective devices such as computers and tablet and appropriate use of the internet and social media to the local communities; life skills training such as financial literacy. • Monitoring the community and generating data using IoT, including water distribution and environmental data. • Phone charging from electricity from the solar panels in the hubs. • Use of tablets that community members can borrow (like a book in a library) and take home.
9	Janata Wifi	• Digital financial services
10	Nepal Internet Foundation/ Everest Community Network	• Technical training for villagers to enable them to install, maintain, troubleshoot and fix the connectivity network.
11	Welfare Association for New Generation (WANG) Connectivity	• Digital skills enhancement for the youth using local language. • Organised learning sessions and activities, i.e. discussions on gender equality, women's rights, reproductive health, climate action, and education, etc.; movie-watching for children.
Southeast Asia (SEA)		
12	Central Visayas Information Sharing Network (CVISNET)	• Series of training to socially and technically prepare the island communities to manage the web portal (for ecotourism and livelihood). • Livelihood, e-commerce, education, eco-tourism, disaster risk reduction (DRR) information. • Cloud-based Barangay e-System and Tools (BeST) residents' information system, a "free to use system" offered to the barangays for planning, monitoring, evaluation, DRRM, health and reports generation.
13	Common Room Networks Foundation	• Digital and financial literacy training • Local women trained to be internet voucher agents • Men trained as technicians • Workshop and training and local content development.
14	Davao Medical School Foundation	• Training of partner POs on basic troubleshooting when connectivity or infrastructure issues arise; on the use and upkeep of the equipment; for barangay health workers (BHWs)/rural health units (RHUs) on the use of electronic health management system. • Training of partner Association of Barangay Health Workers (ABHWs) on basic troubleshooting, financial management and recording, orientation on gender sensitivity, organisational development, orientation on Iclinicsys and E-Konsulta, all under Phase 2 of the project. • Training parents on the responsible use of internet connectivity to monitor children's online activities. • Livelihood, scholarships, annual check-ups, Covid-19 internet access.
15	Department of Science and Technology (DOST)	• LokalFI: internet and non-internet-based delivery of digital educational content. • RCast Technology: offline learning management system and e-library.

Initiator/Initiative		Other services to the community
16	Dompet Dhuafa	• Organise the planting schedule for every member-farmer to match supply of produce with market demand. • Provide training and guidance on the controlled use of pesticides and chemical fertilisers. • Assist the member-farmers on the application of IoT in agriculture to improve productivity. • Strengthen farming communities through regular group meetings.
17	Nexlogic Telecommunications Network Inc.	• Fee access for educational content • Hiring local people and training them when necessary.
18	Papucom	• Employment/income from selling vouchers • Free access to educational materials online • Access to video calls and banking (which are not allowed with other mobile networks).
19	Philippine Coffee Alliance, Inc. (PCAi)	• Training held to teach the CBCEs how to operate the machine.
20	Philippine Rural Reconstruction Movement (PRRM)	• Training done to teach the farmer associations about relevant technologies and apps.
21	redEsperansa.tl	• Kalohan Akademiku: an e-learning platform for teachers.
22	Net2Home (previously called TakNet)	• Training through THNIC Academy • IoT for fire bush monitoring and other • Testing a distributed ledger on Taknet (Thai language) • Online community market
23	University of Technology Sarawak (UTS)	• Training on entrepreneurship
The Pacific		
24	iBoom	• Developing for cybersecurity and for integrating local population in the digital economy.
25	Kacific Refer to page 79 for pricing	• Job creation
26	Satsol Limited	• Affordable power source • Access of remote communities to cash and financial transactions
North and Central Asia (NCA)		
27	Community Networks Development Foundation (CNDF)	• Training on entrepreneurship for women
28	Mountain Community Network	• Technical training for local technicians

Initiator/Initiative		Other services to the community
29	Zardaly (Internet Society Kyrgyz Chapter with local communities)	• Solar panels and car battery as power sources for device charging and connectivity (Zardaly). • Internet in a Box Initiative: a device that stores a digital library that includes Khan Academy in Kyrgyz, thousands of video and audio lessons, cartoons, e-books and Wikipedia in Kyrgyz, Russian and English towards ensuring that Kyrgyzstani cultural heritage is passed down. • Learning sessions with local residents on digital skills, ways to earn through the internet, and various ways of learning.
East and Northeast Asia (ENEA)		
30	Sources for Action-China	• Aside from the virtual platform developed to promote cultural preservation, Sources for Action-China also installed an offline display machine at one of the villages. The machine provides an all-in-one information for visitors to access. • The initiative also provided additional economic opportunities for the village people. • Production of information, education and communication materials for the community. • Training sessions to develop content relevant for the app.

Gains and benefits of partner communities

Social benefits

Connectivity within the community and the outside world

Since most of the partner communities covered are remote and challenging to reach, the internet service has freed the residents from isolation and enabled them to uphold and claim their right to network access. As a result, they correspond faster among themselves and are digitally in touch with others around the world – relatives, friends, like-minded individuals, strangers. The residents of isolated Zardaly, for instance, have appreciated the chance to connect with relatives and friends outside of their village. In rural Bhadrak where CR Bolo operates, the community members are able to communicate among themselves faster through the community intranet set up by the initiative. Moreover, they have a venue to announce important school and community information through Radio Bulbul and the IVR system, as well as provide opportunities for local women's SHGs to broadcast their endeavours.

Meanwhile, community centres, hubs or labs established have become gathering places for community members where they can safely catch up, learn together and discuss community matters. WANG, for instance, ensures that their innovation lab is centrally located among several rural villages and schools. They visit these schools and communities and organise events to encourage the people, especially women and girls, to take advantage of what the lab offers. Hence, women and girls have come to learn while children dropping by have been engaged through weekly activities (e.g. movie watching). WANG likewise provides space to a number of organisations. For instance, UN agencies use the lab space to train their local staff on data recording or data capturing techniques. By letting external organisations into the lab, locals also learn and access resources that are otherwise inaccessible.

Engaging the government and accessing support

The internet connection has likewise enabled the communities to use government services that are otherwise difficult to access or never accessed at all as they often require time, travel and funds to get. The CCCI that BAIF helped establish in Pathardi (India), for instance, has enabled community members to access government services through the facilitation of e-DOSTs, women entrepreneurs who provide online digital services to villagers. The small islands connected through the CIVISNET initiative have also been enabled to access government services online. Correspondingly the barangay (village) local government has a web-based project monitoring and document management systems, which are intended to enhance government services within the islands.

Beyond accessing government portals online, the communities have found a tool to influence the government and make it accountable. The Indigenous community of Kasepuhan Ciptagelar in Indonesia has used online platforms to document their culture and traditions, and engage the government to recognise their claim to their ancestral land. Meanwhile, community members in Zardaly, Kyrgyzstan, have made videos addressed to the president and prime minister, depicting the lack of roads, electricity, social services, and land in their village. As a result, Zardaly has been covered by news media outlets almost monthly. Consequently, the president of the country posted in his social media accounts that the government will provide the neglected locality with paved roads while some ministers also posted that they will bring electricity to the village.

Sustained and enhanced learning

For many of the CCCIs in focus, online access has enabled users to create and access educational and learning tools for school work, personal learning, and other needs (health information, government updates, etc.). Schools covered have benefited as students could still continue with their lessons even if classes are suspended. They can even expand their learning experiences beyond the classroom as they can access any topic they want to explore.

Meanwhile, learning sessions have been provided on socially relevant topics, especially for women and youth. WANG has held "WALI Talks" in the innovation lab, inviting experts to virtually discuss gender equality, women's rights, reproductive health, climate action and education. The lab's connectivity has enabled the speakers to share their knowledge and interact with the villagers despite the distance.

Enhanced capacity of community members

Throughout the countries covered, the key informants have provided capacity development opportunities for their partner communities. Most have paid attention to training the locals on digital literacy, as well as maintaining and managing the communications system and infrastructure associated with the CCCI in place. Moreover, women and youth have been specifically targeted for knowledge and skills enhancement related to the use of empowering internet tools and platforms. While many of the key informants have acquired external funding for such endeavours, some have invested their own funds for capacity development.

Capacity to set up and/or manage the CCCIs

In South and Southwest Asia, AirJaldi has trained almost 2,000 people through a one-month residential course designed to train participants on managing wireless networks, with focus on rural connectivity and hands-on field experience and internships. In a similar manner, DEF has a regular capacity-building mechanism for district coordinators and local entrepreneurs on how to operate and

manage the almost 2,000 Digital Community Information Resource Centres (CIRCs) spread across over 150 districts. On a smaller scale, Nepal Internet Foundation/Everest Community Network has provided core technical training to almost 20 villagers from the two communities covered in the Everest region to enable them to maintain the connectivity network. CR Bolo has likewise trained people on the daily operations of the community radio and updating the IVR.

Similar efforts have been made in Southeast Asia. CVISNET, DMSF and Common Room have provided interventions to socially and technically prepare their partner communities to manage the CCCI themselves.

Capacity to use digital tools and navigate the internet safely and responsibly

Almost all the CCCIs that participated in the interviews conduct digital literacy and training for their partner communities. For instance, Hello World, through the Hello Hubs, initially provides learning sessions on the basic use of connective devices such as computers and tablets. Partners are then tapped to further give computer training on appropriate use of the internet and social media to the local communities. In the same manner, WANG in Pakistan, through its key initiative, WANG Lab of Innovation (WALI), equips the youth with digital skills necessary for the modern world, using local language. Young people are taught on the power of connectivity, and how to manage chat groups and social media connections. Conversely, DMSF in Southern Philippines has trained parents on the responsible use of internet connectivity so that they can monitor their children's online activities.

Supporting and empowering women

The CCCIs in South and Southwest Asia point out that connectivity itself democratises learning across gender. In some of the covered areas, girls are not allowed or are frowned upon when they go to school for education. With digital connection, the girls are able to access educational tools and materials and learn safely.

Moreover, most of the key informants have engaged women and girls towards more participation in community affairs and engagement in economic activities. Satsol in the Solomon Islands reports that the Data Garden initiative has provided a venue for women to volunteer and contribute their time. Many of its volunteers are women. In Zardaly in Kyrgyzstan, the community hotspot hub (school) has enabled young women to have a safe space and engage in a more active social life. Since the community was very conservative, girls were not supposed to be outside at four in the afternoon because there was usually nothing to do outside by that time. Now, they go to the hub to study and meet other young women and members of the community. The hub has become a safe space for them, a place for community gathering.

Other CCCI initiators have sought to develop or enhance women's entrepreneurial skills. AirJaldi provides digital business training solely for women. In Armenia, the capacity-building initiatives organised by CNDF have women as the majority participants. This is largely because many women prefer to work from home, seek opportunities to learn new skills, and aim to contribute positively to their communities. Correspondingly, Digital Dera hosts regular learning sessions for women on food processing through tutorial YouTube videos. The company does not conduct follow-through activities but has received reports of several women applying what they have learned and selling processed food in the local villages or some stores in the city.

Hello World in Nepal is working with the women in partner communities to start their own savings group and fund-raising activities. The organisation is helping these women get authorisation for the

latter. In Pakistan, WANG plans to marry its Wang Initiative for Rural Empowerment (WIRE) model with the social enterprise model for women. Since WIRE already has training programmes on digital business and marketing for the youth, the facilities for such will also double as a livelihood centre for local women. The idea came about when WANG engaged in a school enrolment programme for girls. Mothers refused to send their female children to school because they did not see the need, believing that girls will just end up married and living with their husbands. The experience prompted WANG to come up with a proposal to involve and train the mothers to learn sewing, sell their crafts online, and eventually earn from the endeavour. In the process, they will learn new skills, improve product quality and enhance their financial literacy. Meanwhile, their daughters will be trained in digital literacy in the innovation lab, and will be tasked to engage in electronic marketing and selling of their mothers' products. Having their own income is envisioned to empower the mothers, change their mindsets on girls' education, and help their families to thrive. An increase in the family income can redound to more resources for children's education, health and nourishment. As a result, WANG expects the girls, women and whole community to be transformed. There will be recognition of their multiple contributions in the family and community.

BAIF in India designed the e-DOST programme, a women-led SE model, intended to jumpstart the creation of a digital ecosystem within the village. Through the programme, meticulously selected and trained women from the community serve as e-DOSTs, offering digital financial services right at the doorsteps of the villagers at an affordable cost. These e-DOSTs earn a commission for every successful transaction. The earnings derived by e-DOSTs have enabled them to contribute significantly to the household income, purchase items for themselves and save for the future. Beyond the increase in income, these women relay how their confidence, communication skills, and technical knowledge have been enhanced through their daily interactions with fellow villagers. At the same time, they have earned the respect of family and community members. Aside from the e-DOST programme, women entrepreneurs and women's self-help groups (SHGs) have taken advantage of the e-commerce platform developed by VaPCOL, a subsidiary of BAIF that also helps women manage the packaging and marketing of their products. A new brand of processed mangoes, cashews, and gooseberry-based products such as pickles, preserves, and solar-dried fruits made by local women emerged from the partnership.

FACE in Bangladesh has linked Rohingya women refugees to a fair trade organisation to help these women implement and manage SEs. Connectivity has been installed to promote and market the fashion items they produce and increase their income towards women economic empowerment.

Documentation and promotion of culture and traditions

The CCCIs established by BAIF in India, Common Room in Indonesia and Sources for Action in China have all enabled partner communities to document and promote their culture and traditions. The Indigenous groups in Pathardi and Kasepuhan Ciptagelar have been enabled to produce online content, document their cultural activities, archive records, and share them with the younger generations and other Indigenous communities. The same has been done by Sources of Action through the development of an app that enables and connects smallholder farmers to document, share and showcase knowledge on quality food production, biodiversity, conservation, sustainable farming and local cultural practices. To expand access to the digital portal, an offline display machine was installed where community members can upload and request photos, while visitors can use the machine to gain insights into the community's way of life.

Better security, safer communities and faster emergency/disaster response

The Community Networks Development Foundation in Armenia narrated the instance of a local pastry shop which installed security video cameras to monitor activities within and outside the shop. The Community Mountain Network is likewise relieved that there is internet in the covered villages as the terrain is dangerous with plenty of hikers who might need emergency services when accidents occur. In the Philippines, which experiences strong typhoons and flooding regularly, the disaster information provided by the network helps prepare the local government and islet residents for such hazards in CVISNET areas.

In the partner Indigenous community of Common Room in Kasepuhan Ciptagelar in Indonesia, being connected online enabled the villagers to immediately report a major landslide in 2019, prompting government and non-government entities to instantly distribute aid to the survivors. With 26 houses buried in mud, and each affected family in need of USD 2,000 to rebuild their homes, funds poured in from different parts of the country and the globe due to the online resource mobilisation and crowdfunding conducted by the villagers. Funds gathered were immediately accessed through digital banking and financial transfer platforms.

Economic benefits

Livelihood support, additional Income and development of the local economy

Several CCCIs have enabled the promotion of the culture and environment of the communities, stirring up tourism and providing additional income for enterprising residents and the community. In the Everest region, the CCCI initiated by the Nepal Internet Foundation/Everest Community Network has helped homestay operators and sherpas book more clients. In the Philippines, the online platform that CVISNET installed in the small islands of Cebu has enticed tourists to visit the areas and systematically book their tours with local boat operators. Meanwhile, vloggers and tourists who uploaded the videos of their visit to the unusual and undiscovered Zardaly in Kyrgyzstan have made Zardaly a developing tourist destination. Similarly, The Mountain Community Network in Georgia relays an increase in hostels and homestay accommodations in some villages because of tourist influx. With more tourists in the villages, locals are able to sell their produce from the comfort of their homes – meat, cheese, vegetables, which they used to market in the big cities. Families who just stayed in the villages during summer are now attracted to stay even during winter time.

Entrepreneurial non-profits engaged in SEs have utilised CCCIs to improve the efficiency, market reach, productivity and income of the enterprises they implement and/or support. Dompet Dhuafa and PCAi have installed IoT in the agricultural enterprises of the smallholder farmers they serve for information-based decision-making and smart farming, thereby saving on resources and improving SE income. The DHAN Foundation in India has established Community Resource Centres in their partner communities to provide connectivity that will support and further boost the enterprises implemented by the communities.

Others have found income sources in the related services provided through the CCCIs. The communities covered by BAIF, CVISNET, FACE, and Philippine Rural Reconstruction Movement (PRRM) have been able to start/enhance marketing their products online. The partner POs of DMSF and PRRM are earning income through the Piso (coin) Wi-Fi machine rental and print services provided by the foundation. The PO partner of DMSF is already earning an average income of USD 34 to USD 52 per month, 40% of the overall revenues from the CCCI that will directly go to the PO members as patronage refund and dividends, community health fund, and equipment

maintenance. Meanwhile, community members, mostly women, in areas covered by Common Room and PapuaCom in Indonesia earn income directly from selling internet vouchers. In Pakistan, the agriculture-related information provided by Digital Dera to farmers, has reportedly helped increase crop productivity and farmers' income as well. Through market information, for instance, farmers learn of the prices of farm inputs and produce which enables them to buy from the cheapest source and sell where profits are higher. Climate information and sustainable agriculture practices promoted by Digital Dera have also helped increase productivity. In the same manner, the farmers supported by BAIF in India have learned agricultural technologies from fellow farmers through an online knowledge-sharing platform resulting in crop diversification and improved production yields in Pathardi and outside villages. In Bangladesh, Janata Wifi's free access in shops and tea stalls has increased the number of customers, thereby spurring the growth in income of the local shop owners.

Meanwhile, several initiators note income-generating opportunities seized by users, on their own, due to the online network. redEsperansa.tl in Timor-Leste reports transforming the way partner communities trade as they discover new ways to market their coffee and other products. UTS in Malaysia relays how chat groups created among the residents of nine longhouses (made up of 3,000 people) in Bawang Assan are optimised to sell goods and produce. Some are already trying to be influencers to earn from advertisements. Nexlogic has witnessed an increase in income among indigent household users who are micro-entrepreneurs. In Nookat in Kyrgyzstan, the local entrepreneur who took over the CCCI, along with the local people, are reinvesting a lot for expansion to give better services to villagers, resulting in the creation of jobs and learning of new skills by the people.

Income-generating activities have already been lined up for other CCCIs. Nepal Internet Foundation/ Everest Community Network is currently in the process of helping the villagers market their handicrafts online and connect them with handicraft dealers in Nepal. In the Pacific, Kacific, in partnership with local ISPs, intends to train local volunteers to produce internet vouchers and resell.

Because of the economic opportunities offered by being connected online, Nepal Internet Foundation/Everest Community Network believes that there is a better chance for the youth to stay and contribute in community development instead of trying their luck in the city to find better opportunities.

Lower cost for connectivity, trading, and other activities

The competitive price brought by CCCIs offering affordable or subsidised internet connection has forced other telecom players in the locality to lower the cost of their services. In Suusamyr, Kyrgyzstan, the community has formed an NGO to own and manage the now successful and financially thriving connectivity initiative. The endeavour has forced the state-owned ISP, which used to be the only provider of digital services, charge for poor connection at a very high cost and take several months to install the connection, to immediately lower its subscription cost by 75%, increase internet speed by three times and hasten the installation to their system to just a few days. In the same manner, private investors have been forced to lower their internet cost in the islands covered by CVISNET in Cebu, the Philippines, due to the low price offered by the foundation.

For many, the digital payment, banking services and e-government portals provided through the internet connection have saved time, energy and travel costs, especially since the areas are remote and isolated. The villagers supported by BAIF in Pathardi, for instance, used to travel by bus or on foot 20 kilometres to and from Jawhar, the closest town, for banking, utility payments, mobile

charging and government-related transactions. On average, they travelled five times a month for these transactions, spending USD 1.20 to USD 2.40 per visit, losing a day's earnings in the process. This is no longer the case since the installation of online connectivity in the community and surrounding villages.

Similarly, Janata Wifi cites an example of a medical staff being able to order the much-needed medicine or call for help, without having to physically leave the village, saving time and the patient in the process. WANG likewise appreciates the network connection through its innovation hub as resource speakers for training and learning sessions need not go to remote rural areas to give inputs and share their knowledge. Travelling to rural areas in Pakistan is not just expensive, it is also not safe and the infrastructure is limited. The experience is the same for Digital Dera as farmers are able to meet and consult government officials from the agriculture and livestock department via Zoom set up in the centre. This is most convenient when the weather is bad and travel is difficult. As a result, farmers are able to deal with experts without funds spent.

Environmental benefits

Digital Dera's promotion of sustainable agriculture, through the use of important data and technology accessed from the internet, allows farmers to practise nature-friendly and climate-adaptive practices. In the same manner, the Indigenous community of Kasepuhan Ciptagelar relates that online access to the weather and climate forecasts has enabled them to incorporate climatic conditions such as El Niño and La Niña in their traditional farming calendars. Meanwhile, a farmer in the village has created and uploaded content on the knowledge-sharing platform about sustainable rice varieties and cultivation techniques that improve production. His content has influenced other farmers to adopt crop diversification and experience improved production yields.

In addition, five Hello Hubs established in far-flung areas by Hello World are equipped with IoT-based environmental monitoring systems, while one hub uses IoT for water distribution and efficiency monitoring. The data is used by the community and also sent to Kathmandu to help ensure effective management and use of water supply.

Several initiatives have also relied on renewable energy to power their connection. BAIF, Common Room, Digital Dera, Hello World and Sansol use solar energy to supply electricity to their connectivity initiatives.

Strategies for sustainability

Considering the costs of setting up and maintaining internet connectivity, especially in geographically remote and isolated areas, sustaining the gains and benefits derived by the communities from the CCCIs can be challenging. From the experiences of the 31 key informants engaged in this study three strategies for sustainability have emerged for those that do not recover their costs from transactional services:

- **Strategy 1:** CCCIs established primarily to ensure the right to connectivity, especially by the poor and marginalised; social inclusion[33] and/or transformational services[34] have been integrated to complement the revenue obtained from transactional services.
- **Strategy 2:** CCCIs integrated in the operations and services of existing SEs already engaged in social inclusion and/or transformational services to further promote and enhance the economic development of the poor and marginalised sectors they serve.
- **Strategy 3:** CCCIs that have successfully sought government financing to ensure citizens' free access to the internet.

Regular ISPs provide connectivity primarily to earn profits. On the other hand, all the foregoing strategies, whether self-provided, government-initiated, social business, or entrepreneurial non-profit, have established CCCIs primarily for social impact. For Strategy 1 CCCIs, many have, knowingly and unknowingly, already adopted the SE model. SEs are entities that seek to achieve both social and financial benefits from their services. Unlike traditional businesses that seek profit mainly to enrich the owners of capital, SEs contribute to resolving social and environmental problems while also distributing the wealth created to a broader constituency, especially those from the poor and disadvantaged communities and sectors.[35] Therefore, it can be argued that CCCIs, no matter which strategy, can be considered a segment of SE that needs to be supported.

However, balancing wealth creation with social and environmental benefits at the same time can be difficult, especially when it necessitates interventions to enhance the capacities and empower the communities to eventually manage the CCCIs themselves. Hence, government support is necessary to ensure that there is a conducive policy and regulatory environment for these CCCIs, as well as resources to help establish and sustain connectivity.

For those in Strategy 3, the CCCI's financial viability has been assured through local government support while community empowerment, through social inclusion and transformational services, has been achieved through the efforts of the CCCI initiators, volunteers and/or other stakeholders.

Therefore, ensuring the sustainability of the gains and benefits from the CCCIs entails looking at:

- **Financial viability**: Does the CCCI earn enough profit to cover capital and operational expenses?
- **Extent of community/local empowerment** (through social inclusion and transformational services): Is the community/locality technically equipped to use the internet and/or operate/manage the CCCI without the external drivers?

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33 Social inclusion services are oriented towards addressing digital exclusion. Examples include services in local languages or to meet other community needs (content), access to shared devices (i.e. computer labs or hubs, environmental sensors and other IoT networks) that bring meaning to the connectivity and address communities' needs and training for digital skills.

34 These are oriented at enabling local people to become actors in their own development. These are services that build their capability to own, govern and manage digital resources in a way that could positively impact on their lives and the lives of their families and communities. Transformational services enable the poor and excluded to be co-owners, supervisors, managers and decision makers or to become leaders and stakeholders of the social enterprises that provide digital-related services and ensure meaningful connectivity.

35 Dacanay, M. L. (2013). Op. cit.

- **Government policies and regulations to support the CCCIs:** Are there government policies and regulations supportive of the establishment and operation of CCCIs and allotment of resources for them?

The CCCIs in North and Central Asia are self-provision CCCIs and have operated as SEs, with the financial viability, community empowerment and government support necessary to sustain the CCCI for over a long period. In both cases, community members and development partners have served as major drivers to set up the connectivity, influencing both government and the private sector to support and participate in the endeavour. While the government of Kyrgyzstan seems not to bother with the licence of Zardaly to operate as a network, the country still lacks regulatory measures to make the model legal. Nonetheless, Zardaly and the three other CCCI models in the country have reached financial viability and community empowerment despite working around inconsistent government regulations.

In South and Southwest Asia, the social businesses are doing well in terms of financial viability but may need to better involve the villages they serve, to move towards more transformational relations and arrangements. The entrepreneurial non-profits, meanwhile, have fully involved their partner communities in transformational endeavours, allowing the latter to manage the operations of the network initiative. However, many of them still rely on grants to sustain CCCI operations, perhaps due to policy restrictions for non-profits. In terms of government support, those in India face some regulatory dilemmas but those in Nepal and Pakistan do not have problems with licensing regulations at the moment.

In Southeast Asia, concerns over licensing, as well as corruption in the system have been raised by some key informants. Nonetheless, most entrepreneurial non-profits and partner communities in Indonesia, Malaysia, the Philippines and Thailand seem to have achieved the same level of success as those in North and Central Asia due to local government. These entities are now successfully operating as social enterprises, with sufficient profits/fund support and empowered communities to sustain the CCCIs.

In the Pacific, iBoom has yet to achieve financial viability, community empowerment and government support though the communities are very supportive of the endeavour. It encountered difficulties in acquiring a licence despite policies encouraging network connectivity, as well as major challenges in building the needed infrastructure. Kacific's local ISPs are in charge of the actual installation at the end-user site. In certain other countries, Kacific has set up their own ISP to handle the installation and maintenance. The empowerment aspect is dependent on how vigilant Kacific and their partner ISPs are. Meanwhile, Satsol's Data Garden seems to have achieved financial viability, social inclusion, and government support.

Overall, all three strategies for sustainability need resources and an enabling environment to thrive and fully achieve sustainability. Hence, governments need to be engaged to support CCCIs as a segment of SE that seeks to create wealth and social impact for the poorest and most marginalised sectors, especially in far-flung rural areas covered by most CCCIs.

CHALLENGES

Few enabling policies and regulations for setting up or expanding CCCI services

Across the regions covered by the study, the difficulty in licensing, setting up, and/or expanding CCCI services has been repeatedly mentioned. In the Kathmandu region, for instance, Hello World notes of the lengthy process of getting permissions and approvals from regulatory bodies and local government bodies. Meanwhile, CR Bolo's hybrid connectivity model could benefit many more unconnected rural communities in India if expanded or replicated. However, expansion is not yet feasible for CR Bolo due to the highly competitive and expensive cost of bandwidth. Aside from the cost, the process of obtaining a connectivity-related licence is time-consuming and demanding due to numerous reporting requirements and compliance conditions that are not suited to small-scale networks just starting up.[36] Seeking external grants or financial support for such is also challenging due to the restrictions imposed by the country's Foreign Contribution Regulation Act (FCRA), which limits and monitors foreign funding and increases compliance burdens for non-profit organisations.[37]

In Bangladesh, licensing for internet provision is complicated because licences to operate are varied, depending on scope, whether at national, district or municipality levels. In the process, ISPs at the local level get highly competitive. Janata Wifi relates the instance of smaller ISPs monopolising the provision of internet services. If a new player tries to enter the village where they operate, they reportedly cut the cable wires. The company is still trying to figure out how these ISPs could serve as allies in the promotion of CCCIs where online services are provided for free to disadvantaged communities but revenues can be gained through advertisements. These ISPs also need automation products which Janata Wifi could help them with. The need to establish good relations with smaller players is hoped to contribute to the expansion of internet services to areas where connectivity is lacking.

In Southeast Asia, CCCIs in the Philippines and Malaysia mention similar challenges in regulatory issues, especially for CCCIs with smaller and limited coverage. In the Philippines, applying for radio frequency spectrum is out of the question, while licences for fibre infrastructure are dominated by cable television companies. Given the limited spectrum allowed for Wi-Fi, and the growing demand for data usage, licensing is strictly controlled.[38] The problem of rampant supply chain corruption in the industry has also been pointed out, which makes building networks more costly than it should. Similarly, UTS in Malaysia discusses how its partner community could work around the Wi-Fi licensing regulations since each of the nine longhouses covered by the CCCI requires a licence.

In the Pacific Islands, iBoom discloses how government regulations in the Federated States of Micronesia prevent CCCIs from flourishing. The licensing process and requirements cause much delay, blocking innovations in internet provision instead of fostering them.

In Kyrgyzstan, there is a need to resolve inconsistent government policies to ensure that the model developed in Zardaly could be replicated in other remote villages. Currently, the CCCI in Zardaly has a potential legal problem because it is operating a wireless connection in a public place (school). By

36 Manzar, O., Mawii, Z., & Chaturvedi, U. (2021). *Innovating India: Roadmap for 2019-24: Challenges of Last Mile Connectivity*. Digital Empowerment Foundation. https://www.defindia.org/wp-content/uploads/2021/09/Challenges-of-Last-Mile-Connectivity-Osama-Manzar.pdf?form=MG0AV3

37 ICNL. (2020, February). India's 2020 FCRA Amendments Impact on Association: How India's FCRA Amendments Violate Free Association and Impede COVID Responses. https://www.icnl.org/post/analysis/indias-2020-fcra-amendments-impact-on-association?form=MG0AV3

38 Ibrahim, M. (2023, 14 August). The imperative of efficient spectrum management in the Philippines. *Manila Bulletin*. https://mb.com.ph/2023/8/15/the-imperative-of-efficient-spectrum-management-in-the-philippines?form=MG0AV3

law, all wireless ISPs are required to go through a bidding process to acquire a spectrum licence and operate. Unfortunately, there is no ISP that is willing to bid in remote areas with small populations because the cost will be difficult to recover. On the other hand, the government has a policy to connect all villages in the country to the internet. In fact, the internet connection in the area is paid for by the municipal government, through its local budget. Hence, the CCCI in Zardaly is actually helping the government to achieve this intent. For the other CCCIs in the country, they are using wired connectivity, which requires a more affordable licence for telecommunications services, which is not as difficult to obtain.

Financial viability

Except for BAIF, the financial viability and expansion of services is still difficult to achieve for non-profits in South and Southwest Asia. Most still rely on grants and external support to cover operational expenses. Even CCCIs, which have already achieved financial viability from the sales of products, consultancy fees and payment of services, still rely on private grants and donations to kick off/operate their CCCIs. Given the distance and inaccessibility of unconnected communities, the time and resources in deploying, maintaining and upgrading the necessary infrastructure are high. redEsperansa in Timor-Leste argues that, since most of the physical assets are imported, the suppliers charge more than they should. Meanwhile, WANG highlights the advantage of expanding and upgrading its services to satellite internet as the technology is better and faster. However, the capital outlay and subscription costs can be expensive.

In Pakistan, the seemingly uncontrollable inflation does not help in making the CCCIs viable. Digital Dera, for instance, is concerned about the excessive escalation in prices of goods and commodities in Pakistan which directly impacts the farmers served by its CCCI. For instance, a bag of fertiliser, which cost Rs.1,400 in 2021, has now increased to Rs. 45,100, over 3,000% increase in three years. Electricity costs have escalated, as well as other agricultural inputs and supplies. From 9.5% in 2021, the inflation rate in the country increased to 30.77% in 2023,[39] primarily due to global and domestic forces affected by the COVID-19 pandemic.[40] While the rate has eased this year, it has made life harder for smallholding farmers, women and youth in rural villages where Digital Dera operates. All this impacts the cost of maintaining the CCCI as well.

Most of the key informants wish to replicate their models and expand their services to other remote communities but they do not have the funds to do so. In Nepal, Hello World lacks the resources to expand. WANG also notes the need for additional financial resources to acquire better technologies and human resources, as well as install better systems. Key informants in the Philippines also lament the lack of access to subsidies and capital for expansion in the country.

Unreliable power supply

Most CCCIs have utilised solar power and other renewable energy sources as viable solutions to address the lack of proper grid infrastructure. This approach not only provides a sustainable energy alternative but also enhances the reliability of connectivity services especially in remote areas. By harnessing solar energy, many initiatives can operate independently of traditional power grids, which

39 https://www.macrotrends.net/global-metrics/countries/PAK/pakistan/inflation-rate-cpi?form=MG0AV3

40 Khan, S. (2021, 15 November). Pakistan: Rampant inflation hits hard. *DW*. https://www.dw.com/en/pakistan-rampant-inflation-piles-on-the-pressure/a-59823980?form=MG0AV3

are often unreliable or non-existent in isolated communities. This independence allows CCCIs to maintain a consistent internet connection, ensuring that community members can access essential services and information.

However, while solar power presents a promising solution, it is essential to recognise that its effectiveness can be influenced by geographical and climatic factors. For instance, regions with prolonged periods of cloud cover may experience fluctuations in energy production, which can affect the reliability of internet connectivity. It is crucial for CCCIs to integrate energy storage solutions and explore a mix of renewable energy options, such as wind or hydropower, to mitigate these challenges. By developing a robust and diversified energy strategy, CCCIs can enhance their operational sustainability and better serve the needs of their communities. In this regard, the unreliable power supply in Pakistan is a critical concern raised by both Digital Dera and WANG. CVISNET likewise laments the unreliable and limited electricity in the small islands of the Philippines. This was the case for redEsperansa in Timor-Leste as well.

Possible competition in services

While competition among networks is generally good for consumers as it helps lower internet costs for end users, CCCIs may be at a disadvantage when competing with larger ISPs. The entry of a new player offering 50% cheaper internet services made some of Common Room's subscribers shift to the new ISP in 2023. Meanwhile, PapuaCom has reported that its current operations in Bokondini, Indonesia might close shop soon as competition from Starlink has brought down voucher sales from its CCCI. In the same manner, the sustainability of the e-DOST programme in Pathardi could also be affected if new digital service providers start operating in the villages and offer similar services as the e-DOST.

Lack of community interest and support

Nepal Internet Foundation/Everest Community Network relays that at the onset, the villagers were not usually receptive to internet connectivity. They were suspicious of the initiative, wary that it was solely a money-making endeavour meant to exploit them. Hence, the foundation had to gather villagers and convince them of the advantages of digital technology.

Impact of climate change

Since almost all the communities covered by the CCCIs are remote and isolated, the impacts of climate change have caused some setbacks on the gains achieved by the villagers from the initiative. Digital Dera, for instance, knows first-hand how climate change has impacted the agricultural communities in Pakistan and its direct impact on the company's efforts as well. Extreme weather conditions have affected the livelihood of agricultural villages as well as the cost of CCCI operations. Training activities are sometimes cancelled due to severe rainfall or severe heat. CVISNET in the Philippines also narrates how the islands are susceptible to weather disturbances, often flooding when cyclones or heavy rains occur, especially during high tide. The vulnerability of the island dwellers to flooding and storm surges affects the gains from the livelihood and income-generating activities resulting from being connected, as well as the overall well-being of the villagers.

Need to strengthen capacity of communities on product promotion and marketing

Many of the CCCIs report a boost in the livelihood of partner communities due to online trading and promotion of local products, culture and tourism. Nonetheless, some still see the need to strengthen the people's capacity to promote and market their products. CR Bolo, for example, has been encouraging women SHGs to use the radio and connectivity for micro-banking and micro entrepreneurship but the groups only use the platforms for communication and information-sharing. Similarly, CVISNET shares the need for fishers and seaweed farmers to use digital technology to sell their produce. At the same time, the local government could use it to boost and monitor ecotourism activities in the islands.

OPPORTUNITIES

Policy and regulatory framework

The regulatory environment across Asia Pacific requires significant reform to support CCCI growth. Current licensing procedures, particularly in countries like India, Bangladesh and the Philippines, are often prohibitively complex and expensive for small-scale initiatives. Governments should establish specialised and flexible licensing categories for CCCIs, with streamlined procedures and reduced costs for community-based operators and implementers. This is particularly crucial given that many successful initiatives, such as those in Kyrgyzstan and Nepal, operate in regulatory grey areas despite their positive community impact.

Moreover, there is a need for governments to provide resources for CCCIs to transform lives and spur local economic development towards sustainability, as in the case of BAIF in Pathardi and Zardaly in Kyrgyzstan where the local governments annually allocate funds for internet service through their local plan and budget.

Financial sustainability models

A hybrid funding approach is recommended, combining initial grant funding with sustainable revenue generation. The experience of initiatives like Digital Dera in Pakistan and CVISNET in the Philippines demonstrates the importance of developing multiple revenue streams. Community-based pricing models, as demonstrated by the Mountain Community Network in Georgia (limiting profit to 10% of expenses), can ensure both accessibility and sustainability. Special attention should be paid to developing financial models that can withstand local economic challenges, such as the high inflation rates affecting initiatives in Pakistan.

Technical infrastructure and capacity building

Infrastructure development should prioritise resilient, climate-adapted solutions, particularly given the challenges faced by initiatives in weather-vulnerable areas like the Philippines and Pakistan. The success of solar-powered solutions, as implemented by Hello World in Nepal, suggests the importance of renewable energy integration. Technical training programmes should be institutionalised, following the model of AirJaldi's residential courses in India, which have successfully trained nearly 2,000 local technicians.

Capacity building among CCCIs and potential CCCIs could also be conducted. For some CCCIs, their capacity to integrate social inclusion and transformational services in their initiatives could be strengthened. Similarly, for CCCIs to integrate meaningful connectivity in their SEs and local economy development needs support as well. Overall, basic financial management skills will be required to ensure sustainability.

Establishing a common platform for CCCIs to flourish and learn from each other could also assist potential CCCIs to expand. Such space could be utilised to keep stakeholders updated with opportunities and awareness campaigns revolving around CCCIs as a segment of SE. An example of such a space is ISEA's Technological Innovations for Sustainable Development (TISD) platform, which provides learning exchanges to leverage technological innovations to address sustainable development challenges and support social enterprises, in combination with using available resources from partners such as the Internet Society[41] and the Association for Progressive Communications.[42]

Gender and inclusion

Building on successful models such as WANG's innovation labs and Digital Dera's women's entrepreneurship programmes, CCCIs should integrate gender-responsive approaches from the planning stage. This includes creating safe spaces for women's internet access, developing women-focused technical training programmes, and linking connectivity initiatives with women's entrepreneurship opportunities. The experience in Zardaly, Kyrgyzstan, where community hubs have become safe spaces for women's education and social interaction, provides a valuable model.

Community ownership and governance

The study shows that successful initiatives, particularly in West and Central Asia, have strong community ownership models. Future CCCIs should adopt similar approaches, involving communities from the planning stage and gradually transferring technical and managerial responsibilities to local stakeholders. This should be supported by comprehensive capacity-building programmes, following the example of Digital Empowerment Foundation's CIRC model in India.

The future of CCCIs in Asia Pacific depends on their ability to balance social impact with financial sustainability while navigating complex regulatory environments. Success will require continued innovation in both technical solutions and business models, always keeping community needs and empowerment at the centre of these initiatives.

Continuous technological innovations for sustainable development

Continuous innovation is crucial for the sustainability and effectiveness of CCCIs in addressing the digital divide. As in many examples in the report, CCCIs have successfully integrated innovative technologies and approaches to meet the unique needs of their communities. For instance, initiatives like AirJaldi in India have not only provided internet connectivity but have also developed and piloted new technologies to enhance service delivery. By focusing on local needs and leveraging

41 Luca de Tena, S. (2022). *Community Network Readiness Assessment Handbook*. Internet Society. https://www.internetsociety.org/resources/doc/2022/community-network-readiness-assessment-handbook and the Community Network DIY Toolkit. https://www.internetsociety.org/resources/community-network-diy-toolkit/

42 Community Networks Learning Repository: https://cnlearning.apc.org

innovative solutions, such as the hybrid connectivity model utilised by Community Radio (CR) Bolo, these initiatives can adapt to changing circumstances and ensure they remain relevant and effective in their operations.

Moreover, the incorporation of digital tools and platforms can further enhance the capacity of CCCIs to serve their communities. Digital Dera in Pakistan, for example, has utilised IoT technology to provide real-time data on agricultural practices, thereby improving productivity for local farmers. This kind of technological integration not only addresses immediate connectivity issues but also empowers community members with the knowledge and resources necessary for sustainable development. By fostering an environment of continuous innovation, CCCIs can explore new opportunities for economic growth and social impact, ensuring that they remain at the forefront of addressing the digital divide.

Finally, collaboration among stakeholders is essential for driving continuous innovations within CCCIs. The report illustrates how multi-organisational arrangements have proven effective in enhancing service delivery and expanding reach. For example, the partnerships formed by the Community Networks Development Foundation (CNDF) in Armenia have enabled the installation of fibre optic cables, bringing connectivity to previously underserved areas. By fostering partnerships between local communities, government agencies and private sector players, CCCIs can leverage diverse expertise and resources to innovate and scale their initiatives effectively. This collaborative approach can lead to the development of new business models and sustainable practices that are responsive to the evolving needs of the communities they serve, ultimately contributing to long-term success and resilience in bridging the digital divide.

Expanding the CCCI reach to new social sectors

Expanding CCCIs to include underserved sectors such as Indigenous communities, migrant workers, refugees and the elderly is essential for fostering inclusivity and ensuring that the benefits of digital connectivity reach all segments of society. Indigenous communities often face significant barriers to accessing technology and the internet due to geographic isolation and socio-economic challenges. By tailoring connectivity solutions to meet the unique cultural and linguistic needs of these communities, CCCIs can empower them to preserve their heritage while gaining access to valuable resources. For example, initiatives like the Indigenous Peoples' Organization (IPO) in the Philippines have successfully integrated local languages and cultural contexts into their digital platforms, enabling indigenous populations to engage with educational and health services that respect their traditions.

Migrant workers and refugees, who frequently experience displacement and social marginalisation, also stand to benefit significantly from expanded connectivity initiatives. Many migrant workers and refugees rely on digital platforms to communicate with family members, access essential services and find employment opportunities. The report highlights how organisations like the Migrant Workers Centre on the United Nations High Commission on Refugees have utilised mobile technology to provide real-time information about labour rights and available resources. By developing targeted connectivity programmes that cater to the specific needs of migrant workers, CCCIs can enhance their access to vital information and support networks, thereby improving their overall well-being and integration into host communities.

Furthermore, the elderly population is another critical sector that requires focused attention in connectivity initiatives. As highlighted in the report, many elderly individuals face challenges in accessing digital technologies due to physical limitations and a lack of digital literacy. By implementing user-friendly platforms and providing tailored training programmes, CCCIs can help bridge this gap. For instance, initiatives that create community hubs where the elderly can learn to use technology in a supportive environment can significantly enhance their ability to connect with family, access healthcare services and participate in social activities. Expanding CCCIs to include these vulnerable groups not only promotes social equity but also enriches community life by ensuring that all voices are heard and included in the digital landscape.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The landscape of CCCIs in Asia and the Pacific demonstrates a transformative approach to addressing the digital divide, revealing both significant achievements and persistent challenges. These initiatives have evolved from purely community-owned networks to sophisticated hybrid models involving multiple stakeholders, often combining social enterprise principles with community empowerment.

The characteristics of the CCCIs were found to closely conform to the set of 13 principles and typologies of CCCIs developed by the LocNet initiative. Based on the self-assessment of over 270 initiatives that participated in the survey against the CCCI principles, the CCCIs scored themselves very high across all principles. Beyond the transactional service of providing internet connection, these scores, along with the key informant interview (KII) results, reveal that the CCCIs in Asia and the Pacific have become catalysts for social and economic transformation, particularly in geographically isolated and disadvantaged areas (GIDAs). They have demonstrated remarkable success in improving access to education, healthcare services and economic opportunities. Consistent with LocNet typology, the CCCIs involved in the more in-depth KIIs may be classified into one of three types – self-provision, social business or entrepreneurial non-profit. Some have later formed or involved local social cooperatives to ensure community engagement and sustainability. There are initiatives currently financed by the local government (public municipal) but these were primarily established through self-provision and entrepreneurial non-profit actors, and evolved into publicly financed schemes in recognition of the internet as a public good.

All the CCCI classifications provide social inclusion and/or transformational services that generate significant social impacts beyond those commercial ISPs offer, in line with CCCI principles. Furthermore, CCCIs have proven instrumental in effectively improving the economic position and conditions of community stakeholders, preserving the cultural identity, heritage and integrity of the communities, increasing the levels and capacities for climate action and natural resource management, enabling communities to control, govern and manage internet and digital resources, and empowering women as stakeholders in digital transformation.

The multi-organisational arrangements that characterise many successful initiatives have shown the value of combining government support, private sector resources and community participation. They clearly demonstrate the value proposition for investing in CCCIs as a segment of social enterprise.

The geographic distribution of the 1,417 CCCIs mapped, predominantly concentrated in South and Southwest Asia (54.13%), and Southeast Asia (38.53%), as well as not identifying CCCIs in 23 countries in the region also highlights both the potential for expansion and the need for greater coverage in other regions.

Financial viability remains a major concern, particularly for non-profit organisations struggling to balance social impact with operational sustainability. The regulatory environment varies considerably across regions, often creating barriers to scalability and replication of successful models. Technical capacity limitations and infrastructure challenges continue to affect the quality and reliability of services, especially in remote areas.

Recommendations

Recommendation for government and policy makers: Create an enabling regulatory environment that supports development of CCCIs, and encourages investment. This includes:

- Integrating all types of CCCIs into the national broadband strategy and digitisation policies, recognising their role in closing the digital divide.
- Simplifying and streamlining licensing regulations and procedures that provide legal status to CCCIs.
- Establishing clear options for affordable spectrum usage, pole and duct access for CCCIs, and infrastructure sharing policies.
- Creating transparent wholesale open access to backhaul capacity through open data platforms or investments in physical infrastructure (dark fibre, conduits, etc.).
- Providing fiscal incentives: Fee exemptions (customs waivers on import duties for open-source hardware/software) and tax breaks for CCCI investors.
- Contributing financially towards CCCI development: Dedicated universal service fund allocation for CCCIs, voucher schemes, grants, low-interest loans and loan guarantees.
- Supporting technical assistance: For capacity building, feasibility studies, quality assurance, technical and management expertise, governance models, open-source tools, etc.
- Involving government departments, such as education and health, which can benefit from CCCI-provided connectivity as anchor clients and premises providers.

Recommendations for funders: Unlock additional funding for CCCIs that are financially sustainable and generate significant social impact. This includes:

- Reducing the transaction costs of subsidies and grants – increasing flexibility and project implementation periods, simplifying impact metrics and streamlining reporting requirements.
- Considering one-time grants to offset equipment costs.
- Providing right-size grant support based on stage of CCCIs and scale of operations, using multi-cycle phased grant making strategies that encourage operators to move to new sustainability milestones that unlock larger funds at each stage.
- Using innovative financial instruments – blended finance, revenue-based financing, concessional loans, crowdfunding and credit guarantees, etc.
- Adopting schemes for financing end-user access devices such as micro-loans and part payments.
- Supporting elements of the meaningful connectivity ecosystem beyond the infrastructure such as teaching and learning materials, network management tools and local applications in local languages, etc.
- Prioritising support for bringing connectivity to vulnerable populations, including Indigenous communities, women-led social enterprises, those with disabilities and refugees.

Recommendations for CCCIs and CCCIs stakeholders: Prioritising cost-effective deployments and efficient management to achieve financial sustainability and maximise impact through each stage of growth. This includes:

- Adopting a hybrid funding approach, combining initial grant funding with sustainable revenue-based loans to cover initial operating expenses. Community-based pricing models, as well as

developing financial models that can withstand local economic challenges, need to be looked into.

- Pushing for the prioritisation of resilient, climate-adapted solutions in infrastructure development particularly given the impact of climate change in highly exposed and vulnerable countries.
- Developing and supporting capacity development programmes for CCCIs, which should include the establishment and maintenance of a common platform for learning exchanges to address common challenges and keep up with technical innovations.
- Building on successful models in integrating gender-responsive approaches from the planning stage. This includes creating safe spaces for women's internet access, developing women-focused technical training programmes and local applications, and linking connectivity initiatives with women's entrepreneurship opportunities.
- Promoting community ownership and governance among future CCCIs, involving communities from the planning stage and gradually transferring technical and managerial responsibilities to local stakeholders.
- Creating programmes targeted at older people to learn about technology use and network deployment within CCCIs.
- Accounting for the labour involved in the many social aspects of CCCIs when remunerating work.
- Situating network access points and administrative operations in places that are accessible to people of diverse genders, physical abilities, ethnicities, classes, castes, etc.

APPENDICES

Appendix 1: Online survey questionnaire

Online survey questionnaire: https://limesurvey.apc.org/index.php/163386?fbclid=IwAR1yJizoq_96_-yk8lLbx_h3q0vCKHlrwTvvjtkOWIJt3CoJu-QSjvFvXDo

Appendix 2: KII guide questions

KII guide questions: https://docs.google.com/forms/d/e/1FAIpQLSfXu0TUJErhj9LL1ngLpSjahf4EG1J9uZIaZB9zHnFYq5GKQA/viewform

Appendix 3: CCCI principles

Principles for CCCIs: https://www.apc.org/node/40458

Appendix 4: Typology of CCCIs

Typology of CCCIs: https://www.apc.org/en/node/40460

Appendix 5: Detailed results of the survey

Location of CCCIs

Most of the CCCIs mapped are located in South Asia (67%), with almost all based in India (178), five in Nepal, and only one in Bangladesh. Meanwhile, 29% (79) are distributed in the Pacific Islands, and 4% are found in Southeast Asia. Only one is located in East and Northeast Asia (China) while none in North and Central Asia participated in the survey.

Figure 1. Distribution of CCCIs per sub-region

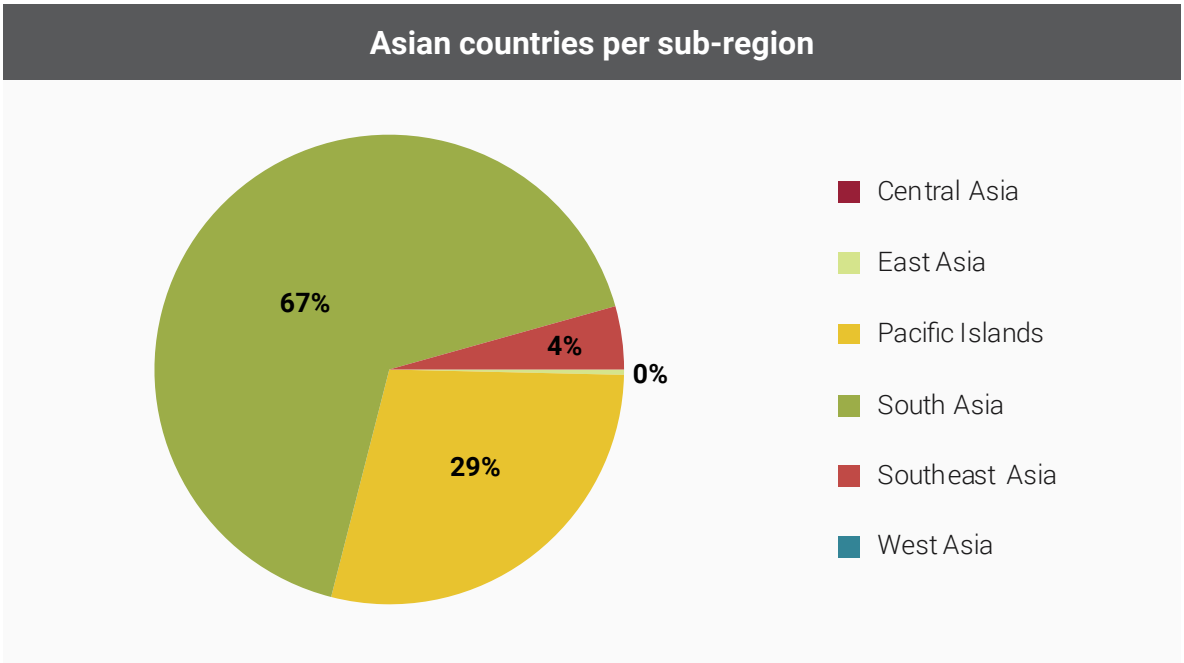

Table 1. Distribution of CCCIs per sub-region and country

Sub-region	Number	%	Country	Number	%
South Asia	184	67	India	178	64
			Nepal	5	2
			Bangladesh	1	0
Pacific Islands	79	29	Vanuatu	29	11
			Papua New Guinea	27	10
			Solomon Islands	10	4
			Cook Islands	6	2
			Federated States of Micronesia	5	2
			Kiribati	2	1
Southeast Asia	12	4	Indonesia	8	3
			Philippines	4	1
East and Northeast Asia	1	0	China	1	0
North and Central Asia	0	0.00		0	0
TOTAL	**276**	**100**		**276**	**100**

Year of establishment

The majority of the CCCIs (204 or 74%) were established from 2021 onwards. On the other hand, 14% (38) started their operations between 2016 to 2021 while 9% (25) even earlier, in 2015 and before.

Figure 2. Distribution of CCCIs by year established

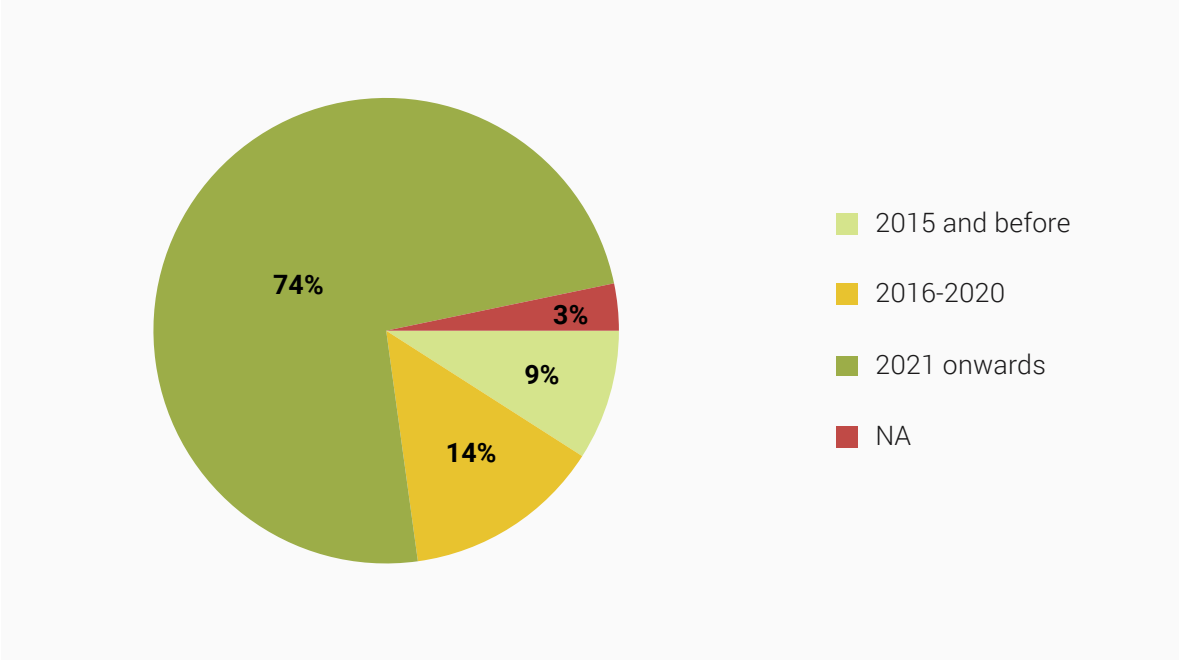

Table 2. Distribution of CCCIs by year established

Year	Number	%
2021 onwards	204	74
2016-2020	38	14
2015 and before	25	9
NA	9	3
TOTAL	**276**	**100**

Current status of the CCCIs

Most of the CCCIs mapped are active (216 or 78%) while 18% (49) are dormant. The rest (10 or 4%) are in progress or at the pilot stage (1).

Figure 3. Distribution of CCCIs by current status

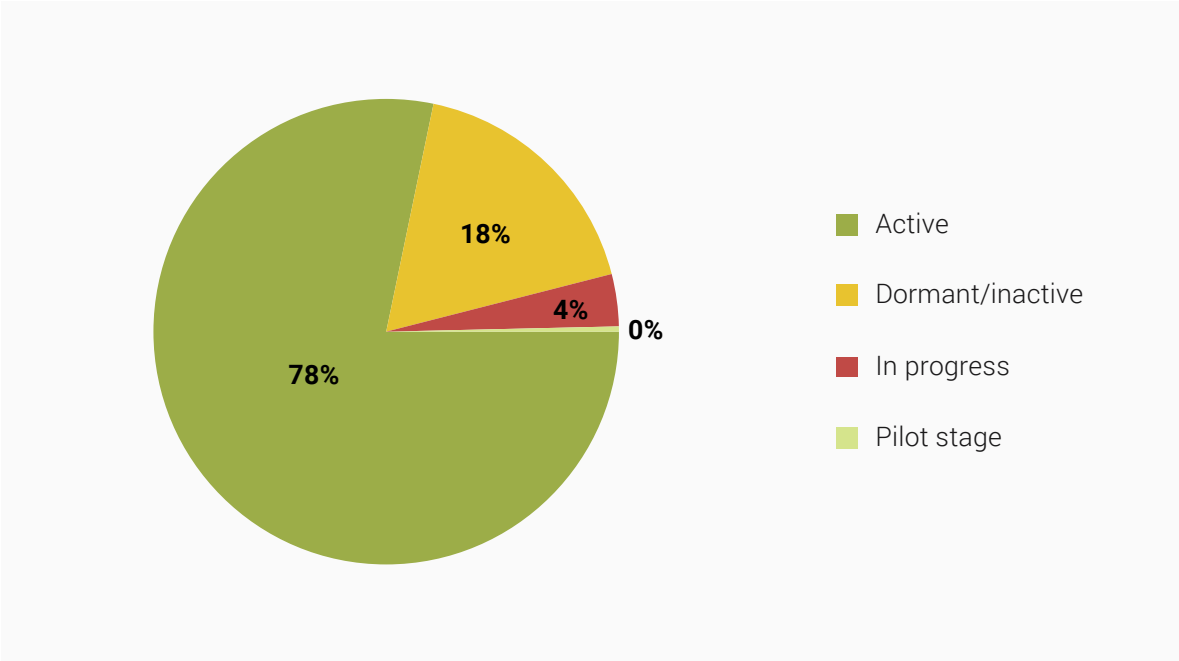

Table 3. Distribution of CCCIs by current status

CCCI Status	Number	%
Active	216	78
Dormant/inactive	49	18
In progress	10	4
Pilot stage	1	0
Total	**276**	**100**

Type of connectivity provided

Almost all of the CCCIs (97% or 166) primarily offer internet connectivity. Most (60%) link communities online through household or office Wi-Fi hotspots with over 900 hotspot points available. Meanwhile, 36% (100) connect their partner communities online through over 4,000 public Wi-Fi hotspot points. Others provide services though community-owned public access centres or cybercafés (5%), school-hosted public access centres (5%) and mobile 2/3/4G networks (3%). Around 9% of CCCIs provide online access though other facilities such as clinic, community centre, library, private cybercafé, etc.

Figure 4. Connectivity services provided by CCCIs

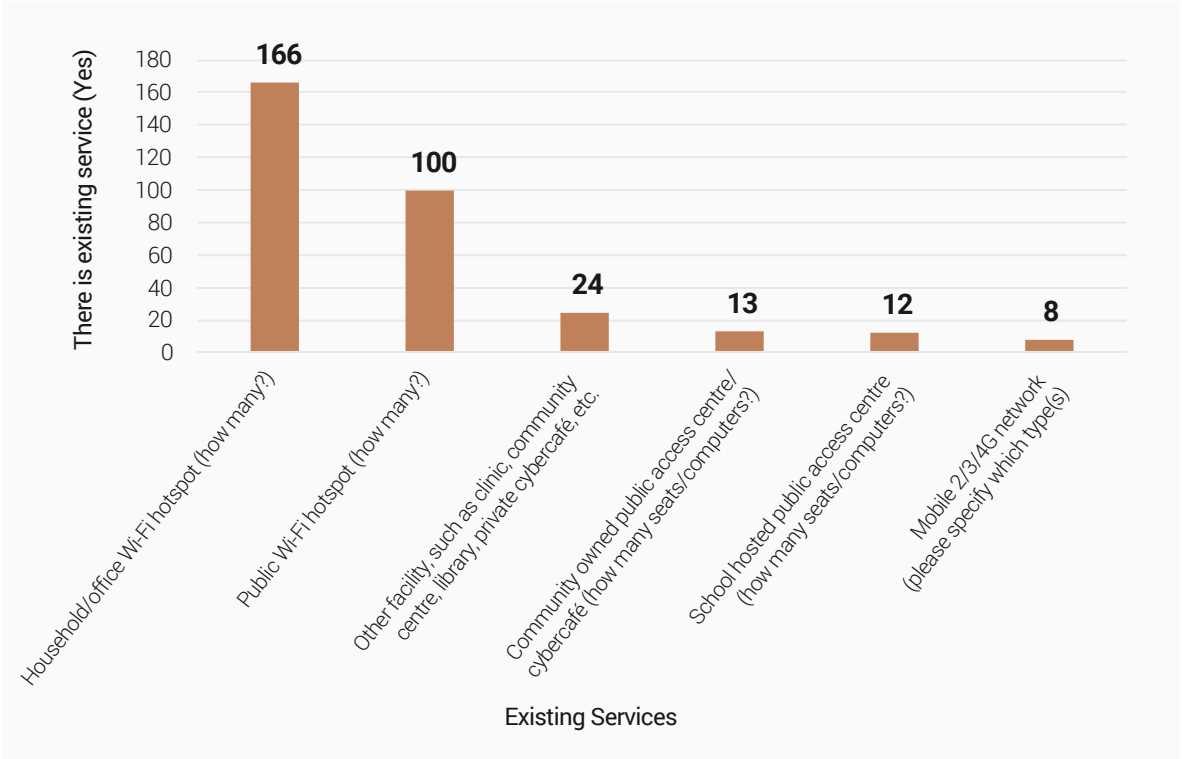

Table 4. Distribution of CCCIs by connectivity services provided

Initiative	Number of CCIs providing the service	%	Total count
Household/office Wi-Fi hotspot	166	60	927
Public Wi-Fi hotspot	100	36	4,033
Community-owned public access centre/ cybercafé (and total count of seats/computers)	13	5	27
School-hosted public access centre (and total count of seats/computers)	12	4	209
Mobile 2/3/4G network	8	3	NA
Other facility (e.g. clinic, community centre, library, private cybercafé, etc.)	24	9	NA

Other services offered

On top of delivering online communication, most CCCIs (68%) are involved in enhancing the capacity of communities to use the internet through digital literacy and technical training. Online-related services are also provided such as intranet for the locality (64%), financial/payment facilities (63%), personal support for online services (62%), cybercafé or computer centre (61%), device charging (31%) and school connectivity (12%). A small portion of CCCIs offers voice calls (3%), offline connectivity (2%) and community radio services (2%). Only four CCCIs (1%) use the connectivity for monitoring and collecting data on environmental conditions.

Figure 5. Services offered by CCCIs

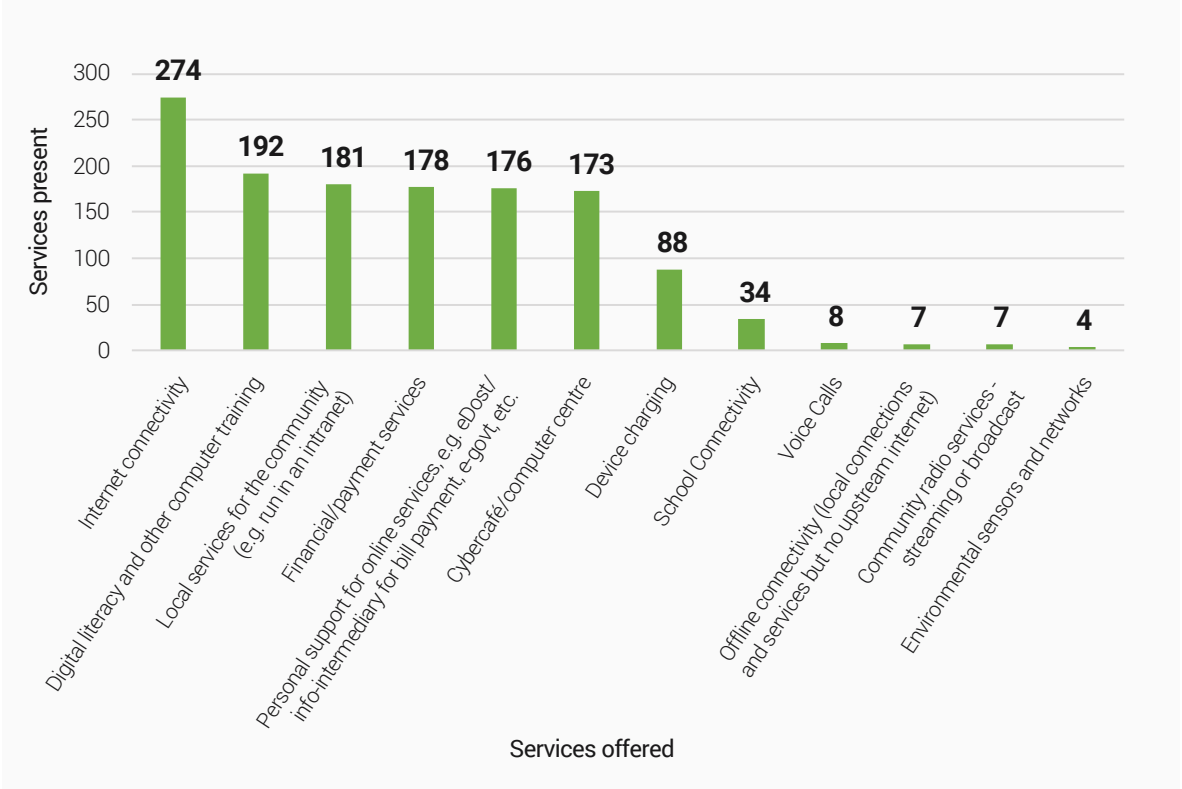

Table 5. Distribution of CCCIs by services provided

Type of services offered	Number	%
Internet connectivity	274	97%
Digital literacy and computer training	192	68%
Local services for the community (e.g. intranet)	181	64%
Financial/payment services	178	63%
Personal support for online services (e.g. bills payment, e-government services, etc.)	176	62%
Cybercafé/computer centre	173	61%
Device charging	88	31%

Type of services offered	Number	%
School connectivity	34	12%
Voice calls	8	3%
Offline connectivity (local connections and services but no upstream internet)	7	2%
Community radio services – streaming or broadcast	7	2%
Environmental sensors and networks	4	1%

Application of CCCI principles[43]

When asked to rate their services against CCCI principles, from 0 (not at all aligned with) to 10 (completely aligned with), most of the CCCIs affirm that their connectivity support is in line with the principles. The CCCIs have an average score of above nine in the following areas:

- Allowing the community to shape the local connectivity they build and use in ways that are positive for the well-being of the community while actively minimising the risk of potential harm to the community (9.90).
- Allowing the community to shape the local connectivity they build and use in ways that are affordable, aiming to strengthen local economies, rights, languages and cultures (9.90).
- Provision of connectivity to rural, remote and/or marginalised communities (9.92).
- Allow the community to participate in deploying and operating the infrastructure they build (9.89).
- Adding value to people's personal, social, political and/or economic lives, particularly people in the community who are poorer and more marginalised than the majority (9.36).
- Allowing the community to shape the local connectivity they build and use in ways that reflect the interests and relationships within the community, including when the community does not directly provide the physical infrastructure and services itself (9.34).
- Striving for operational and financial viability/sustainability, local ownership and community participation in the governance of the network (9.05).

On the other hand, the CCCIs rate themselves above eight in terms of the following concerns:

- Taking into account the dynamics of power and gender (8.84).
- Supporting collective action to influence, diversify and shape wider internet access markets, including building awareness and use of environmentally and socially sustainable solutions (8.18).
- Interest in being a part of a broader national and global ecosystem that shares experiences and supports initiatives with similar principles (8.14).

43 These principles have been developed through an extensive consultation process with community-centred access initiatives working in different communities across the global South, with participants and partners in the Local Networks (LocNet) initiative led by the Association for Progressive Communications (APC) and Rhizomatica, and with APC members, all of whom have internet rights at the core of their activities. The process included a survey, a face-to-face group discussion, and email and online consultations.

Table 6. Average score of CCCIs vis-à-vis CCCI principles

Services	Average Score
Allow the community to shape the local connectivity they build and use in ways that are positive for the well-being of the community while actively minimising the risk of potential harm to the community.	9.90
Allow the community to shape the local connectivity they build and use in ways that are affordable, aiming to strengthen local economies, rights, languages and cultures.	9.90
Are provided in rural, remote and/or marginalised communities.	9.92
Allow the community to participate in deploying and operating the infrastructure they build.	9.89
Add value to people's personal, social, political and/or economic lives, particularly people in the community who are poorer and more marginalised than the majority.	9.36
Allow the community to shape the local connectivity they build and use in ways that reflect the interests and relationships within the community, including when the community does not directly provide the physical infrastructure and services itself.	9.34
Strive for operational and financial viability/sustainability, local ownership and community participation in the governance of the network.	9.05
Take into account dynamics of power and gender	8.84
Support collective action to influence, diversify and shape wider internet access markets, including building awareness and use of environmentally and socially sustainable solutions.	8.18
Interested in being a part of a broader national and global ecosystem that shares experiences and supports initiatives with similar principles.	8.14

Community involvement

The partner communities are significantly involved in the management and operations of the initiatives at varying levels -- from approval of the initiative, to resource contribution to set it up, to setting the directions on how the connectivity could be best utilised, to managing the daily operations, to the provision of technical support, to monitoring and assessing the results, to the promotion of the online network locally, and to serving as the main users of the internet connection, either for free or through paid/subsidised services. Many of the initiators started with capacity building efforts to ensure that partner communities are technically equipped to use/optimise the connectivity and/or manage the CCCI's operations.

Appendix 6: List of countries per sub-region in Asia and the Pacific

East and Northeast Asia: China, Democratic People's Republic of Korea, Japan, Mongolia, Republic of Korea and the Russian Federation, and two associate members, Hong Kong, China, and Macao, China.[44]

North and Central Asia: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, Turkmenistan and Uzbekistan.[45]

Pacific: Australia, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, New Zealand, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu, as well as American Samoa, the Cook Islands, French Polynesia, Guam, New Caledonia, Niue and the Northern Mariana Islands as associate members.[46]

Southeast Asia: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste and Viet Nam.[47]

South and Southwest Asia: Afghanistan, Bangladesh, Bhutan, India, the Islamic Republic of Iran, Maldives, Nepal, Pakistan, Sri Lanka and Türkiye.[48]

Appendix 7: Acronyms and abbreviations

ADB	Asian Development Bank
ADMU	Ateneo de Manila University
ADSL	Asymmetric digital subscriber line
AIT	Asian Institute of Technology
APC	Association for Progressive Communications
APNIC	Asia-Pacific Network Information Centre
BEACON	Better Access and Connectivity
BHW	Barangay health worker
BPL	Broadband over powerline project
BTS	Base transceiver station
CAPEX	Capital expenditures

44 https://www.unescap.org/subregional-office/east-north-east-asia
45 https://www.unescap.org/subregional-office/north-central-asia
46 https://www.unescap.org/subregional-office/pacific
47 https://www.unescap.org/subregional-office/south-east-asia
48 https://www.unescap.org/subregional-office/south-south-west-asia

CBCE	Community-based coffee enterprise
CBO	Community-based organisation
CCCI	Community-centred connectivity initiative
CIRC	Community Information Resource Centre
CN	Community network
CNDF	Community Networks Development Foundation
CR Bolo	Community Radio Bolo
CSO	Civil society organisation
CSR	Corporate social responsibility
CSSP	College of Social Sciences and Philosophy
CVISNET	Central Visayas Information Sharing Network
DepEd	Department of Education
DEF	Digital Empowerment Foundation
DHAN	Development of Humane Action Foundation
DMSF	Davao Medical School Foundation
DOST	Department of Science and Technology
DOST-STII	DOST-Science and Technology Information Institute
DUMBO	Digital Ubiquitous Mobile Broadband OLSR
ENEA	East and Northeast Asia
ETCI	East Timor Coffee Institute
FACE	Foundation for Architecture and Community Equity
FCRA	Foreign Contribution Regulation Act
FDSL	Fundasaun Dezenvolvimento Software Livre
FSM	Federated States of Micronesia
GDP	Gross domestic product
GIDA	Geographically isolated and disadvantaged area
GSM	Global System for Mobile Communications

ICT	Information and communications technology
IIT	Institute of Technology - Bombay
IntERLab	Internet Education and Research Laboratory
IoT	Internet of things
IPO	Indigenous peoples' organisation
ISEA	Institute for Social Entrepreneurship in Asia
ISOC	Internet Society
ISP	Internet service provider
ITU	International Telecommunication Union
IVR	Interactive voice response
KII	Key informant interview
LGU	Local government unit
LocNet	Local Networks initiative
LTE	Long-term evolution
Mbps	Megabits per second
MCN	Mountain Community Network
MNO	Mobile network operators
MOA	Memorandum of agreement
MOU	Memorandum of understanding
NCA	North and Central Asia
NGO	Non-governmental organisation
NOC	Network operations centre
NTC	Nepal Telecom
OLSR	Optimised link state routing
OPEX	Operational costs
PCAi	Philippine Coffee Alliance, Inc.
PO	People's organisation

PTCL	Pakistan Telecommunication Company Limited
PRRM	Philippine Rural Reconstruction Movement
P2P	Point-to-point
RBB	Rural Broadband
REIINN	Resilient Education Information Infrastructure for the New Normal
RHU	Rural health unit
SACOFA	Sarawak Cable and Wireless Facilities Sdn Bhd
SEA	Southeast Asia
SE	Social enterprise
SHG	Self-help group
SMS	Short message service
SSWA	South and Southwest Asia
TDF	Tusheti Development Fund
TISD	Technological Innovations for Sustainable Development
TOA	Telecom Operators Association of Georgia
UC	University of California
UN	United Nations
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UP	University of the Philippines
USAID	United States Agency for International Development
UTS	University of Technology Sarawak
VBTS	Village Base Station
VFI	Vizcaya Fresh Inc.
WALI	Wang Lab of Innovation
WANG	Welfare Association for New Generation
WIRE	Wang Initiative for Rural Empowerment
WMN	Wireless mesh networks