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RHIZOMATICA

BRIDGING THE DIGITAL DIVIDE IN AN INDIGENOUS COMMUNITY IN INDONESIA:

The Community-Centered Connectivity Initiative in Kasepuhan Ciptagelar

May 2025

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Project Director and President
Institute for Social Entrepreneurship in Asia (ISEA)

List of Abbreviations

APNIC	Asia Pacific Network Information Centre
BTS	Base Transceiver Station
BumDes	Badan Usaha Milik Desa
CCCI	Community-Centered Connectivity Initiatives
CN	Community Network
CSO	Civil Society Organization
DI	Development Indexing
GBPS	Gigabyte per second
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMLS	Gugus Mitigasi Lebak Selatan or South Lebak Mitigation Group
GNLD	Gugatan Nasional Literasi Digital or National Digital Literacy Movement
GSM	Global System for Mobiles
ICT	Information and Communications Technology
IDR	Indonesian Rupiah
ISEA	Institute for Social Entrepreneurship in Asia
ISP	Internet Service Provider
KBPS	Kilobytes per second
KRA	Key Result Area
KOMINFO	Minister of Telecommunications and Information
NGO	Non-government Organizations
POKDARTIK	Kelompok Masyarakat Desa Sadar Teknologi Informasi dan Komunikasi or ICT Community Awareness Group
PUSPINDES	Pengembangan Informatika dan Desa or Center for Village and Informatics Development
RT/RW Net	Rukun Tetangga / Rukun Warga Network Neighborhood Association / Community Association Network
SROI	Social Return on Investment

List of Abbreviations

SVI	Social Value International
Telecom	Telecommunication
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USD	United States Dollar
UU ITE	Undang-Undang Informasi dan Transaksi Elektronik or Information and Electronic Transactions Act
VIS	Village Information System
VOIP	Voice Over Internet Protocol
Wi-fi	Wireless Fidelity

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INTRODUCTION

This case study is one of four research outputs on the social impact of community-centered connectivity initiatives (CCCIs) that the Institute for Social Entrepreneurship in Asia (ISEA) generated in partnership with the Association for Progressive Communications (APC). These case studies use social entrepreneurship concepts and tools to explore the multifaceted impact of initiatives that have achieved relative success in bringing meaningful connectivity to marginalized populations and communities in Indonesia, India, South Africa, and Kenya.

These CCCIs may be considered as social enterprises in the digital industry. They enable marginalized people and communities not only to access but to control, manage, and use digital resources and connectivity in ways that improve their quality of life and enhance their capacity to be actors in their own development.

As social enterprises, they provide three types of services: transactional, social inclusion, and transformational services. Transactional services are connectivity services that can be accessed via a payment of money or other form of agreed transaction in exchange for the service. Social inclusion services are oriented towards addressing digital exclusion and meaningful connectivity, or other factors behind the "usage" gap. Examples include the provision of affordable or free internet; developing and sharing local digital knowledge resources relevant to meeting community needs; provision of hubs or community-based facilitators to broaden access; and provision of training on digital skills. Transformational services are oriented at enabling the poor and excluded to overcome their capability deprivation and become actors in their own development. These are services that build their capability to own, govern, and manage digital resources in a way that would positively impact their lives and the lives of their families, communities, and the marginalized sectors they are a part of. 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. Transactional and social inclusion services are usually directed at the potential users or customers of digital-related services. Transformational services are usually directed towards those who are capacitated to provide, manage, and operate the provision of digital-related services to communities.

These three types of services result in or facilitate various social impacts. Depending on which type of service played the most significant role in bringing about the social impact, they are then referred to as transactional services-facilitated impacts, social inclusion services-facilitated impacts, and transformational services-facilitated impacts. Profit-oriented internet service provider companies mainly bring about transactional services-facilitated impacts. The cases studied would substantiate that beyond these transactional services-facilitated impacts, many of the social impacts brought about by CCCIs are facilitated by their social inclusion and transformational services. The analytical tools used to study the social impact of these 4 CCCIs are Development Indexing (DI) and Social Return on Investment (SROI).

Development indexing is a methodology that assists in the quantification of social impacts where simple proxy measures are deemed inadequate. As shown by the 4 cases studied, CCCIs have many social inclusion and transformational services-facilitated impacts including the improvement in the economic position and conditions of community stakeholders and increased levels and capacities for inclusive human development. Faced with time and resource constraints and as the first case studies to explore the use of Development Indexing to quantify these complex social impacts of CCCIs, the cases were able to define main elements or key result areas, sub-elements of such and potential performance indicators where significant social impacts were noted. The case research did not reach the stage of developing and using a scorecard, usually from one to one hundred (1-100), assigning scores based on relative weights to quantify the performance indicators under each key result area, the last stage when using Development Indexing as a methodology. In lieu of quantification based on assigned scores, the case studies identified what may be considered significant social impacts based on the available data approximating relative scale and depth of impact characterized as high, medium, and low. The social impact characterized by the performance indicator is considered significant when both scale and depth were approximated as high, at least one was deemed high, or both scale and depth were deemed as medium.

Social Return on Investment (SROI) is a methodology that articulates the financial and social costs and benefits of social enterprises, in the process showing whether the benefits derived from such investment outweigh the costs. With the total value of the net financial return of the CCCI together with the monetized value of social outcomes using established conventions as numerator and investments as denominator, the ratio needs to be greater than one to show cost-effectiveness. SROI follows certain conventions in quantifying and defining proxy measures for monetizing both tangible and intangible social impacts. The SROI methodology used in the 4 cases follows the procedures, requirements, and conventions developed by Social Value International (SVI) that are accessible through their website (https://www.socialvalueint.org/guide-to-sroi). The SVI-prescribed SROI Value Map that was generated as a result of the case study is made available as an appendix to each case study.

Tangible social impacts that can be easily monetized include economic benefits such as increased incomes or cost savings derived from the use of the Internet. Intangible social impacts such as increased capacities for inclusive human development and community empowerment are much harder to quantify and monetize. Following the principles and conventions of SROI as a methodology, the cases approximated the quantification of significant social impacts and used monetary proxies that were deemed meaningful and acceptable to the stakeholders benefiting from the CCCI's services, as represented by the key informants for the cases. Given resource and time constraints, the case studies were only able to explore the quantification and monetization of a limited set of performance indicators deemed significant and as such, the SROI values derived are undervalued.

DI and SROI are complementary measures of effectiveness: Development Indexing is a measure of effectiveness in terms of qualitative impact on relevant stakeholder groups while SROI is a measure of cost-effectiveness. With the aid of DI and SROI as methodologies, the case that follows provides indications of the most significant social impacts that the CCCI in Kasepuhan Ciptagelar has made on the indigenous stakeholders and communities it served, as well as the cost-effectiveness of the intervention in bridging the digital divide in rural Indonesia.

BRIDGING THE DIGITAL DIVIDE IN AN INDIGENOUS COMMUNITY IN INDONESIA:

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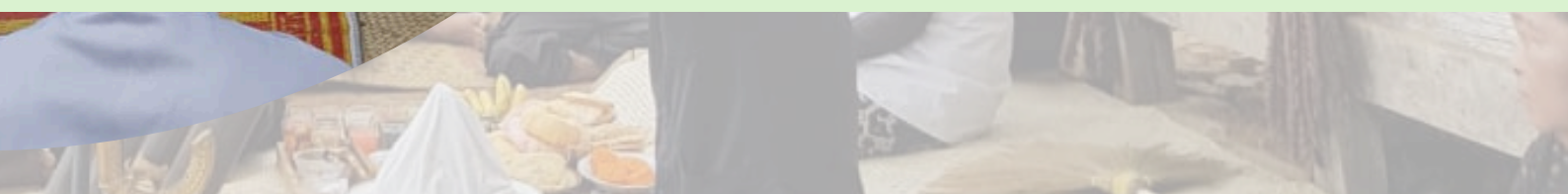

THE STATE OF DIGITAL CONNECTIVITY IN INDONESIA

In archipelagos such as Indonesia, digital connectivity has been key in bridging the various divides consequent to its geographic characteristics. Among the government's major achievements in connectivity has been the completion of the Palapa Ring in 2019, a national fiber optic cable network development project that connected 90 regencies[1]. Despite the private sector's initiatives and the national government's deployment of internet infrastructure, the large differences in bandwidth costs between Java, the center of economic growth, and the areas outside of it; the unavailability of proper devices; and the people's inability to produce local content, which is linked to the lack of digital skills and gender gap, continue to contribute to this digital divide.

Of Indonesia's approximately 18,306 islands, some are highly accessible with their well-developed infrastructure, while most remain hard to reach. As such, community and economic activities are concentrated in only six highly urbanized regions. In the rural and remote areas, an estimated 12,000 villages still had no connection in 2020.[2] The unreliable power supply and the limited access to suitable and affordable devices in these areas aggravate the barriers to connectivity.

Indonesia has a rich culture and is home to many indigenous peoples who live in forests or islands. The country has 718 local languages, 14 of which have the most speakers—Javanese, Sundanese, Melayu, Batak, and Madurese, to name a few. Indigenous communities, in particular, continue to experience 'structural marginalization.' They are not governed by the Village Law of 2014, which gave communities the autonomy and access to funds to set up their internet operations. A bigger concern, moreover, is that indigenous culture and forms of knowledge in general are given little recognition, if at all.

Proper utilization of the Internet is another challenge. The lack of digital literacy among many users has led to various issues such as online fraud, phishing and malware attacks, hoax news, and some cases of online gender-based violence.[3]

The gender-based digital divide is also a concern. Only about 40 percent of women have internet access via mobile phones, compared to 60 percent of men. Women, therefore, have fewer opportunities to access content and policies and have representation on the internet networks and certain digital platforms. They are also more vulnerable in terms of online privacy and security.[4]

[1] The governance structure in Indonesia consisted of national, provincial, regency, district, and village levels.
[2] Preliminary Study: School of community networks in Indonesia, as cited in Indonesia National Study (LocNet, 2022).
[3] Common Room (N.D.) Preliminary Study: School Of Community Networks Development In Indonesia, p.6.
[4] Dinita Andriani P. (Principal, Luminate Group), Gender-Based Digital Gap in Indonesia. Common Talks Online Discussion, 29 March 2021, as cited in Common Room (N.D.), Preliminary Study: School Of Community Networks Development In Indonesia, p.7.

Policies on Telecommunications Infrastructure Development

Indonesia is a young democracy, with government reform beginning only in 1998. Despite political contestation and conflicts in some regions, its socio-political environment is generally stable.

Since the country implemented policies on decentralization and regional autonomy in 2001, regional governments played a role in defining policy and regulation in their jurisdictions. For the telecommunications sector, in particular, provincial and local governments are tasked with regulating the licensing policies for building backhaul towers for internet infrastructure. However, other policies governing the sector are still mostly held by the national government.

Indonesia's Telecommunications Act of 1999 began the privatization of telecommunication (telecom) companies. This allowed new players from private corporations and cooperatives to compete with the traditional state- and regional-owned enterprises that previously dominated the industry. Nonetheless, the state-owned Telkom remains the leading operator, serving about 80 percent of the mobile and fixed broadband users in 2022.

However, the licensing rules for Internet Service Providers (ISP) remain tight and unavailable at the community level. The more remote and poorer communities, which often have highly dispersed populations in hilly inaccessible territories, are not attractive business prospects to the few licensed ISPs and telecom operators. Connectivity in these areas thus continues to be a challenge despite the policy reforms.

In 2014, Village Law No. 6 gave communities autonomy and access to funds through sub-national budgets and the centralized Village Funds. The elected Village Chiefs were encouraged to form Village-Owned Enterprises (Badan Usaha Milik Desa or BUMDes) and to cooperate with other villages and non-government organizations (NGOs) to form enterprises. This law also recognized that all Indonesian villages had the right to information through the Village Information System (VIS). As a result, 211 villages in the Regency of Pemalang in Central Java began to develop their village information systems. They were driven by Pusat Pengembangan Informatika dan Desa (Center for Village and Informatics Development - PUSPINDES) and Kelompok Masyarakat Desa Sadar Teknologi Informasi dan Komunikasi (ICT Community Awareness - PokDarTIK), a local group of Indonesia ICT Volunteers affiliated with the national NGO, Relawan TIK.[5] This initiative supported the digitalization of local authority procedures and developed village online presence and local populations' use of ICTs in rural communities. Further, it helped the communities build the networks, including a VoIP component, funded by the Regency. It also enabled backhaul and internet access through agreements with six licensed ISPs. They built a 15-meter tower on their premises that directly serves nearby villages.[6]

[5] Bidwell and Jensen (2019) Bottom-up Strategies. Pages 86-88 https://www.apc.org/en/pubs/bottom-connectivity- strategies-community-led-small-scale-telecommunication-infrastructure, as cited in Indonesia National Study (2022) p.3.
[6] Indonesia National Study (2022) p.3.

As part of the government's continuing effort to achieve sustainable development goals at the village level, the Ministry of Villages, Development of Disadvantaged Areas and Transmigration (Kemendes) issued Kemendes Regulation No. 13/2020 on Priority for the Village Funds Allocation in 2021. It further empowered the village authority to use funds for the procurement of information technology and communication infrastructure, including digital applications, backhaul towers for internet networks, computers, smartphones, and internet subscriptions. However, not many village governments allocated village funds for internet infrastructure,[7] unlike in the case of the 2014 Law.

Nevertheless, Indonesia saw the growth of ISP operators, both registered and unregistered, at the local level. These operators provide internet access to individuals and organizations, using Wifi and optical fiber, offering them either at low tariffs or for free. Most are commercially driven, often by micro-entrepreneurs, but some also exhibit key features of CCCI: ownership and management by the community, and engagement in local content production of different kinds.[8] The NGOs, on the other hand, pushed internet literacy further beyond content consumption to advocate multi-stakeholder oversight of content policy and greater accountability.[9] In 2019, however, most CCCI providers still operated without legal status. Thus, the Ministry of Kominfo released Regulation No. 13/2019, allowing certain parties to develop official cooperation with registered ISPs and become the resellers of internet service in their respective communities.[10] However, only a few resellers have established official cooperation with the existing ISPs.[11] By 2024, data on unregistered resellers remained hard to find. The resurgence of the number of illegal connections is attributed to both business or economic issues and social concerns.[12]

Related policies on education, culture, and data privacy

During the Coronavirus Disease (COVID-19) outbreak, the government recognized that internet access and connectivity were important tools to facilitate remote learning. As such, the Minister of Education and Culture Letter Number 4/Year 2020 established the implementation of education in an emergency for COVID-19. Later on, the Ministry's Letter Number 15/ Year 2020 released the Guidelines for Implementing Learning from Home in an Emergency Response for the COVID-19 Pandemic Outbreak.

In 2021, the Directorate for Development and Utilization of Culture, Ministry of Education and Culture reinforced the implementation of Law Number 5/2017 or the Cultural Advancement Act with the implementation of the Village Culture Advancement Program. The initiative aimed to support the gathering of Basic Cultural Data (DAPOBUD) as well as promote appreciation of arts and cultural expression in remote places. Since this program was implemented during the COVID-19 pandemic, it relied heavily on the internet and digital platforms to collect data on cultural information in rural areas and remote places.

[7] Online focus group discussion with Sukabumi Regency Government officials on March 10, 2021, as cited in Common Room (N.D.) Preliminary Study: School Of Community Networks Development In Indonesia, p.6.
[8] Indonesia National Study (2022), p.2.
[9] Ibid., p.3
[10] Minister of Telecommunications and Information (KOMINFO) Regulation No. 13/Year 2019 on Telecommunication Service Providers (Paragraph 6, Article 22 on Telecommunication Services Reseller Cooperation), as cited in Common Room (N.D.), Preliminary Study: School Of Community Networks Development In Indonesia, p.13.
[11] Common Room (N.D.) Preliminary Study: School Of Community Networks Development In Indonesia, p.13.
[12] Berita (2024), "Illegal RT/RW Net Networks Are Proliferating Again, Operators Complain That Their Business Has Been Disturbed" accessed from https://www.kompas.id/baca/english/2024/04/09/en-jaringan-rtrw-net-kembali-marak-operator-mengeluh-bisnis-terganggu.

In the same year, the Minister of Communication and Information Technology (Kominfo) also initiated the National Digital Literacy Movement (GNLD) to address people's generally low level of digital literacy. Four digital literacy learning modules were launched to improve the digital capabilities and skills of internet users, namely: 1) Digital Media Culture; 2) Digital Media Security; 3) Digital Media Ethics; and 4) Digital Skill.

Despite the many policies in place, the country still lacked protection for data privacy, with the impending completion of the Data Privacy Protection Bill. Some of the issues related to the bill intersected with the impact of the Information and Electronic Transactions Act (UU ITE) Law No. 11 of 2008, which regulated the use of electronic documents and/or information such as electronic signatures, electronic transactions, domain names, intellectual properties, and protection of personal rights, among others as evidence before Indonesian Courts. Some movements, however, deemed this law as a hindrance to the fundamental right to freedom of expression and silencing advocates for human rights on the internet.[13] In certain instances, the government has resorted to bandwidth throttling to help manage the escalation of conflicts, thereby restricting citizens' freedom of expression and right to access information.

Evolution of RT/RW Net community-based internet movement in Indonesia

The community-based internet movement, composed of students from various campuses and universities, pioneered the creation of Warnets or internet cafes in the mid-1990s to address the need for affordable internet services and connectivity among people in general. Later, the group worked on a wireless network using radio technology and walkie-talkies so they were able to connect the internet to their homes. These community-based internet services became commonly known as RT/RW Net, "a community self-supporting computer network within a small area, using cables or 2.4-gigahertz wireless lines... free from laws and government bureaucracy."[14]

At some point, however, government officials confiscated devices belonging to some residents who developed wireless internet networks in numerous cities in the country, resulting in many “casualties” among the Indonesian internet freedom fighters. It was only in 2005 that the '2.4GHz frequency liberation movement' was successfully carried out by various members of the civil society and received official recognition from the Indonesian government. [15]

Nevertheless, Indonesia's policies and regulations until 2019 specified that internet connectivity may only be provided by either a state-owned company or legally registered private companies. In 2019, the Ministry of Kominfo released Kominfo Regulation No. 13/2019, which allowed community-based internet services to register as cooperatives so they could get telecommunications operator licenses. This allowed them to engage with registered internet service providers (ISPs) so that they could be resellers of internet services in their respective communities. Many of these groups, however, did not register as cooperatives and continued their businesses without telecommunications operator licenses. Some provided internet services by reselling internet package services from telecommunication

[13] Common Room (N.D.), Preliminary Study: School Of Community Networks Development In Indonesia, p.17.
[14] From RTRW-Net Indonesia Facebook Group profile.
[15] Onno W. Purbo, Brief Notes of the Struggle for Wireless Internet Connectivity in Indonesia. URL: https://lms.onnocenter.or.id/wiki/index.php/History_Internet_Indonesia:Pemb Freeman_2.4Ghz. Accessed on March 9, 2021, as cited in Preliminary Study: School Of Community Networks Development In Indonesia (Common Room, 2024).

companies and registered ISPs without official agreement from these companies. Despite the lack of formal recognition, it cannot be ignored that community-based internet service providers played an important role in connecting underserved rural and remote areas.

In April 2024, however, RT/RW Net came under the attention of the Ministry of Kominfo for tax avoidance and illegal bandwidth reselling. The Ministry issued a letter prohibiting telecommunications service providers from “participating in illegal telecommunications operations by selling internet services (bandwidth) to RT/RW Net, which does not have a license to operate telecommunications operations" and “offering products specifically for RT/RW Net via websites or other media."

THE KASEPUHAN CIPTAGELAR COMMUNITY-CENTERED CONNECTIVITY INITIATIVE

Key Players in the Kasepuhan Ciptagelar CCCI

Three key stakeholders, namely the Common Room, the Kasepuhan Ciptagelar, and Awinet, signed the tripartite Memorandum of Understanding to establish a CCCI in the indigenous village. Each party has a distinct role in the initiative:

- Common Room, the coordinating body, is responsible for the conceptual framework and operation, tripartite agreement, and finance and administration;
- Kasepuhan Ciptagelar, the main recipients of the internet services, is tasked to handle resource mobilization, local support, voucher distribution, and local technical assistance; and,
- Awinet, the registered ISP company, is in charge of providing the local internet infrastructure development, bandwidth and licenses, technical support and maintenance, and knowledge and skill transfer.

Common Room

The Common Room Networks Foundation is an open platform for creativity and innovation. What started as a project of the Bandung Center for New Media Arts was eventually formalized as an NGO in 2006. It aimed to maintain a space for freedom of expression and civic empowerment that utilized art, culture, and media tools.

In 2013, Common Room conducted research on the cultural spaces in 19 provinces in Indonesia as part of a study led by the Ministry of Tourism and Creative Economy of the Republic of Indonesia. Alongside this, the foundation was also engaged in research on creative economy and ecotourism in 16 regencies in West Java provinces in partnership with the West Java Province Regional Development Planning Agency. The research identified the need to address the huge gap in information and education between the peripheral areas and the country's capital, Jakarta, on Java Island. Under this project, Common Room started actively engaging with the Kasepuhan Ciptagelar indigenous community to develop urban and rural collaboration platforms that nurtured creativity, innovation, and social entrepreneurship in both the local and international contexts. Common Room still had no background in internet operations during this time.

With the eventual enactment of Directive Number 5 of 2016 on Experimentation in Telecommunications, Informatics, and Broadcast Technology under Kominfo, Common Room was given an experimental license to operate a CCCI, thereby overcoming the regulatory limitations in licenses and charging for services or spectrum use. However, its operation was limited to research and experimentation, specifically for a non-commercial, temporary, and closed-circuit network. This led to the establishment of a CCCI in Kasepuhan

Ciptagelar, aimed at promoting citizen-participatory conservation mapping of land and endangered species, cultural preservation, indigenous land rights, and other local concerns. It hoped to overcome the notion that the indigenous community was not interested in technological advancement.[16]

Kasepuhan Ciptagelar

The Kasepuhan Ciptagelar is a Sundanese indigenous village located in a sub-region within the Sukabumi Regency of West Java Province. It is characterized by heavily forested terrain and poor internet connectivity despite the presence of ISPs. Founded in 1368, Kasepuhan Ciptagelar is a farming community that is independent, self-sufficient, with little pollution and has a high level of food security, specifically in rice production. The community produces many of its implements and endeavors to preserve its culture, as may be seen in the characteristics of their location, the shape of the houses, and several other traditions in their daily life. Ciptagelar indigenous community is home to around 30,000 individuals, distributed in 569 hamlets across 3 different regencies, of which 8,919 or 30 percent are income earners. Kasepuhan Ciptagelar village, the central customary village for this indigenous community has around 143 households with a population of about 429.[17] The average monthly income of the population is IDR482,500 (or USD30.81).

The government's first attempt to digitally connect Kasepuhan Ciptagelar started in 2009. The five-year project provided internet access to the villagers residing within a 100-meter radius of the government facility. However, the initiative was cut short to two years. In 2014, informal telecom operators started providing the village with internet access at 25-30 kilobytes per second (kbps). However, they needed a license to continue their operation in the village.

Meanwhile, the villagers continued to find ways to have their internet facility. The people of Kasepuhan Ciptagelar considered themselves unique in that they were technologically advanced compared with typical indigenous groups. For example, they were able to establish their own hydropower plant and radio station, which were uncommon in other communities. They believed they could adapt to modern technology without giving up their faith and tradition.

Yoyoyogasmana, an artist who worked as a communications officer, recalled how they tried to put up a wireless facility even without technical know-how. The villagers worked in the city to build houses and bartered their labor for cables so they could build the internet network back in their home village in Ciptagelar. Ibu Umi, a microentrepreneur who later became in charge of the deployment of the CCCI, added that they also scavenged for scraps in abandoned towers to build the infrastructure required for a network.

The Common Room and Kasepuhan Ciptagelar relations

The partnership between Common Room and Kasepuhan Ciptagelar started in 2013. Their initial collaboration focused on ecotourism and digital mapping of the cultural landscape, a

[17] More details about Common Room work in this field and in particular in Kasepuhan Ciptagelar in Section “The Common Room and Kasepuhan Ciptagelar relations” on page 16.
[18] Data from Serah Ponggokan, the traditional population census in 2023

step toward the recognition of their Indigenous land rights. Even though the existence of the Ciptagelar indigenous community was widely known by the government and some groups in Indonesia, they had not yet received official recognition of their indigenous land rights from the state. In 2021, the Regent of Sukabumi issued Decree Number 430/Kep.1050-Disbudpora/2021 concerning the Recognition of the Existence of the Banten Kidul Indigenous Community in Sukabumi Regency, which included the Ciptagelar indigenous community. However, this letter was not accompanied by a Regional Regulation document that recognized the rights of indigenous peoples in the official regulatory framework in Sukabumi Regency.

The process of getting official recognition for Indigenous land rights for the Ciptagelar Indigenous community was complex, as the members of the community were widely distributed in three different regencies in Banten and West Java Provinces. A participatory mapping project was completed in 2017, and funded through a GIZ grant. The project was developed collaboratively with the elder representative of the Ciptagelar Indigenous community. They used geo-mapping devices to record the spatial distribution in their community, using platforms such as Open Street Map that required network connection. The mapping process was integrated with traditional mapping methods and storytelling. The villagers believed that access to the internet would enhance their prospects of achieving their land rights, as well as help them address other issues such as food sovereignty, environmental and cultural preservation, and disaster risk reduction.

In 2016, Common Room and the Ciptagelar Village Council began to explore the options of building an internet infrastructure for the community which led to the experimental license described above. With support from volunteers and non-profit groups, an Open Base Transceiver Station (BTS) system[17] was established to deliver voice and data over IP networks using Global System for Mobiles (GSM)-compatible phones. GSM allowed simultaneous voice calls and data transmission, using 2G[18] and 3G[19] connectivity.

However, the central 2G/3G setup proved to be too costly over time. To address this issue, the parties, in collaboration with registered ISP company Awinet, launched an experiment to build a wireless network in the village. After several attempts, they finally succeeded in setting up an internet facility in 2018. Through Kasepuhan Ciptagelar's partnership with Common Room and Awinet, it became compliant with Kominfo Regulation No. 13/2019 and became a registered community-based internet service provider.

In 2019, the Association for Progressive Communications (APC) initiated a peer learning network among CN support organizations in the Global South, which included Common Room. The program aimed to address the globally prevalent rural-urban digital divide by supporting, developing, and consolidating citizen initiatives so that they can build independent and sustainable CCCIs in their underserved areas. Their strategy included the provision of legal, safe, affordable, and meaningful internet access, together with related,

[18] Open BTS was an open-source software used for GSM access points, allowing mobile phones to connect with Voice over IP (VoIP) networks. GSM-compatible mobile phones served as Session Initiation Protocol (SIP) endpoints, signaling protocols used for initiating, maintaining, and terminating communication sessions that include voice, video, and messaging applications.
[19] 2G referred to the second generation of mobile networks using digital (as opposed to analog) technology. It allowed multiple users on a single channel via multiplexing, as well as multimedia messaging. Data speeds were up to 64 kilobytes per second (kbps).
[20] 3G used Universal Mobile Telecommunications System (UMTS) as its core network architecture while combining the aspects of the 2G network with new technologies and protocols such as packet switching. Data speeds improved to 2 megabytes per second (Mbps) and enabled the transfer of large email messages.

value-adding services such as digital literacy training. The APC, together with other funding organizations, continued to support Common Room's initiative in Kasepuhan Ciptagelar as an innovative approach to CCCIs in an indigenous village.

Aside from the three signatory stakeholders in the Memorandum of Understanding governing the establishment of the CCCI in Kasepuhan Ciptagelar, the academic community is also considered an ally in conducting research and crafting policy recommendations.

The CCCI in Kasepuhan Ciptagelar as a social enterprise

As social enterprises in the digital industry, CCCIs aim to promote social inclusion and transformation. In the specific case of Kasepuhan Ciptagelar, the establishment of a CCCI was intended to not only bring awareness and understanding of the internet in the indigenous community but also to achieve recognition as a people, bridge the gender gap, provide economic and learning opportunities to the villagers, and empower them to manage and direct the use of connectivity to serve their needs.

Program Background and Theory of Change

Villages in the rural and remote areas of the country have limited knowledge of the internet and access to funding to build their facilities. These conditions are often coupled with the villagers' lack of technical skills and confidence and feelings of inadequacy to manage the technology's impact on their communities. They believe that opening too quickly and too widely to the internet may further aggravate the impact of modernity on the villagers' practices and traditions, especially the younger generation.

Given this context, the establishment of a CCCI is seen as a mechanism to raise awareness and understanding of the internet in the area so that the people themselves can utilize the internet for their own ends even as they decide on these matters collectively. Internet access is also hoped to bring local content to the online platform and other digital channels to achieve de facto recognition of the indigenous land rights, to attain genuine rural-urban collaboration instead of mere population migration, and to earn the government recognition of them as a legitimate and self-determined unit of society.

Common Room followed the 5-L framework of Low Tech, Low Energy, Low Maintenance, Low Learning Curve, and Local support in providing legal, safe, secure, affordable, and meaningful connectivity to local communities.

> *"The (community-centered connectivity initiative) is mostly about the network of people. To make the Ciptagelar model a success, we need to work with real people and not only (with) the technology, devices, and tools. We need to make sure that we work directly with people who need the connectivity. Capacity building and digital literacy have to be built first before the infrastructure. Building the human resources capacity is a lifelong experience. To replicate the model, the context is very important; there is no one policy (that) fits all."* - Gustaff H. Iskandar and Ridha Nadhiran (ISEA, APNIC, and APC, 2023)

Even before the construction of the infrastructure, Common Room had already published several curricula and training materials to make the internet relevant to the villagers. Topics included basic technical skills on computers, computer networks, internet infrastructure,

internet utilization, internet safety, internet for village administration, internet for education, internet for small and medium enterprises, internet for telemedicine, Internet of Things, and internet and disaster risk reduction.

Common Room used specific approaches that acknowledged local and cultural traditions, especially the rituals, values, and knowledge systems. For example, Abah Ugi Sugriana Rakasiwi, the Chief Leader of the indigenous people, designed the fiber optic network topology of the Ciptagelar CCCI as he knew the feasible distribution points in Kasepuhan Ciptagelar. Blessings of the internet tower and other rituals were also maintained during the project implementation.

Once the social infrastructure was set up, the construction of the physical infrastructure or the hardware followed. The success of the 2018 experiment of Common Room and Kasepuhan Ciptagelar was followed by a grant from the APC that enabled the construction of a local internet infrastructure. By the end of 2019, Kasepuhan Ciptagelar had four wireless backhaul links built on towers made of bamboo, and a mesh network[21] in 13 hamlets, each with several access points, creating a hub-and-spoke network. Each backhaul ran at 1 gigabyte per second (Gbps) and with one hop or satellite link. The local wi-fi hotspots—the access points or hubs—were used to distribute signals to network users.

After 2019, the number of access points grew to 542 public wi-fi hotspots and 10 private ones in 2024. These access points are hosted in the homes of the villagers who provide security to the hardware. In turn, these private hosts receive free internet access but have to cover the electricity costs. Energy generation is not an issue at Ciptagelar because it has its own hydropower plant that supplies electricity to the village. Awinet, on the other hand, handles cloud services and employs backhaul solar/generator power equipment to ensure uninterrupted service. The network expansion was organic and required no specific promotional activities. People who wanted to avail of the service would approach the Chief Leader of the Ciptagelar indigenous community to inquire about extending their operations to their areas.

While the business model secured wholesale internet for the village, it also extended economic and learning opportunities to both men and women, thereby narrowing the gender gap in the community. Most voucher sellers are village women, while the local technicians are mainly village men trained by Awinet and Common Room through the CCCI's training and capacity-building program. The network also employed a manager, a local woman, who oversaw financial matters, administration, and employment issues. Each connected village appointed a person who would transfer payments to the manager. Aside from creating jobs and enabling the financial sustainability of the network, this system also built a sense of ownership of the internet infrastructure and service among the villagers.

Other auxiliary services provided to the village include technical skill and capacity building of hotspot technicians, routine monitoring of the installed devices, maintenance and repair of internet tools and devices, workshop on the management and administration of CCCI, and training and sharing sessions on the healthy and safe use of the internet.

[21] Unlike the standard routers that provided one central access point, the mesh network could make simultaneous connectivity throughout a space.

Each internet voucher is valid for 24 hours with unlimited bandwidth and users can purchase them whenever they need internet access. However, not all users are paying customers. Two elementary schools (with students aged seven to 12) in small villages are given free internet access to enable the administrators to send daily and monthly data required by the Ministry. Previously, they had to travel nearly 20 to 40 kilometers to the nearest internet access point to submit their reports.

With Common Room's support, the village also started a local content production facility called CigaSakola, or Media Lab, under the Ciptagelar Indigenous Council. The villagers are using the equipment and facilities to make local multi-media content including musical and theatrical productions and documentaries, some of which promote local tourism through the Ministry. Aside from building the capacities of locals, they also provide training to other groups such as the geology students from a local university. The village also served as a venue for the Rural ICT Camp in 2021, which aimed to build an intranet, distribute the products (e.g., e-books), provide tutorial videos for children and adults, and disseminate information to the community.

Common Room also implemented many initiatives to support human development such as Digital Storytelling, Children's Music, technicians' workshops, and documenting women's roles and their daily lives in Ciptagelar. Other anticipated social services were peer-to-peer training for the CCCI's participants, free internet access for teachers, podcast and local content workshops, and workshop and training on local content development, including documentation of traditional knowledge and technology.

The decentralized geo-political relations in Indonesia facilitated the participative and democratic aspects of the model. This is evident in the presence of the elected Village Chiefs and the Village Council structure. The indigenous communities also have the position and authority to govern their community members and to maintain their culture and tradition. Combined with the local community stakeholders' sense of ownership of the enterprise, the model offers simple mechanisms for the capacity-building of community members to manage and extend the networks to adjacent villages. This has contributed to increasing not only their income but also the employment level in the expansion areas. Finally, the community has been mobilized to create and adopt content focused on their own self-determined needs.

Initial investment

The Association for Progressive Communications (APC) supported the initial investment of USD 25,000 in 2019, spread over two years. Common Room, on the other hand, spent over USD 43,413.21 on infrastructure and USD 1,146.89 on training and materials development.

While internet infrastructure is expected to last for 10 to 15 years, Common Room had to spend significant amounts annually on maintenance and repair (USD 10,380.84), monitoring of installed devices (USD 3,643.49), and continuing materials development[22] (USD 6,702.23). Aside from these recurring expenses totaling over USD 20,000, it also had to spend on the maintenance of solar panel controllers (USD 306.67), backhaul cost (USD 44,000), and software licenses (USD 480) for another yearly expense of USD 44,786.67.

[22] Publication of several curricula and training materials was necessary to make the internet relevant to the villagers, e.g. internet for education, internet for small and medium enterprises, and internet for telemedicine, among others. Several of them needed to be updated every year but its cost may vary from that of the initial publication.

Revenue is generated by selling vouchers, each costing IDR 10,000 (USD 0.70) for unlimited bandwidth of 2 Mbps for 24 hours. 'Gotong Royong' guides the tripartite agreement, characterized by shared costs and revenues among the parties. Gotong Royong is an Indonesian traditional term for collective work. Gotong can generally be understood as 'carrying a burden using one's shoulder,' while Royong means 'togetherness' or 'communally.' Thus, the combined phrase Gotong Royong can be translated literally as 'joint bearing of burdens.' In a general sense, it may also be understood as working together, helping each other, or mutual assistance for a shared or collective interest.

The network income is distributed as follows: 12.5 percent to voucher sellers; 12.5 percent to technicians; and the remaining 75 percent to the three supporting organizations - Awinet (70 percent), Kasepuhan Ciptagelar (20 percent), and the Common Room (10 percent) - for bandwidth cost, tax payment, maintenance, technical support, reinvestment, and savings.

Operational and financial sustainability

Financially, Common Room received USD 5,608 in 2021 from vouchers, which steadily increased to USD 7,860 in 2022 and USD 7,710 in 2023. From August 2020 to October 2023, the voucher sales grossed USD 376,734 *(See Table 1).*

Table 1. Distribution of Voucher Sales Revenues among Stakeholders, 2020-2023

Stakeholders' Shares in Voucher Sales	2020	2021	2022	2023
Common Room share (10% of 75% or 7.5%)		$5,607.74	$7,860.38	$7,710.22
Kasepuhan Ciptagelar share (20% of 75% or 15%)		$11.215.47	$15,520.75	$15,420.45
Awinet share (70% of 75% or 52.5%)		$39,254.15	$55,022.63	$53,971.56
Resellers		$9,346.23	$13,100.63	$12,850.37
Technicians		$9,346.23	$13,100.63	$12,850.37
Total	**$94,356.23***	**$74,769.80**	**$104,805.00**	**$102,802.97**
Total 2020-2023	**$376,734.00**			

** Derived from the given total sales 2020-2023*

With steady revenue streams, the CCCI became sustainable and grant-free within five years and was able to expand to other areas.

On the part of Kasepuhan Ciptagelar, its Village Council earned USD 11,215 in 2021, USD 15,721 in 2022, and USD 15,420 in 2023. This income was allocated to the improvement of the network locally, security, and other activities such as content development. The 10 local technicians earned an average additional income of about USD 98 per month, while the 86 voucher agents earned USD 11.40 monthly.

In 2023, an average of 1,000 individual users per day availed of the internet services. The number reached an average of 1,200 per day during peak periods. Still, as the daily use of the internet remains unaffordable to many, most villagers purchase vouchers only as needed. *Table 2* summarizes the performance of the community-centered connectivity initiative.

Table 2. Users Trend, 2021-2023

Users	2021	2022	2023
Population within signal range coverage area of the network	2,000	2,500	3,700
Total number of users	900	1,200	2,000
Actual initial adoption level	45%	48%	54%
Average number of total users during the day			1,000
Average number of users during peak period			1,200
Annual number of access vouchers sold	18,690	23,610	12,850
Voucher purchased per user	21	20	6

Source: LocNet Comparative Economic and Social Sustainability Study – Network Survey Data Elements

By 2024, the Kasepuhan Ciptagelar CCCI covered 43 hamlets spread across the two provinces of West Java and Banten. Of the 29,730 total population in these 43 hamlets, 3,700 were within the signal range coverage of the CCCI network. Being closer to Kasepuhan Ciptagelar, West Java enjoyed better connectivity than Banten. Consequently, the former experienced better promotion of cultural events, faster consolidation and delivery of support during disasters, and had more trained and skilled technicians than the latter. Meanwhile, internet penetration remained a challenge in Banten.

RESULTS AND IMPACT

The Common Room Report

According to a Common Room report in 2024, there are some indications of social impact among the stakeholders including the following:

- Internet connectivity grew from five to 43 hamlets in 12 villages between 2019 to 2024;
- The initiative of the local voucher agent and technician to expand coverage created new jobs in the new areas of operations;
- Local subsidies for around eight local primary and junior high schools for internet access were extended;
- Increasing internet connectivity was able to support the remote education process;
- Internet access also supported the COVID-19 pandemic preparedness efforts in the surrounding region.

Common Room also considered progress in bridging the gender gap an impact area. Gender equality was an issue in internet access at the village level. Before, men were the main users of handheld gadgets and computers while only less than 30 percent of women had access to these devices. It was a common misconception that the internet was the men's business and that women were technophobes. Since connectivity was an enabling tool and brought many economic opportunities to its users, the old belief placed not only women at a disadvantage but also their children who could have benefited from the women's use and exposure to digital technology. Five years after the establishment of the CCCI, the share of women using the internet is estimated to have increased to 50 percent in 2024.

On the flip side, some challenges remained in the program, including the following

- The remote location of the last-mile[23] villages which made it more difficult to connect them;
- Limited skill in handling the administration and financial process among local technicians;
- Shifting from oral culture and tradition to written form required a longer adaptation process;
- Negative impacts of internet usage including online fraud, hoax news and disinformation, online gambling, and illegal loans;
- Limited skill in the production and distribution of local content and knowledge; and
- Macroenvironment conditions such as climate change, natural disasters, prolonged COVID-19, and population growth.

Results of Key Informant Interviews

The primary data gathering method used to identify and/or validate the impact of the CCCI was limited to key informant interviews, as the prescribed design of a self-administered, online survey among the villagers was not feasible.

[23] In business, this is the term used to describe places with high risks but low affordability of goods or services by the poor.

Seven interviewees representing institutional and individual stakeholders were the main sources of information:

- ✓ Mr. Wildan Hidayatullah of the Lebak Disaster Response Agency;
- ✓ Mrs. Umi Kusumuwati for Economic Recovery and Development and Gender;
- ✓ Mr. Yoyoyogasmana Ciptagelar for Community Governance;
- ✓ Ms. Elva Yulia for the Youth Sector;
- ✓ Mr. Numan Sumantri of Awinet;
- ✓ Mr. Savero Dwipayana of Portkesmas, a civil society organization; and
- ✓ Mr. Heru Tjatur of ICT Watch.

The following sections detail the effects of the CCCI, based on the data generated from key informants.

Perspectives and outcomes experienced by institutional stakeholders

The Lebak Disaster Response Agency

As the world's largest archipelago, Indonesia is prone to disasters such as flooding, earthquakes, tsunamis, and volcanic eruptions. The Central Government assists at events declared as 'national disasters' and leads the emergency and relief activities. Regional authorities work to heighten the public awareness of natural disasters down to the village level. The South Lebak Mitigation Group (Gugus Mitigasi Lebak Selatan or GMLS) is one of the community-based organizations that works towards this goal.

Formed in 2018, the GMLS helps to mitigate risks by training the village people in disaster preparedness and emergency response, and by coordinating with them during and after a disaster. In 2023, with the support of various local and international organizations, GMLS developed a joint project on disaster preparedness with Common Room to provide a 24/7 tsunami alert, one of the tsunami-ready indicators set by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). In partnership with Common Room and the councils of two villages—Ciptagelar and Gelaralam, GMLS set up Jarindes, the village information and communication radio broadcast. Before having internet access, disaster-related information was transmitted using a radio "handie-talkie" unit, which only reached a one-kilometer radius. The villagers were then expected to share the news through word of mouth. Warning signals of a forthcoming disaster were made using bamboo poles, which inevitably resulted in inaccuracies.

With the CCCI's internet facility, GMLS began using an amateur radio repeater or tower that could broadcast information simultaneously within a 32-kilometer radius. The repeater also housed an advanced sensor that provided further data that ensured the accuracy of information to be shared with the public. Likewise, it controlled the warning sirens, which was particularly beneficial to the villagers who may be working in the middle of a field during an impending disaster and would otherwise not be reached by a simple radio unit or word of mouth.

The faster communication process brought about by the internet also allowed Jarindes to issue more accurate information. Using a mobile phone application, villagers can take pictures of events and send them to a hamlet, where a trusted person is assigned to screen and validate the information and forward it to the command center for dissemination. A

'village protocol' from the Ministry stationed at the command center then collaborates and validates reports first with the village officials, before broadcasting them to the public. With this two-level information validation, Jarindes earned the public trust and was able to help fight misinformation.

Due to accurate reporting and faster communication, the villagers gained access to the government's post-disaster assistance, which usually consisted of food, clothing, and medical and personal hygiene supplies for two weeks. The provision may be extended to three months, depending on the degree of the damages.

Further, clearer communication allowed the aid provided to the survivors to be more appropriate to their needs. During a landslide in 2019, for example, the villagers needed more help than just the emergency kits. Some 26 houses were buried in the mud, and each family needed around IDR 30 million (USD 2,000) and six months to rebuild their homes. Resources came from the local government as well as from local and international donors. Although there is no data on the amount of money and materials gathered from the various sources, the Ciptagelar villagers said that being digitally connected and being relatively more popular than other indigenous communities enabled them to seek assistance and engage in crowdfunding during disasters. Digital banking and fund transfers also facilitated resource mobilization.[24]

Another benefit of having internet access that villagers pointed out was access to the weather and climate forecasts. As a result, they were able to incorporate climatic conditions such as El Niño and La Niña with their traditional farming calendars. This was particularly helpful to the young people, who were unaware of the shifting planting calendars. The youth were also exposed to new farming techniques, such as hydroponics, which could help improve their land's productivity.

The Ciptagelar governing body

Health care. Villagers follow all government-mandated health protocols, especially during the COVID-19 pandemic, despite having their traditional healthcare practices. Ciptagelar is served by a rural health unit located three kilometers away from the village. It is staffed with a nurse, midwife, and paramedic, who administer health services such as routine immunization for children and COVID vaccination. Childbirth, however, is entrusted to the shamans.

Internet connection improved health services as daily reports are now submitted online to the Ministry of Health.

Education. Face-to-face classroom delivery remains the preferred and practiced modality in Kasepuhan Ciptagelar, despite improved internet connectivity. Since the village was not affected by the pandemic, they did not have to resort to online classes. Besides, there remained challenges in adapting to online classes in the village, including the availability of devices among the students and teachers, and training of teachers on strategies for online delivery of learning sessions. The internet, however, helped education administrators comply

[24] According to the 2015 Country Report by the Japan International Cooperation Agency, which studied natural disasters in Indonesia from 1983 to 2013, the number of losses in both property and lives was on a decline even while the frequency of occurrences of disasters was on the rise.

with the daily submission of reports to the Ministry of Education, which was 20 to 40 kilometers away from the village, as they were now able to send them online.

Consequently, because the students can easily access learning materials from the internet, it was reported that they are learning more and faster, so much so that the teachers are challenged to keep ahead of their students in the classroom.

On the downside, because the youth now tend to devote more time to using their devices instead of playing outdoors and doing house chores, they have acquired a sedentary lifestyle while lacking social and life skills. Children have also started using curse words they hear on online videos or throwing tantrums when restrained from using devices. The youth cannot be blamed for this phenomenon though as many parents resort to using these devices to keep their children occupied while they work. Adults fear that the change in children and youth's behavior will be detrimental to their overall development. While this behavioral trend is not dominant in Kasepuhan Ciptagelar, the village council representative estimates that four out of 10 village children are negatively affected by digital technology.

Environment. Indigenous people in this area have always had the task of monitoring and reporting fire incidents in the forests to the national park authorities. Having internet access helped them monitor environmental conditions, resulting in more accurate and faster information flows.[25]

Civil Society Organizations

According to the representatives of the village council and the civil society organizations (CSO), the impact of having internet access to the local economic development may be observed in the increased number of members of their online shopping group and increased online transactions. The common items sold online by Ciptagelar residents were palm sugar, herbs and spices, coffee, and native crafts.

The online consumption rate of the villagers also rose, as may be observed in the increased ownership of devices and clothes, especially among the women and their children. Aside from purchasing devices, men also purchased tools, motorcycle accessories, mattresses, and daily needs. In Ciptagelar, the ability of people to purchase these goods in cash was a sign of improved economic capacity. Credit purchases also reached an estimate of IDR 7.5 billion (USD 500,000) in 2024.

The representative of the ICT Watch, a CSO that initiated several digital literacy initiatives and movements in Indonesia, noted how Kasepuhan Ciptagelar was well prepared to deal with the problems resulting from increased internet access, such as consumers' overborrowing, illegal online gaming, gambling, and loans. Unlike other communities, Ciptagelar villagers were aware of the pros and cons of having internet access. Aside from digital literacy training, Common Room also taught the villagers financial literacy, promoted the buy-local mindset, and honored indigenous wisdom. Thus, even though there had been incidents of cyberbullying, it was not prevalent in Ciptagelar. The villagers still relied on their

[25] While a non-profit organization in Japan invested in a three-year project in Kasepuhan Ciptagelar in March 2020, it was intended to "improve infrastructure, living environment, and livelihood for the marginalized community" and not necessarily for environmental preservation.

culture of non-violence, appealing to one another to personally discuss and settle conflicts instead of posting about them on social media. Similarly, as the various stakeholders strove to keep the internet for meaningful connectivity, they also began to work on data privacy and protection.

Finally, as for gender equality, a women's sector representative named Ibu Umi expressed that while gender roles differed within the community, both genders had equal rights, including in internet access. However, how the internet was used remained strongly influenced by gender roles. For example, women tended to use the internet more to find recipes or tips for home decorations.

Awinet

Awinet, the ISP and Common Room's corporate partner, considered the CCCI viable, especially since the average number of users during the peak period had increased to 1,500 during the first quarter of 2024 from the previous year's 1,200. This is believed to be linked to the increase in the number of online transactions claimed by the village representatives. Awinet also pointed to the employment generated by the internet facilities for the voucher sellers and technicians as an indication of positive impact.

Perspectives and outcomes experienced by community stakeholders

Three key informants from Kasepuhan Ciptagelar, representing different age and gender groups, shared their experiences with the CCCI. All three identified the basic need to communicate—from gathering information to engaging in social activities and keeping up with the challenges of everyday living—as a compelling reason to access digital technology.

For Elva Yulia, a college student then in Bandung, communicating with her family was particularly important to her.

Yoyoyogasmana, a middle-aged man, added that he wanted to have internet access mainly to spread information about the indigenous people of Kasepuhan Ciptagelar and to achieve public recognition of their community. He hoped that this recognition would be translated into the formalization of their land rights. While an information campaign with the same intent had been done in the past using the radio broadcasting platform, he believed that the internet gave them a broader and faster reach. He recalled that before the CCCI in Ciptagelar, he and his fellow villagers spent some IDR 100 million (USD 6,500) on experiments beginning in 2009 to learn to build their internet facility. In addition, they had to settle their debt amounting to IDR 63 million (USD 4,200), which they incurred over years of trial and error. Further, since people bartered their labor in home construction in the cities in exchange for cables and gathered abandoned towers and scrap materials for free, this was equivalent to about IDR 150 million (USD 10,000) to IDR 300 million (USD 20,000) in opportunity losses and free labor.

For Ibu Umi, a middle-aged woman entrepreneur in charge of the deployment of the CCCI, having access to health information, especially during COVID-19, motivated her to engage in the initiative.

Overall, the internet facility set up by the CCCI in 2019 certainly made communication among the members of the indigenous people in Ciptagelar easier and more affordable.

Aside from this, the key informants also highlighted the impact of technology in various areas. Examples of these outcomes are presented below.

Business development and employment generation

Respondents unanimously highlighted the positive impact of technology on business or enterprise development—from learning new farm practices to expanding an existing business to the online market and creating a new product line under one's brand.

As a young entrepreneur, Elva started selling women's native clothing called kabaya through an online selling platform. Eventually, she was able to launch her brand and became both a content creator and a platform-certified affiliate. She earned an average of IDR 200,000 (USD 13) per week during low seasons and around IDR 500,000 (USD33) to IDR 1 million (USD67) per week in peak seasons.

Similarly, Ibu Umi, who also ran a small kabaya shop before the internet became accessible, was able to boost her business through the online platform. This enabled her to engage 10 to 20 resellers, each earning between IDR 14,000 (USD 0.90) and IDR 15,000 (USD 1) per day. She earned between IDR 20,000 (USD 1.33) and IDR 55,000 (USD 3.67) per day, even reaching IDR 2 million (USD 133.33) a day during the peak season.

Yoyoyogasmana was able to access the latest farming technologies shown on digital platforms. One of his research interests was raising black soldier flies.

Despite the apparent increase in business incomes among the villagers due to increased access to digital technology, the informants noted that digital financial transactions had already been widely used even before the CCCI. They attributed this high usage rate to active trade and tourism in their area.

Internet use in daily life

When the CCCI was established, villagers started communicating digitally through social media platforms such as Instagram, Facebook, YouTube, and Twitter. They also used digital applications to communicate and coordinate with people outside the village, including when sending files and documents. Online video calls were used extensively, as a lower-cost alternative to phone calls.

Elva Yulia, the sister of the Village Chief, considered herself lucky to have started college in Bandung in 2019 when the internet was already working in Kasepuhan Ciptagelar. Before this, she spent IDR 200,000 (USD 13) to IDR 500,000 (USD 33) to travel about 100 kilometers every two to three months to visit her family and paid IDR 50,000 (USD 3.33) to IDR 100,000 (USD 6.67) per month for telecommunication facilities to speak with them.

Education and learning opportunities

According to Elva, the internet helped her finish her college degree. She was able to access between 10 to 20 references within an hour, which would have taken her weeks or months if she sourced them physically from other cities.

Cultural preservation

The community used digital tools to document their cultural activities, archive records, and share them with the younger generations and other indigenous communities. While many young people had left the village for education or employment, the villagers hoped that the efforts to preserve and promote their culture through digital platforms would help them retain pride in their traditions.

Notwithstanding, the villagers believed that their ancestors gave their blessing for them to embrace technology to connect their people and to their traditions. Hence, they took pride in carrying out the desires of their ancestors.

The villages' culture, including Ciptagelar's traditional language Sundanese, was made part of a course at a university beginning in 2023. This is seen as a major step towards cultural preservation and increased awareness of the villages.

Health and COVID management

Since the COVID-19 pandemic in 2020, internet connectivity has become an important tool to support daily communication, including in the areas of public administration, health services, education, and economic activities, among others. Concerning health issues, two villages that bordered the non-indigenous community were linked to the Kasepuhan Ciptagelar CCCI, creating a communication channel that helped slow down or prevent the spread of the virus in these communities.

The villagers also became more rapidly aware of the health protocols and risks which led them to close their borders to outsiders who tried to find refuge in their isolated community. This enabled them to successfully control the spread of the virus, resulting in zero recorded cases during the pandemic. As a result, the village saved between IDR 500,000 (USD 33) and IDR 1 million (USD 67) in treatment costs per COVID-19 patient, while the positivity rate in West Java reached 13.3 percent in 2021 (Wuryantari, et. al., 2022).

Psycho-emotional well-being

Internet connectivity was also seen to promote the psycho-emotional well-being of the villagers, enabling easy and affordable connections which created positive feelings among family members. It also provided the younger generation with free entertainment. Despite the negative effects of the internet on users' mental health, the key informants opined that the positive effect on their well-being still outweighed the cost.

Political participation

The key informants had varying opinions on the villagers' political participation as a consequence of internet access. Ibu Umi thought that Ciptagelar's villagers had always been actively engaged in politics, and the internet simply heightened political awareness. Elva attributed the higher participation of the youth in the 2024 election to free access to information on digital platforms. She also observed that youth participation in information campaigns and in working as elections officers was higher in the recent election compared with the past. The youth were also very much involved in the ballot counting process, she added. Yoyoyogasmana highlighted that the internet allowed people to know the

candidates better and helped them distinguish between the new players from the political elites.

Negative consequences

Despite the many cited benefits of being digitally connected, internet access had negative impacts as well. It facilitated fraud, hoax information, mis- and disinformation, loss of properties, and scams in financial transactions. For instance, one cited case of a scam resulted in the loss of IDR 8 million (USD 533). The villagers, however, remained confident that social order within their community was still maintained, supported by their indigenous methods of enforcing social control. In addition, the village had set up security measures and promoted digital literacy among community members.

In summary, the following results of the CCCI were achieved, based on the testimonies of the villagers and the representatives of various institutions:

- Making the internet accessible to the indigenous community and raising their awareness and understanding of the internet
- Widening their access to information and knowledge and extending learning opportunities
- Preserving cultural identity, integrity, and heritage by using digital tools to document and promote their cultural activities, archive records, produce and distribute local content and knowledge and share them with the younger generations and with other indigenous communities;
- Developing local microenterprise and economic recovery business opportunities, and job creation, including that of the network technicians and voucher resellers;
- Using digital tools in their daily activities, including communicating and connecting with family and other people through social media platforms;
- Overcoming the stigma that the indigenous community was not interested in technological advancement; and
- Consolidating and extending aid during disasters.

The original objective of the villagers of Kasepuhan Ciptagelar to achieve political recognition and land rights remained a continuing concern. But a positive development in October 2024 was the release by Sukabumi regency government to recognize and protect the indigenous rights in the region including the Ciptagelar indigenous community. This new regulation follows the regent decree letter that was released in 2021 and 2024.

Initiating the use of Development Indexing to measure social impact

Given the array of social impacts that the CCCI in Kasepuhan Ciptagelar had on the various stakeholder groups in the community, the social enterprise tool of Development Indexing was used in putting together a framework that defines the main elements or key result areas (KRA), the sub-elements under each KRA, and potential performance indicators to capture these social impacts.

Based on the gathered data, the performance indicators may be synthesized into four (4) key result areas (KRAs):

- Better adaptation of the community to climate change and climate-related disasters;
- Improvement in the economic conditions of the community stakeholders;
- More effective preservation of cultural integrity, identity, and heritage; and
- Increased levels of and capacities for inclusive human development and community empowerment.

Better adaptation of the community to climate-related challenges. It was in disaster risk management and adaptation to environmental challenges that the positive impacts of connectivity on the provision of government services to the community were felt the most. Its impact was less evident in education, health, and infrastructure given the village's geographic distance from the urban centers, coupled with its capacity for self-sufficiency. The accuracy of and efficiency in submitting reports to the various Ministries as a result of having an internet connection, however, cut across the various sectors.

The use of modern devices in monitoring tsunami and other disaster risks, and the use of the internet in information exchange and dissemination made disaster management faster and broader in reach. Additionally, more people affected by disasters were able to receive aid and recovery assistance from the national government and donors from various locations globally. The prevention of loss of lives and property and the wider extension of aid to the survivors, regardless if they were digitally connected or not, may thus be considered the most significant impact of the CCCI.

Improvement in the economic conditions of community stakeholders. This aspect may be examined at three levels: 1) individual and household; 2) microenterprise level; and 3) the agricultural sector. The greater number of economic activities consequent to making digital connection available and affordable—mainly the proliferation of online trading or shopping platforms—created new businesses for existing microentrepreneurs and created new microentrepreneurs as well. Many of these enterprises further generated employment through their distributors and resellers. In turn, this local business development led to greater consumption by individuals and households. The growth in both local consumption (demand) and local trade and production (supply) could sustain the economic growth cycle and accelerate digital connectivity in the village (as observed in the buying patterns of devices among the members).

The resulting improved economic conditions were not confined to digitally connected households and microenterprises but also extended to the wider agricultural sector. The forecast of phenomena such as El Niño and La Niña with the help of digital technology, combined with indigenous agricultural practices such as the use of the farming calendar, enabled farmers to time their planting with new seasonal patterns due to climate change. Such adaptive practice allowed them to keep their land productive, thereby maintaining

their yield. At the same time, the integration of the traditional and the new technologies also encouraged younger farmers to explore other ways to optimize land productivity (hydroponics, for example). This two-pronged, two-generational development made Kasepuhan Ciptagelar's agricultural sector more resilient and sustainable.

More effective preservation of cultural integrity, identity, and heritage. The impact of connectivity on the preservation and promotion of the indigenous people's culture, which they had been aiming for even before the establishment of the CCCI, went beyond the actual number of villagers using the facilities. The production of local content, for example, as well as the inclusion of their language in the curricula of a formal educational institution benefited the indigenous community and the next generation.

Increased levels of and capacities for inclusive human development and community empowerment. At the individual level, the effect was most pronounced in people's daily communication, which helped maintain strong family relations. It was also evident in the conduct of their regular tasks, which digital technology made faster, easier, and cheaper. Connectivity also facilitated both formal education (e.g., accomplishment of academic requirements) and informal learning (e.g., keeping oneself abreast of the latest farming technology). In addition, with the large number of digital communication and information platforms available, connectivity led to more informed and more engaged citizens in the 2024 national election.

Common Room extended local subsidies for around eight local primary and junior high schools for internet access. Its impact, however, was deemed marginal because there were challenges in the supply of devices among the students and teachers, and in the skills and level of training of teachers on various strategies to deliver online learning sessions. Face-to-face classroom delivery remained the preferred and practiced modality in Kasepuhan Ciptagelar, despite their internet connectivity.

With regard to addressing gender equality issues, five years after the establishment of the CCCI, the share of women using the internet increased from 30 to 50 percent. This means that almost twice as many women had internet access in 2024 than when the initiative started.

The anticipated increase in the agency or sense of control over one's life consequent to the project was not significant in the case of Kasepuhan Ciptagelar. The villagers had been engaged in technology development (e.g., power plant and various ICT experiments) even before the CCCI and had been lobbying for their land rights recognition over the years. However, the initiative's social preparation or the ‘brainware’, which the Common Room deliberately established before building the network infrastructure, helped the villagers optimize the benefits of the internet and minimize social costs such as over-borrowing and overexposure of children to screens. Community empowerment was apparent in that the villagers were able to use digital connectivity effectively and sustainably.

The four above-mentioned key result areas of impact may be further dissected into the stakeholder types who benefited, each with corresponding performance indicators that may be considered as sub-elements of an evolving Development Index that could later be quantified in a scorecard.

In determining the extent of impact, the approximate ratings of high, medium, and low are used and are based on the a) extent of reach and b) depth of impact. The extent of reach is rated “high” if the number of stakeholders experiencing the described outcome is 61 percent and above the total number of stakeholders in the group. Reach is rated “medium” and “low” if the number of stakeholders experiencing the described outcome is between 31 percent and 60 percent, and 30 percent or below, respectively, of the total number of stakeholders in the group. Depth of impact is the estimated or perceived difference or the "quality of change" a social enterprise intervention is making for each person or individual stakeholder. The impact is considered “significant” (1) if both Reach and Depth are high; (2) if both are medium; and (3) if at least one is high.

Based on the above-mentioned criteria, Table 3 shows the ratings[26] for the social impact indicators that are deemed significant in the case of Kasepuhan Ciptagelar.

[26] Full explanation of the ratings is presented in Table 3.1 contained in the Annex.

Table 3: Elements of an evolving Development Index					
Stakeholders	**Key Result Area (KRA) sub elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #1: Better adaptation of community to climate-related disasters					
Government	**1. Wider reach and faster communication and coordination of government agencies**	1. Faster and cheaper way of submission of reports to government through the online facility instead of land travel	Low	Low	Not significant
		2. More accurate information submitted to authorities (e.g., reporting of the impact of disasters and number of survivors)	Low	Low	Not significant
		3. Broader reach of information for better resource mobilization to support recovery and rehabilitation post-disaster	Low	High	Significant
CSO	**2. Faster, more effective information generation of the CSOs**	1. Higher citizens' participation in generating and validating data from the ground	High	Low	Significant
		2. More reliable monitoring and timely information dissemination with the use of modern, more effective devices.	High	High	Significant
		3. More proactive risk management through dissemination of risk information, hazard models, exposure databases, and vulnerability information	High	Low	Significant
Community	**3. Improved capacity of the community to respond to climate-related events and disasters**	1. Greater awareness of climate challenges and knowledge of disaster preparedness	High	Medium	Significant
		2. Improved capability to avoid or minimize loss of lives and property amid disasters	High	High	Significant
		3. Improved access to more appropriate assistance to recover and rebuild post-disaster	High	High	Significant

Table 3: Elements of an evolving Development Index *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #2: Improvement in the economic conditions of the community stakeholders					
Individual and/or household level	**1. Increase in assets**	1. Increase in household assets (e.g., motorcycles, gadgets, home improvements)	Low	High	Significant
		2. Increase in financial resources to support the increase in consumption or avoidance of over borrowings	High	Medium	Significant
		3. Increase in wealth creation or investment	Low	Low	Not significant
Microenterprise group	**2. Increase in business transactions and new business enterprises**	1. Increase in trade or transactions (either in traditional market or in new online channels) of existing microentrepreneurs	Medium	High	Significant
		2. Increase in employment generation	Low	High	Significant
		3. Increase in the number of new digital technology-related enterprises, including market expansions of CCCI outside of the village	No data	No data	No data
Farmers and/or agricultural sector	**3. Greater sustainability of the agricultural sector**	1. Improved capability to use new adaptive farming techniques to climate change, integrating traditional practices with new technologies	Low	High	Significant
		2. Higher yield of the sector, resulting from the use of climate-adaptive techniques (e.g., hydroponics)	Low	Low	Not significant
		3. Greater inter-generational sustainability with the involvement of the young (next generation) farmers	High	High	Significant

Table 3: Elements of an evolving Development Index *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #3: More effective preservation of cultural integrity, identity, and heritage					
Indigenous Community	**1. Improved capacity for local knowledge preservation and creation**	More effective documentation of cultural activities, archive records, and share them with the younger generation	High	Medium	Significant
	2. Greater awareness of the society at large of the indigenous community's existence and traditions	Better achievement of societal awareness of the indigenous village by sharing information with other indigenous communities and academic communities, among others	High	Medium	Significant
	3. Wider reach of advocacy of indigenous rights and policy reforms	More effective way of establishing land rights (e.g., land mapping) for policy reform.	High	Medium	Significant
KRA #4: Increased levels and capacities for inclusive human development and community empowerment					
Individual human development	**1. Higher level of self-development and wellbeing**	1. Greater knowledge to achieve good health and well-being (e.g., health news and advisory, entertainment)	High	High	Significant
		2. Better capability to develop technical skills and special interests (e.g., recipes, home design, farming technologies)	High	Low	Significant
		3. Greater achievement in formal education	Low	High	Significant
Individual and/or household-level productivity	**2. Higher productivity in the performance of daily tasks**	1. Faster and cheaper communication and coordination with the use of the new digital technology.	Low	High	Significant
		2. Greater cost-efficiency, e.g., cut down on travel time and transportation expenses	High	High	Significant
		3. More applications of modern technology to simplify complex tasks, e.g., programming	Low	Low	Not significant

Table 3: Elements of an evolving Development Index *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #4: Increased levels and capacities for inclusive human development and community empowerment					
Indigenous community	**3. Greater social cohesion and political participation**	1. More enhanced social relations within the households or among community members	High	Low	Significant
		2. Heightened political awareness and/or engagement	High	Medium	Significant
		3. Better capacity to promote social order and to fight unacceptable behavior (e.g., disinformation, scams, gambling)	High	Low	Significant
		4. Local subsidies for around eight local primary and junior high schools for internet access were extended.	Low	Low	Not Significant
		5. Five years after the establishment of the community network, the share of women using the internet had increased from 30 to 50 percent in 2024 .	High	Low	Significant
		6. Increase in agency or sense of having control over one's life, capacity to influence one's thoughts and behavior, and having faith in one's ability to handle a wide range of tasks and situations.	Low	Low	Not Significant
		7. Community empowerment or enabling people/stakeholders to have control over resources, decisions, and the capability to use such effectively and sustainably to effect change towards sustainable and equitable development in their community, sector, and society at large.	High	High	Significant

Toward measuring cost-effectiveness using Social Return on Investment

Social Return on Investment (SROI) was also used as a tool to further measure the social impact and cost-effectiveness of Kasepuhan Ciptagelar CCCI. Following the conventions of Social Value International, the case study explored the quantification and monetization of the most significant social impacts directly identified with the assistance of the key informants.

In the absence of a survey due to limited time and resource constraints, the social impact identified were quantified and monetized as social benefits or costs experienced by relevant stakeholders of the CCCI using the data shared or validated by the key informants. The number of beneficiaries experiencing such benefits or incurring such costs were also estimated and used as a multiplication factor to come up with the total monetized value of the relevant social impact.

Table 4.1 details the means of monetization or how each of the social impacts identified as significant by the key informants were monetized. The table likewise relates these identified social impacts to the four key result areas (KRAs) contained in *Table 3.1* in the Annexes showing the elements of an evolving Development Index for the Kasepuhan Ciptagelar CCCI. To quantify and monetize a significant negative social impact required by the SROI methodology, the case study surfaced the sedentary lifestyle and lack of social and life skills affecting 4 of 10 of children. This is also shown in *Table 4.1*.

Table 4.1 Monetization of impact

Description of social impact (No. of beneficiaries)[27]	Link to KRA	Means of Monetization
Increase in business transactions and new business enterprises (12-145)	KRA on the economic conditions of community stakeholders	Estimated income provided by the resource persons x women population x 25% of women were into trading/business. (Trade and entrepreneurship in Indonesia, 2023)
Instilled pride in following the desires of their ancestors (300-800)	KRA on cultural integrity, identity, and heritage	Average cost of pleasing the ancestors, from making a statue to having a funeral celebration x cumulative number of users[28]
Savings on health services, consequent to not having positive COVID-19 cases (3,954)	KRA on inclusive human development and community empowerment	Cost savings from COVID-19 treatment (actual cost of treating COVID provided by the resource person) x positivity rate at West Java at 13.3% [29]
Better access to government's rehabilitation assistance (3,865)	KRA on adaptation of community to climate-related disasters	Average cost of emergency kits (based on various commercial and government prices) x risk rate of West Java x percentage of survivors needing help[30] x only 25% of the affected population are severely impacted (Teguh Dartanto, 2022).
Better access to more appropriate assistance (30)	KRA on adaptation of community to climate-related disasters	Cost estimates of housing rehabilitation provided by the resource person x actual number of beneficiaries in a (sample) year

[27] where the number of beneficiaries changed per year, data indicated is the range
[28] https://www.npr.org/sections/goatsandsoda/2019/09/29/764638760/photos-the-dead-live-with-their-loved-ones-on-this-indonesian-island
[29] Wuryantari Setiadi, et.al., 2022
[30] https://go.kompas.com/read/2021/01/20/213309974/indonesias-west-java-province-at-high-risk-of-natural-disasters

Table 4.1 Monetization of impact *[cont.]*		
Description of social impact (No. of beneficiaries)	**Link to KRA**	**Means of Monetization**
Improved access to learning materials (75-200)	KRA on inclusive human development and community empowerment	Estimated savings (cost estimates provided by the resource person) on travel x estimated number of population in the higher education
Income generation for new online resellers (24-96)	KRA on the economic conditions of community stakeholders	Income estimates of resellers provided by the resource person x 25% of women of the marginal (year-to-year) increase in users
Increase in savings from not having to travel back to families (300-800)	KRA on inclusive human development and community empowerment	Money spent on traveling to and from home, given by the resource person
Increase in savings from not spending on the old telecommunications services (e.g., internet shops) (75-200)	KRA on inclusive human development and community empowerment	Money spent annually on old communication channels, given by the resource person
Sedentary lifestyle and lack of social and life skills affecting 4/10 of children		Sources said 4/10 children are being affected x children population in the village x cost of stunted growth of children as a percentage of GDP [31] Cost of stunted growth of children as a percentage of GDP, 0.01% to 1.2% of national GDP across countries (Akseer et. al., 2022)

First among the top beneficiaries were the microentrepreneurs, followed by the indigenous community members who held pride in following the desires of their ancestors. This was followed by the savings from the community for not having any recorded COVID-19 cases.

The CCCI also benefited those who did not have internet access, for example, the survivors of various disasters who were able to receive assistance from the government but who would not have been reached if not for the modern communication facility. Another group of beneficiaries were community members who could have been infected by COVID-19, estimated at 11,862 individuals. Following this pattern, it could then be surmised that the whole Kasepuhan Ciptagelar benefited, including the preservation of culture through the production of local content, promotion of their village, and the teaching of the Sundanese language in a university.

On the other hand, the younger generation enrolled in basic and secondary schools tended to experience the negative impact the most, with their tendency to develop a sedentary lifestyle while lacking social and life skills.

The social impact valuation of the community-centered connectivity initiative on Kasepuhan Ciptagelar resulting from the SROI analysis is summarized in the Social Outcomes contained in *Table 4.2*. Adding the Financial Outcome or net income of the Kasepuhan Ciptagelar CCCI to the monetized value of Social Outcomes, both positive and negative, would yield the Aggregate Outcome that would serve as the numerator in the SROI ratio on a yearly basis. The Aggregate Inputs or Investments to set up the Kasepuhan Ciptagelar CCCI is likewise indicated in *Table 4.2* which serves as the denominator, also on a yearly basis.

Table 4.2 SROI Summary				
Outcomes	**2020**	**2021**	**2022**	**2023**
A. Financial Outcome: Net income of Kasepuhan Ciptagelar CCCI	$49,569.57	$9,256.57	$39,291.77	$37,135.07
B. Social Outcomes				
1) Increase in business transactions and new business enterprises	$7,535.39	$22,606.18	$68,097.75	$90,424.71
2) Instilled pride in following the desires of their ancestors	$28,242.45	$56,484.90	$65,899.05	$75,313.20
3) Savings on health services, consequent to not having positive cases	$12,356.53	$12,356.53	$12,356.25	$0.00
4) Better access to government's rehabilitation assistance	$23,716.43	$23,716.43	$23,717.05	$23,716.43
5) Better access to more appropriate assistance	$15,000.00	$15,000.00	$15,000.00	$15,000.00
6) Improved access to learning materials	$8,750.00	$17,500.00	$20,416.67	$23,333.33
7) Income generation for new online resellers	$4,233.57	$12,700.71	$14,742.00	$16,934.28
8) Increase in savings from not having to travel back to families	$11,100.00	$22,200.00	$25,900.00	$29,600.00
9) Increase in savings from not spending on the old telecommunications services (e.g., internet shops)	$8,750.00	$17,500.00	$20,416.67	$23,333.33
10) Sedentary lifestyle and lack of social and life skills affecting 4/10 of children	($696.00)	($2,088.00)	($2,784.00)	($4,640.00)
Aggregate Outcomes	**$167,129.06**	**$205,565.19**	**$301,339.55**	**$328,425.36**
Aggregate Inputs	**$115,535.33**	**$127,085.12**	**$120,243.79**	**$113,557.14**
SROI Ratio	**1.45**	**1.62**	**2.51**	**2.89**

The aforementioned SROI Summary is culled from the Common Room SROI Value Map accessible through this link: https://tinyurl.com/CommonRoom-SROIValueMap. This provides the details of all relevant quantities and values used and generated using the procedures and conventions of SROI Analysis prescribed by Social Value International.

Based on the Common Room SROI Value Map and as detailed in *Table 4.2*, the Kasepuhan Ciptagelar CCCI generated SROI values that were all above 1, ranging from 1.45 to 2.89, in 2021-2023. This indicates increasing cost effectiveness, with 2.89 as the SROI with the highest blended outcome value of USD 328,425.36 in 2023. This figure means that every dollar invested in the community-centered connectivity initiative in Kasepuhan Ciptagelar that year generated a blended value of USD 2.89. The longitudinal, year-on-year increase in the SROI ratio shows that the CCCI's impact on the community is increasing over time. This trend indicates that the use of inputs to produce outcomes is becoming more efficient every year.

A Closer Look at the Qualitative Social Impact and Cost Effectiveness of Kasepuhan Ciptagelar CCCI

An analysis of the types of social impact generated by the Kasepuhan Ciptagelar CCCI, using the performance indicators deemed as significant under the four KRAs outlined in *Table 3.1*, reveals that most impacts have been facilitated by social inclusion and transformational services. The primary transactional service offered by the CCCI was the provision of internet access through vouchers. All the rest were social inclusion and transformational services that included digital literacy training, local content development and dissemination as well as building the capability of Kasepuhan Ciptagelar technicians, locals and institutions to manage and sustain CCCI operations. *Table 5* details the most significant services provided by the CCCI, indicating the type they may be classified under.

Table 5. Various Types of Services Provided by the Kasepuhan Ciptagelar CCCI

Transactional Services	Social Inclusion Services	Transformational Services
Provision of internet service through vouchers	Digital literacy training Publishing of curricula and training materials to make the Internet relevant to the villagers Conduct podcasts/workshops on local content development, including documentation of traditional knowledge and technology Development of village culture through digital storytelling, children's music and the documentation/dissemination of events and relevant themes including women's roles and their daily life	Training and capacity building of technicians and locals to undertake monitoring, maintenance, and repair of internet tools and devices, CCCI management and administration, and to conduct training and sharing sessions on the healthy and safe use of the Internet Capacity building and support to set up and manage CigaSakola or Media Lab as a center for local content production and dissemination and to enable villagers to produce local media content Capacity building for locals to manage and extend internet services to adjacent villages

Of the initial 34 social impact indicators in *Table 3.1,* 26 were considered significant. Of this number, 13 impact indicators were facilitated by transactional services, nine by social inclusion services, one by transformational services, and three by a combination of both transactional and transformational services. These are detailed in *Table 6*.

Table 6: Significant social impacts and their classification						
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicator / Performance Indicator**	**Indication if monetized or not in SROI Analysis**	**Indication of Type of Impact**		
				Transactional services-related impact	**Social Inclusion-related impact**	**Transformational services-related impact**
KRA #1: Better adaptation of community to climate-related disasters						
Government	Wider reach and faster communication and coordination of government agencies	Broader reach of information for better resource mobilization to support recovery and rehabilitation post-disaster	Monetized	x		
CSOs	Faster, more effective information generation of the CSOs	Higher citizens' participation in generating and validating data from the ground	Not monetized		x	
		More reliable monitoring and timely information dissemination with the use of modern, more effective devices.	Not monetized		x	
		More proactive risk management through dissemination of risk information, hazard models, exposure databases, and vulnerability information	Not monetized		x	
Community	Improved capacity of the community to respond to climate-related events and disasters	Greater awareness of climate challenges and knowledge of disaster preparedness	Not monetized	x		
		Improved capability to avoid or minimize loss of lives and property amid disasters	Not monetized		x	
		Improved access to more appropriate assistance to recover and rebuild post-disaster	Monetized		x	

Table 6: Significant social impacts and their classification *[cont.]*

Stakeholders	Key Result Area (KRA) sub-elements	Description of Performance Indicator / Performance Indicator	Indication if monetized or not in SROI Analysis	Indication of Type of Impact		
				Transactional services-related impact	Social Inclusion-related impact	Transformational services-related impact
KRA #2: Improvement in the economic conditions of the community stakeholders						
Individual and/or household level	Increase in assets	Increase in household assets (e.g., motorcycles, gadgets, home improvements)	Not monetized	x		
		Increase in financial resources to support the increase in consumption or avoidance of over borrowing	Not monetized		x	
Microenterprise group	Increase in business transactions and new business enterprises	Increase in trade or transactions (either in traditional market or in new online channels) of existing microentrepreneurs	Monetized	x		
		Increase in employment generation	Monetized	x		x
		Increase in the number of new digital technology-related enterprises, including market expansions of CCCI outside of the village	Not monetized	x		x
Farmers and/or agricultural sector	Greater sustainability of the agricultural sector	Improved capability to use new adaptive farming techniques to climate change, integrating traditional practices with new technologies	Not monetized	x		
		Greater inter-generational sustainability with the involvement of the young (next generation) farmers	Not monetized	x		

Table 6: Significant social impacts and their classification *[cont.]*

Stakeholders	Key Result Area (KRA) sub-elements	Description of Performance Indicator / Performance Indicator	Indication if monetized or not in SROI Analysis	Indication of Type of Impact		
				Transactional services-related impact	Social Inclusion-related impact	Transformational services-related impact
KRA #3: More effective preservation of cultural integrity, identity, and heritage						
Indigenous Community	Improved capacity for local knowledge preservation and creation	More effective documentation of cultural activities, archive records, and share them with the younger generation	Not monetized		x	
	Greater awareness of the society at large of the indigenous community's existence and traditions	Better achievement of societal awareness of the indigenous village by sharing information with other indigenous communities and academic communities, among others	Monetized	x		
	Wider reach of advocacy of indigenous rights and policy reforms	More effective way of establishing land rights (e.g., land mapping) for policy reform.	Not monetized			x
KRA #4: Increased levels and capacities for inclusive human development and community empowerment						
Individual human development	Higher level of self-development and wellbeing	Greater knowledge to achieve good health and well-being (e.g., health news and advisory, entertainment)	Monetized	x		
		Better capability to develop technical skills and special interests (e.g., recipes, home design, farming technologies)	Not monetized	x		
		Greater achievement in formal education	Monetized	x		

Table 6: Significant social impacts and their classification *[cont.]*

Stakeholders	Key Result Area (KRA) sub-elements	Description of Performance Indicator / Performance Indicator	Indication if monetized or not in SROI Analysis	Indication of Type of Impact		
				Transactional services-related impact	Social Inclusion-related impact	Transformational services-related impact
KRA #4: Increased levels and capacities for inclusive human development and community empowerment						
Individual and/or household-level productivity	Higher productivity in the performance of daily tasks	Faster and cheaper communication and coordination with the use of the new digital technology.	Monetized			x
		Greater cost-efficiency, e.g., cut down on travel time and transportation expenses	Monetized	x		
Indigenous community	Greater social cohesion and political participation	More enhanced social relations within the households or among community members	Not monetized	x		
		Heightened political awareness and/or engagement	Not monetized	x		
		Better capacity to promote social order and to fight unacceptable behavior (e.g., disinformation, scams, gambling)	Not monetized		x	
		Five years after the establishment of the community network, the share of women using the internet had increased from 30 in the project inception to 50 percent in 2024.	Not monetized		x	
		Community empowerment or enabling people/stakeholders to have control over resources, decisions and the capability to use such effectively and sustainably to effect change towards sustainable and equitable development in their community, sector and society at large.	Not monetized			x

While an ISP can also create the 13 impacts by providing internet access as a transactional service as normally done by these commercial players, they could not possibly generate those impacts facilitated by the CCCI's social inclusion, transformational, and transactional-transformational services.

Further, of the 27 significant impacts, only nine were monetized and included in the SROI analysis given the limitations in time and resources. These significant impact indicators, many of which were facilitated by social inclusion and transformational services, include the following:

Better adaptation of community to climate-related disasters:

- Higher citizens' participation in generating and validating data from the field
- More reliable monitoring and timely information dissemination with the use of modern, more effective devices
- More proactive risk management through dissemination of risk information, hazard models, exposure databases, and vulnerability information
- Greater awareness of climate challenges and knowledge of disaster preparedness
- Improved capability to avoid or minimize loss of lives and property amid disasters

Improvement in the economic conditions of the community stakeholders:

- Increase in household assets (e.g., motorcycles, gadgets, home improvements)
- Increase in the number of new business enterprises, including market expansions outside of the village
- Improved capability to use new adaptive farming techniques to climate change, integrating traditional practices with new technologies
- Greater inter-generational sustainability with the involvement of the young (next generation) farmers

Increased levels and capacities for inclusive human development and community empowerment:

- Better capacity to promote social order and to fight unacceptable behavior (e.g., disinformation, scams, gambling)
- Five years after the establishment of the community network, the share of women using the internet had increased from 30 in the project inception to 50 percent in 2024.
- Community empowerment or enabling people/stakeholders to have control over resources, decisions, and the capability to use such effectively and sustainably to effect change towards sustainable and equitable development in their community, sector, and society at large.

The results of the SROI analysis of this case study should be seen as understated in terms of cost-effectiveness and need further refinements in a succeeding study to include the quantification and monetization of these significant social impacts.

A succeeding DI study could also develop a scorecard that could more substantively quantify the significant qualitative impacts that the Kasepuhan Ciptagelar CCCI has had on the various stakeholder groups of the marginalized Indigenous communities who were engaged.

SUMMARY AND CONCLUSION

The impact of this CCCI benefited not only the internet users but also non-users. This effect was evident in the community's improved adaptation to climate-related disasters, distribution of relief and rehabilitation assistance, and in successfully keeping their community safe and infection-free during the pandemic. Equally important, the CCCI helped improve the local income-generating opportunities and develop a more resilient and sustainable agricultural sector that benefited both internet users and non-users.

While the original shared vision of Common Room and Kasepuhan Ciptagelar to achieve recognition and formalization of their land rights has not yet been realized, they were able to achieve remarkable progress in preserving and promoting the cultural heritage of the community. At the household level, community members benefited in making their everyday tasks easier and more cost-efficient.

On the downside, however, the stakeholders witnessed how digital technology could influence children and youth to develop sedentary lifestyles while lacking social and life skills, although this trend has not yet reached an alarming stage in Kasepuhan Ciptagelar. There were also instances of misinformation and the prevalence of vice, such as scams, gambling, illegal loans, and over-indebtedness. The villagers were able to keep order and manage these negative consequences using their indigenous ways of enforcing social control.

The SROI Value Map showed that the investment in the CCCI in Kasepuhan Ciptagelar generated a blended social and financial value that reached US 2.89 for every US 1 invested in 2023. The impact and operational sustainability of the CCCI have good prospects, especially since the ownership of the infrastructure and of the business among the indigenous community was established.

One aspect of Indonesia's legal environment that worked well for the CCCI was its push for the advancement of digital connectivity in the country. Despite the continuous presence of unregistered service providers, and still lacking policy reform to further support the indigenous communities, there were legal provisions that enabled the CCCI to operate and thrive. Collaborating with industry partner Awinet helped end the Indigenous community's decade-long struggle to establish its internet infrastructure.

Preparing the community ahead of the construction of the infrastructure also created a market for internet services that supported the network's financial sustainability. The demand arose from the community members' daily need to communicate the requirements of formal and informal education, running of microenterprises, disaster risk management, delivery of health information and services, especially during the pandemic, as well as making agriculture more resilient and sustainable, among others. The village's eventual capacity to create its content while preserving its culture further contributed to maintaining the market demand. It was the same social preparation, too, that allowed the Kasepuhan Ciptagelar to manage, if not totally counter, the negative effects of connectivity.

What may be challenging, however, was the entry of possible competition. In 2023, for example, the RT/RW Net movement started providing internet services that were 50 percent cheaper than Common Room. Common Room's price of IDR 10,000 per 24-hour voucher was 2.1 percent of the average monthly income of the population IDR 482,500. This meant that a daily purchase of vouchers would eat up 63 percent of the average monthly income of the population.

Consequently, some of the Common Room subscribers switched to the cheaper provider. At the same time, the CCCI had yet to tap the current reach of its network as there were only 2,000 registered users out of its total capacity of 3,700.

Overall, what sustained the CCCI in Kasepuhan Ciptagelar was the investment in human development. It established a sense of ownership among the indigenous community of both the network infrastructure and the services. It helped that the village was known to be adaptive to modern technology and considered having digital connectivity as part of their ancestors' will for them— both of which were not typical of indigenous groups. These traits, however, were made even more robust by the CCCI's empowerment of the Kasepuhan Ciptagelar community to control and govern its digital resources and use such for inclusive human and community development.

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Annex

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact)					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #1: Better adaptation of community to climate-related disasters					
Government	**1. Wider reach and faster communication and coordination of government agencies**	1. Faster and cheaper way of submission of reports to government through the online facility instead of land travel	Low (Affects only the reporting personnel estimated at 16 or less than 1% of the population.)	Low (One-time saving only.)	Not significant
		2. More accurate information submitted to authorities (e.g., reporting of the impact of disasters and number of survivors)	Low (Only 25% of the affected population need help and the unreached ones are only those in the remote areas.)	Low (The various levels of governance are on top of any disaster situation and reporting was done regularly.)	Not significant
		3. Broader reach of information for better resource mobilization to support recovery and rehabilitation post-disaster	Low (Only around 6% of the affected population need help beyond the usual aid the government extends.)	High (The government is now able to provide major assistance to more survivors who would not have otherwise been reached without the internet.)	Significant

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact) *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #1: Better adaption of community to climate-related disasters					
CSO	**2. Faster, more effective information generation of the CSOs**	1. Higher citizens' participation in generating and validating data from the ground	High (Any community members with internet access can now report incidents faster and more accurately.)	Low (The Indigenous people have always been tasked to watch over and report [disastrous] incidents even before the age of internet connection.)	Significant
		2. More reliable monitoring and timely information dissemination with the use of modern, more effective devices.	High (Reach increased from 1km-radius to 32-km radius.)	High (Saved many people and properties with the use of modern warning devices)	Significant
		3. More proactive risk management through dissemination of risk information, hazard models, exposure databases, and vulnerability information	High (Risk management practice included citizen awareness and preparation of the villagers.)	Low (Risk management needed to be leveled up to include database, models, etc..)	Significant
Community	**3. Improved capacity of the community to respond to climate-related events and disasters**	1. Greater awareness of climate challenges and knowledge of disaster preparedness	High (Village-level preparation.)	Medium (More information may be channeled via the digital space than traditional word of mouth, for example.)	Significant
		2. Improved capability to avoid or minimize loss of lives and property amid disasters	High (Reach extended beyond the internet users.)	High (The number of losses in both property and lives was on a decline even while the frequency of occurrences of disasters was on the rise.)	Significant
		3. Improved access to more appropriate assistance to recover and rebuild post-disaster	High (Reach extended beyond the internet users.)	High (Villagers could reach the government and the rest of the world for assistance.)	Significant

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact) *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #2: Improvement in the economic conditions of the community stakeholders					
Individual and/or household level	**1. Increase in assets**	1. Increase in household assets (e.g., motorcycles, gadgets, home improvements)	Low (Estimated to affect only 15% of the enterprising population.)	High (This impact included increase in number of women owning gadgets.)	Significant
		2. Increase in financial resources to support the increase in consumption or avoidance of over borrowings	High (Village-level financial literacy program as part of social preparation was done.)	Medium (Combined with the traditions that kept social order and discipline.)	Significant
		3. Increase in wealth creation or investment	Low (Internet users were not reported to engage yet in personal investments, insurance, and other instruments.)	Low (Internet users were not reported to engage yet in personal investments, insurance, and other instruments.)	Not significant
Micro enterprise group	**2. Increase in business transactions and new business enterprises**	1. Increase in trade or transactions (either in traditional market or in new online channels) of existing microentrepreneurs	Medium (Trading accounted for about 25% of the economic activities in the area.)	High (Increased income by an annual average of USD4,998.)	Significant
		2. Increase in employment generation	Low (True for only around 17% of the population.)	High (Income increased by about 5x.)	Significant
		3. Increase in the number of new digital technology-related enterprises, including market expansions of CCCI outside of the village	No data (No number of organic network expansion and users.)	No data (Potentially high)	No data

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact) *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #2: Improvement in the economic conditions of the community stakeholders					
Farmers and/or agricultural sector	**3. Greater sustainability of the agricultural sector**	1. Improved capability to use new adaptive farming techniques to climate change, integrating traditional practices with new technologies	Low (Estimated 15% of the population)	High (Climatic conditions such as El Niño and La Niña were incorporated with their traditional farming calendars.)	Significant
		2. Higher yield of the sector, resulting from the use of climate-adaptive techniques (e.g., hydroponics)	Low (Estimated 15% of the population)	Low (The village has already been known as independent, self-sufficient, and of high level of food security.)	Not significant
		3. Greater inter-generational sustainability with the involvement of the young (next generation) farmers	High (Involvement of the next generation.)	High (The village was assured of continuity in the agricultural sector.)	Significant

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact) *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #3: More effective preservation of cultural integrity, identity, and heritage					
Indigenous Community	**1. Improved capacity for local knowledge preservation and creation**	More effective documentation of cultural activities, archive records, and share them with the younger generation	High (Multi generations of village members)	Medium (Started even before the internet connectivity came.)	Significant
	2. Greater awareness of the society at large of the indigenous community's existence and traditions	Better achievement of societal awareness of the indigenous village by sharing information with other indigenous communities and academic communities, among others	High (Out of Ciptagelar, even globally)	Medium (Institutionalized in having a Sundanese course in a university)	Significant
	3. Wider reach of advocacy of indigenous rights and policy reforms	More effective way of establishing land rights (e.g. land mapping) for policy reform.	High (Successful recognition of indigenous rights by the Sukabumi regency)	Medium (Mapping of lands contributed to land rights being granted)	Significant

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact) *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #4: Increased levels and capacities for inclusive human development and community empowerment					
Individual human development	**1. Higher level of self-development and wellbeing**	1. Greater knowledge to achieve good health and well-being (e.g., health news and advisory, entertainment)	High (Benefited even those outside of network)	High (Savings from not needing health services during the pandemic.)	Significant
		2. Better capability to develop technical skills and special interests (e.g., recipes, home design, farming technologies)	High (All network users)	Low (Presence of alternative sources)	Significant
		3. Greater achievement in formal education	Low (Estimated at 25% of the population)	High (High amount of savings from the internet)	Significant
Individual and/or household-level productivity	**2. Higher productivity in the performance of daily tasks**	1. Faster and cheaper communication and coordination with the use of the new digital technology.	Low (Estimated at 25% of the population)	High (High amount of savings from the internet instead of using old technology)	Significant
		2. Greater cost-efficiency, e.g., cut down on travel time and transportation expenses	High (All users)	High (High amount of savings from the internet)	Significant
		3. More applications of modern technology to simplify complex tasks, e.g., programming	Low (Use of internet largely on communication)	Low (Use of internet largely on communication)	Not significant

Table 3.1. Elements of an evolving Development Index (with details on extent and depth of impact) *[cont.]*					
Stakeholders	**Key Result Area (KRA) sub-elements**	**Description of Performance Indicators / Performance Indicators**	**Approximate Rating for Common Room**		
			Extent of Reach	**Depth of Impact**	**Significance**
KRA #4: Increased levels and capacities for inclusive human development and community empowerment					
Indigenous community	**3. Greater social cohesion and political participation**	1. More enhanced social relations within the households or among community members	High (All users)	Low (Villagers had strong social fabric prior to internet)	Significant
		2. Heightened political awareness and/or engagement	High (More information circulated on the political candidates during the election)	Medium (Considered high impact among the youth but not so much among the older adults)	Significant
		3. Better capacity to promote social order and to fight unacceptable behavior (e.g., disinformation, scams, gambling)	High (CCCI's social preparation help minimize the negative consequences of the internet)	Low (The village had its own traditional of keeping social order prior to the internet)	Significant
		4. Local subsidies for around eight local primary and junior high schools for internet access were extended.	Low (Access to gadgets and skills of teachers were limited)	Low (Access to gadgets and skills of teachers were limited)	Not Significant
		5. Five years after the establishment of the community network, the share of women using the internet had increased from 30 to 50 percent in 2024 .	High (The change in absolute term meant there were 200% more women had access to internet in 2024.)	Low (Both genders were treated equally in rights, including internet access)	Significant
		6. Increase in agency or sense of having control over one's life, capacity to influence one's thoughts and behavior and having faith in one's ability to handle a wide range of tasks and situations.	Low (The villagers had been engaged in technology development even before the CCCI.)	Low (The villagers had been engaged in technology development even before the CCCI.)	Not Significant
		7. Community empowerment or enabling people/stakeholders to have control over resources, decisions and the capability to use such effectively and sustainably to effect change towards sustainable and equitable development in their community, sector and society at large.	High (Social preparation for all villagers.)	High (Social preparation helped the villagers optimize the benefits of internet / minimize social costs.)	Significant

About the Cooperating Organizations

The Association for Progressive Communications (APC) is an international network of Civil Society Organizations (CSOs), operating since 1990. Its work focuses on supporting Information and Communication Technology (ICTs) for social justice. In 2017, APC has embarked in exploring and supporting Community Networks, now called as Community-Centered Connectivity Initiatives (CCCIs), in bridging the digital divide worldwide. APC is present in 20 countries from the Global South.

Visit APC's website here: **www.apc.org**

Rhizomatica is driven by its mission to make alternative telecommunication infrastructures for vulnerable, poor, and isolated communities in Africa and Latin Africa. Using approaches combining regulatory activism and reform, critical engagement with, and development of, technology, design of novel sustainability models, and direct community involvement and participation, Rhizomatica aims to support communities towards building and maintaining self-governed and owned communication and energy infrastructure.

Visit Rhizomatica's website here: **www.rhizomatica.org**

The Institute for Social Entrepreneurship in Asia (ISEA) is a learning and action network set-up by social enterprises, social enterprise resource institutions and scholars in 2008 to undertake research, education, advocacy and building of platforms for social entrepreneurship towards sustainable development. It pursues various platforms for multistakeholder collaboration to advance social entrepreneurship towards accelerating the achievement of the Sustainable Development Goals: Technological Innovations for Sustainable Development; Women's Empowerment, Livelihoods and Food in Agricultural Value Chains; Decent Work for All in Sustainable Value Chains; Rural Revitalization, Youth and Social Entrepreneurship; Health for All and Poverty Reduction through Social Entrepreneurship. It has a membership spanning 15 countries and territories in Asia and is based in the Philippines with a regional office hosted by the Ateneo Center for Social Entrepreneurship.

Visit ISEA's website here: **www.isea-group.net**

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