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FINANCING MECHANISMS FOR LOCALLY OWNED INTERNET INFRASTRUCTURE

Connectivity Capital in collaboration with Association for Progressive Communication (APC), Internet Society (ISOC), and Connect Humanity

SEPTEMBER 2022

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About the study partners

PARTNERS

The Association for Progressive Communications (APC)

APC is an international network of civil society organisations dedicated to creating a just and sustainable world by harnessing the collective power of activists, organisations, excluded groups, communities and social movements, to challenge existing power structures and ensure that the internet is developed and governed as a global public good. Local Networks (LocNet) is an initiative led by APC in partnership with Rhizomatica that aims to directly support the work of community networks and to contribute to an enabling ecosystem for the emergence and growth of community networks and other community-based connectivity activities in developing countries.

The Internet Society (ISOC)

ISOC works for an open, globally-connected, secure, and trustworthy Internet for everyone. ISOC is the world's trusted independent source of leadership for Internet policy, technology standards, and future development. More than simply advancing technology, ISOC works to ensure the Internet continues to grow and evolve as a platform for innovation, economic development, and social progress for people around the world.

Connect Humanity

Connect Humanity is a fund advancing digital equity that supports, catalyzes, and scales holistic solutions providing people with the internet access and means needed to participate fully in a digital society. The fund's approach centers on community connectivity providers and civil society organizations who are demonstrating progress in connecting historically underserved communities, pioneering efforts to make the internet more affordable, providing digital literacy training, and more.

SPONSOR

UK Aid

The UK Government promotes the inclusive, responsible and sustainable digital transformation of partner countries. Its flagship Digital Access Programme (DAP) - led by the Foreign, Commonwealth & Development Office (FCDO) - operates in Brazil, Indonesia, Kenya, Nigeria and South Africa. The DAP includes a partnership project with APC in support of community networks as complementary models of inclusive connectivity.

About the study author

Connectivity Capital

Connectivity Capital is an impact investment firm focused on expanding Internet access in developing countries. Connectivity Capital manages the world's first impact investment fund that identifies, invests in, and partners with market leading Internet Service Providers (ISPs) that expand access to connectivity in underserved communities. The firm provides investment management and advisory services to partners that share their passion that affordable broadband connectivity should reach every community in the world.

ADDITIONAL REPORTS

USAID-Connectivity Capital Barriers to Investing Report

Open-source ISP Business Toolkit (*www.affordablebroadband.org*)

Foreword

Since the pandemic, there's been a growing appreciation of the economic and human costs of a world in which half the population lives without internet access and the tools needed to meaningfully participate in a digital society. This has come with a new energy to close digital divides. But the discussions among policymakers, development experts, philanthropy, and corporations too often focus on how much money is needed and not enough on how money needs to be used differently.

We commissioned this report to help change the conversation. The second half of humanity will not be connected in the same way as the first — by large for-profit incumbent telecommunications companies. While these firms have connected billions of people in the last 25 years, they are meeting their limits. It is simply not in their business models to invest in low-income, often rural, communities that do not offer the profit margins they have come to expect. They have not and will not connect everyone.

The digital divide is not a problem the market alone will solve. We need to do things differently. Globally there is a growing movement of community connectivity providers — including community networks, municipal networks, cooperatives, and social enterprises — connecting underserved communities, often at faster speeds and lower prices than incumbent providers.

These are the networks we need to promote, support, and invest in. *Yet, almost all of them struggle to access capital. This is a nascent movement and the financial tools and capital stacks have not yet matured to meet the needs of these networks and the communities they serve. We now need to cultivate the financial infrastructure that will allow community connectivity providers to grow and scale.*

This report is designed to provide a foundation of understanding about what these providers look like, their various ownership and operating models, and how they can be financed sustainably. It is a practical tool for those who want to build networks and for funders and investors. The report's 10 case studies show where and how community connectivity providers are already getting the job done and demonstrate how underserved communities can build their own internet infrastructure and take control of their digital futures.

We hope this report will help more communities to achieve digital equity, catalyze more funding for community connectivity providers, and accelerate access to the internet and digital tools so that everyone can fully participate in our digitalizing world.

Connect Humanity

Jochai Ben-Avie
Chief Executive
Connect Humanity

Executive Summary

BACKGROUND

The purpose of this report is to increase the understanding of financing mechanisms available to Community Connectivity Providers (CCPs). CCPs, including community networks, municipal networks and social enterprises, are locally-owned and operated networks that fill gaps and provide access where traditional telecommunication networks do not.

Three billion people around the world still remain offline without access to the transformational power of the internet. These communities are falling further behind as the world becomes increasingly digital around them.

The majority of the unconnected communities are located in low income or rural regions of the world.

Despite a growing number of innovative and successful CCPs, there has been minimal research about financing CCPs.

KEY TAKEAWAYS

CCPs HAVE DISTINCT COMPETITIVE ADVANTAGES

The financial feasibility of CCPs are largely determined by the degree to which they can avoid or decrease costs of building & operating a network. CCPs that leverage community assets and resources to lower the cost of deployments have a higher chance of sustainability.

STAGE & STRUCTURE AFFECT CAPITAL AVAILABILITY

CCPs that are self-reliant, growing in scope and scale, or have specialized local registration status have an enhanced ability to deliver connectivity at scale and attract larger amounts of capital from various sources.

ALIGNMENT OF FINANCIAL EXPECTATIONS IS KEY

When choosing between different financing mechanisms, CCPs have to evaluate trade-offs, cost of capital, and return expectations. CCPs that match financing sources with appropriate projects and return profiles are most likely to have access to sustained funding.

RECOMMENDATIONS

Recommendations are targeted toward the three major stakeholders that influence the ecosystem and flow of capital to CCPs:

1. **GOVERNMENT & POLICY MAKERS**

Create an enabling regulatory environment that allows CCPs to operate cost-effectively and encourage investment through fiscal incentives, subsidies, and technical assistance.

2. **CCPs**

Prioritize cost-efficient deployments and diversify revenue streams with a focus on financial sustainability and self-reliance. Identify stage-appropriate sources of capital that fit needs.

3. **FUNDERS & INVESTORS**

Unlock grant & sub-commercial capital to CCPs that are financially sustainable and generate significant social impact connecting unserved communities.

Overview

Context

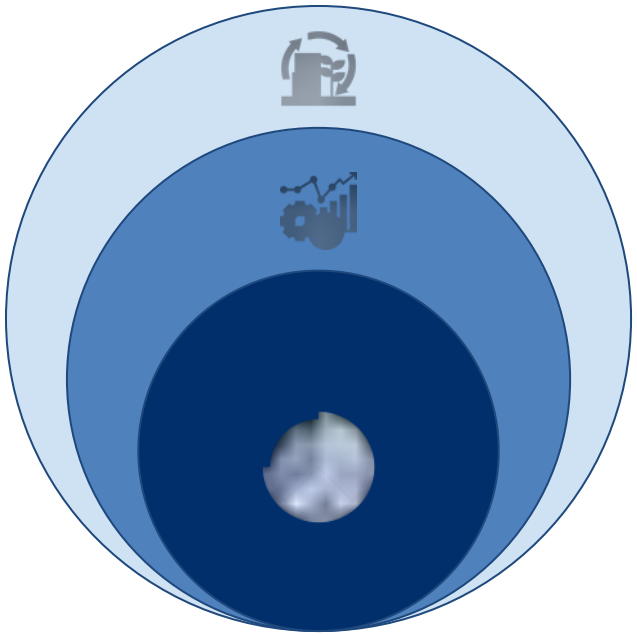
- There has been minimal research about innovation in financing of locally-owned community connectivity providers.
- Despite a growing number of success stories of Community Connectivity Providers (CCPs), most of which have required innovative financing, there has been limited written about these approaches.

Purpose

- Document and analyse the ecosystem of investment and sustainability strategies that Community Connectivity Providers (CCPs) including community networks and municipal networks have employed in recent years.
- Identify how existing financing mechanisms can be adapted to finance CCPs.
- Identify financing and sustainability strategies from other sectors that may have application for CCPs.
- Reduce friction between community connectivity providers and funders, thereby catalyzing more funding towards community-owned internet infrastructure.

Scope of the report

Problem Scope



Community Connectivity Providers

Organizational Sustainability

Operational Sustainability

Financial Sustainability

Important Definitions

- **Community Connectivity Providers (CCP)**: The spectrum of connectivity providers that are locally-owned and prioritize digital equity and the needs of underserved communities. These include community networks, cooperatives, municipal networks, small operators, and social enterprises.
- **Financing Mechanism**: The way in which an organization receives the funding necessary to remain operational. This report classifies main financing mechanisms as grants & subsidies, equity and debt.
- **Emerging Markets**: Those countries designated by the IMF, UN, and World Bank as 'Developing' and 'Least Developed'. These are usually characterized by low-mid per capita income, high market volatility, transitional nature and high growth-potential.

In-scope activities

- Identify the challenges and funding constraints of community connectivity providers in emerging markets
- Explore the relationship between an operator's ownership structure, operating model, stage of growth, and available financing mechanisms.
- Showcase different financing mechanisms and owner-operator models of community connectivity providers.
- Identify ways to reduce friction and increase alignment between expectations of capital providers & operators of CCPs.

Out-of-scope activities

- While we acknowledge their importance, we do not focus on other aspects of an organization's sustainability that may include governance mechanisms, technology adoption, human resource planning, environmental risk management etc.

How to read this report

FOUNDATION

Section 1: Background
Section 2: Role & Development of CCPs

- The context of the digital divide from the lens of community operators - reframing the problem and examining the underlying factors and challenges prevalent in emerging markets.
- An update on the current state of connectivity globally with an overview of the funding gap and key interventions required to close the digital divide with a focus on the challenges and the role of community connectivity providers (CCPs).
- A description of the stages in the life cycle of operators - breaking down down the economics of operating a network (costs, revenue, retained earnings & funding). A simple way to calculate a Return on Investment (ROI) equation to influence different levers of growth. A definition of the different milestones and metrics to consider on the path to financial sustainability.
- Ready-to use tools, resources, and workbooks available for operators to understand their economic viability.

DEEP-DIVE

Section 3: Owner-Operator Models
Section 4: Financing Mechanisms

- A comparison of the trade-off that operators consider when deciding on their ownership structure, legal entity, and operating models. An analysis of different operating models along with the degrees of participation in the network architecture.
- Examples of a variety of CCPs and the rationale behind the choice of their unique owner-operator model.
- An introduction to the process of developing a financing plan, the main financing instruments, and the sources of capital and return expectations.
- Opportunities for funders to participate in the blended capital stack and identify the evolving financing needs and capital structures of a CCP over its life cycle. Novel ways to consider linking financing mechanisms to financial sustainability milestones.

ACTION

Section 5: Recommendations

- An overview of the key stakeholders and the case for increased funding allocation to CCPs
- Recommendations for governments and policy makers to create an enabling regulatory ecosystem that incentives funding to CCPs.
- Recommendations for operators to enhance financial sustainability and investment readiness at various stages of growth.
- Recommendations for investors to understand the risk profiles of community connectivity providers and develop financing strategies.

Target audience for the report

This report has been designed for **community connectivity providers** and **funders or investors** to **identify financing mechanisms and sustainability strategies** that are applicable to to expand access to connectivity through CCPs**.**

The two main emphasis for this report are:

1. ***Community Connectivity Providers (CCPs)***: To improve operations and be investment ready at various stages of growth

2. ***Funders and investors***: To understand the different risk profile and tradeoffs associated with a variety of different operating models

Key Audiences

Case studies

11 case studies across 10 countries…

This report covers the following broad topics:

- Operator life-cycle and stages of growth
- Economics of operating a network
- Ownership structures
- Operating models
- Financing mechanisms

Summary of case studies (1/2)

Organization	Country	Year Founded	Legal Registration	Technology	Key Takeaway
Broadband for the Rural North Ltd (B4RN)	United Kingdom	2011	Non-Profit Community Benefit Society	Gigabit Fiber Optic Network	Government sponsored voucher schemes provided the incentive for B4RN to accelerate growth and reach scale to access a crowdfunded bond promoted by a bank
Zenzeleni Networks	South Africa	2012	Non-Profit Company	Wireless Mesh & Fixed Wireless	South Africa's first cooperative-owned ISP, Zenzeleni is pursuing financial sustainability aided by grant funding and anchor client revenue
City of Ammon Fiber Optics	USA	2011	Municipal Utility	Software-defined networking over Gigabit Fiber	The Ammon model proves out the benefits of broadband infrastructure as a utility, where residents own the fiber and providers compete to serve
Guifi.net	Spain	2004	Private Not-for-Profit Foundation	Wireless & Fiber	Guifi paves the path for a disruptive open and neutral model based on an "infrastructure-as-a-commons" network deployment
Rhizomatica	Mexico	2009	Not-for-profit organization	Licensed IMT (mobile) spectrum	Demonstrates how flexible regulation can enable local sustainable economic development in underserved localities through community-owned infrastructure

Summary of case studies (2/2)

Organization	Country	Year Founded	Legal Registration	Technology	Key Takeaway
RS Fiber	USA	2012	Cooperative	Wireless & Fiber	A subordinated development loan backed by a general obligation tax abatement bond seeded the construction of RS Fiber's cooperative-owned broadband network
AlterMundi	Argentina	2011	Non-profit association / Civil association	Mesh WiFi	Systematically lowered the cost of deployments by developing their own low-cost hardware and gaining free access to unused upstream bandwidth
BOSCO	Uganda	2007	Not-for-Profit Organization	Unlicensed WiFi	Leveraged local and international partnerships to provide connectivity to isolated communities in Northern Uganda
Common Room	Indonesia	2006	Non-Profit Organization	WiFi	In partnership with the local ISP and residents, Common Room has brought affordable internet access to the indigenous communities in West Java
La Différence	DR Congo	2017	Cooperative and Charity	Unlicensed Fixed Wireless	Pamoja Net, operated by La Différence cross-subsidizes its free off-peak public WiFi access by leasing fixed lines to local businesses and NGOs in Idjwi Island, DRC
Net2Home	Thailand	2013	Social Enterprise	Mesh WiFi	Combines external support and an entrepreneurial franchise model to provide affordable wireless internet access in a low-density rural agricultural area in Thailand

Glossary & Additional Definitions

Telecommunication

Internet Service Provider (ISP): An organization that provides services for accessing, using, or participating in the Internet. In this report, ISPs refer mostly to access networks.

Mobile Network Operator (MNO): a cellular communications service provider that provides wireless voice and data. MNOs usually operate over licensed spectrum and provide capped mobile data over 2G, 3G, or LTE technologies

Community Connectivity Providers (CCP): The spectrum of connectivity providers that are locally-owned and prioritize digital equity and the needs of underserved communities. These include community networks, municipal networks, social enterprises, small local operators, and cooperatives.

Community Network (CN): Collectively owned and managed communications networks that are usually not for profit and community goals oriented.

Municipal Network (Muni network): Broadband Internet access owned by public entities with services provided either fully or partially by local governments to residents within certain areas or jurisdictions.

Financial

Average Revenue Per User (ARPU): The average revenue generated per active user or subscriber, usually measured monthly. Useful to understand the company's revenue generation capability and growth at the per-unit level.

Cost of Goods Sold (COGS or Cost of Sales): The direct costs involved in provision of connectivity services, usually includes the cost of backhaul/IP transit, tower rent / lease, cross connect fees etc.

Gross Profit (GP or Gross Margin): A company's net sales minus its cost of sales. An initial measure of financial health that reflects a company's efficiency in using raw material.

Earnings before Interest, Depreciation and Taxes (EBITDA): A measure of profitability that eliminates the effect of financing and capital expenditures. Useful to understand a company's cash flow & debt-service level.

Earnings before Interest and Taxes (EBIT or Operating Profit): Analyzes core operational profitability without the costs of capital structure and tax expenses.

Profit After Tax (PAT or Net Profit): Often referred to as the "bottom-line", PAT is an all-inclusive measure of overall financial performance over a defined period of time.

Geographic

Low and Middle Income Countries (LMIC): A World Bank classification that includes 137 countries with a Gross National Income (GNI) per capita of $12,695 or less.

Emerging Markets: Those countries designated by the IMF, UN, and World Bank as 'Developing' and 'Least Developed'. These are usually characterized by low-mid per capita income, high market volatility, transitional nature and high growth-potential.

Least Developed Countries (LDCs): As defined by the United Nations Committee for Development (UNCDP), LDCs are a group of 46 low-income countries confronting severe structural impediments to sustainable development. They are highly vulnerable to economic and environmental shocks and have low levels of human assets.

Landlocked Developing Countries (LLDCs): A group of 32 countries that face serious challenges to socio-economic development because of lack of territorial access to the sea, isolation from world markets and high transit costs.

Small Island Developing States (SIDS): A distinct group of 58 island countries that face unique social, economic, and environmental challenges, mainly as a result of their remote geography.

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Section 1: Background

Section 1	**Background**
Section 2	Role & Development of CCPs
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Section 5	Recommendations

Section 1: Background

What to expect in this section?

'Section 1: Background' explores the context of the digital divide through the lens of smaller local operators across global markets. This is critical to reframing the problem and examining the underlying factors prevalent across various unserved and underserved regions.

This introduction also serves as the foundation for the rest of this report and begins with a brief update on the global state of connectivity. We revisit the different types of connectivity gaps and emphasize the importance of providing universal and meaningful connectivity.

The section concludes with an overview of the funding gap and key interventions required to close the digital divide. The focus is primarily on the challenges of connectivity in low-income and rural regions around the world.

Key Takeaways

- The internet continues to be unavailable, unreliable, and / or unaffordable for many. Covid-19 has only underscored the global digital divide. 37% of the global population, ~2.9 billion people, are still non-users of the internet and are predominantly located in rural and low-income regions of the world.
- Inclusive internet access can only be unlocked through funding and policy interventions. While a significant amount of investment is required to close the digital divide and ensure universal connectivity, policy and regulatory reforms play a large role in enabling access to affordable connectivity.
- Many emerging markets lack the fixed infrastructure ecosystem needed to deliver robust and affordable uncapped connectivity. A confluence of positive developments (cheaper landed bandwidth, affordable network equipment, and increased device ownership) over the last decade make this the right time to invest in community connectivity providers.

Section 1: Background

1.1 The state of global connectivity

1.2 Connectivity in emerging markets

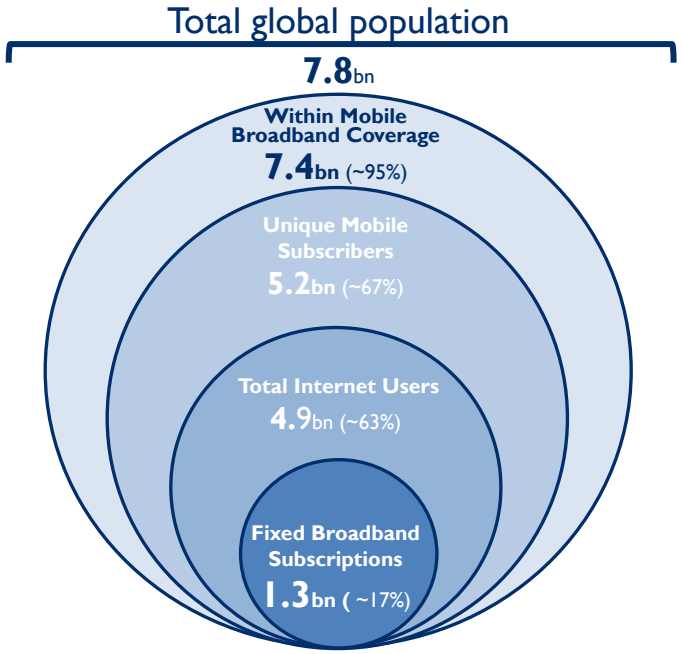
State of Connectivity: The world is divided - separated by communities who can and can't reap the benefits of internet access. Covid-19 has only underscored this divergence.

- Internet traffic volume has **grown ~50-60% since pre-pandemic levels**, driven primarily by working from home (video conferencing and collaboration, VPNs), learning from home (video conferencing and collaboration, e-learning platforms) and entertainment (online gaming, video streaming, social media).
- At the same time, the COVID-19 pandemic illuminated a long-standing issue: **The many low-income communities around the world that lack reliable and / or affordable access to connectivity are being left further behind.**

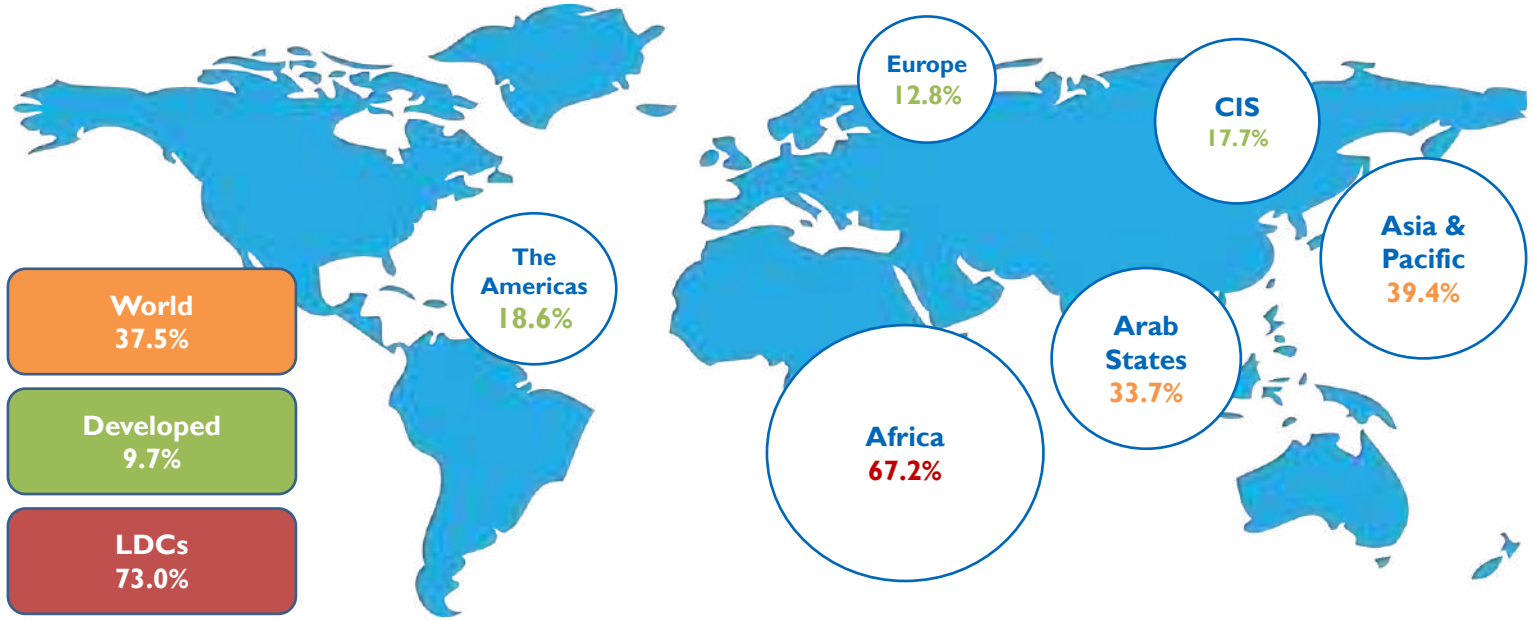
Source: Google, Nokia, Lightwave

State of Connectivity: 37% of the global population is offline, predominantly in emerging markets

Global Participation in the Digital Economy



Offline Population by Region

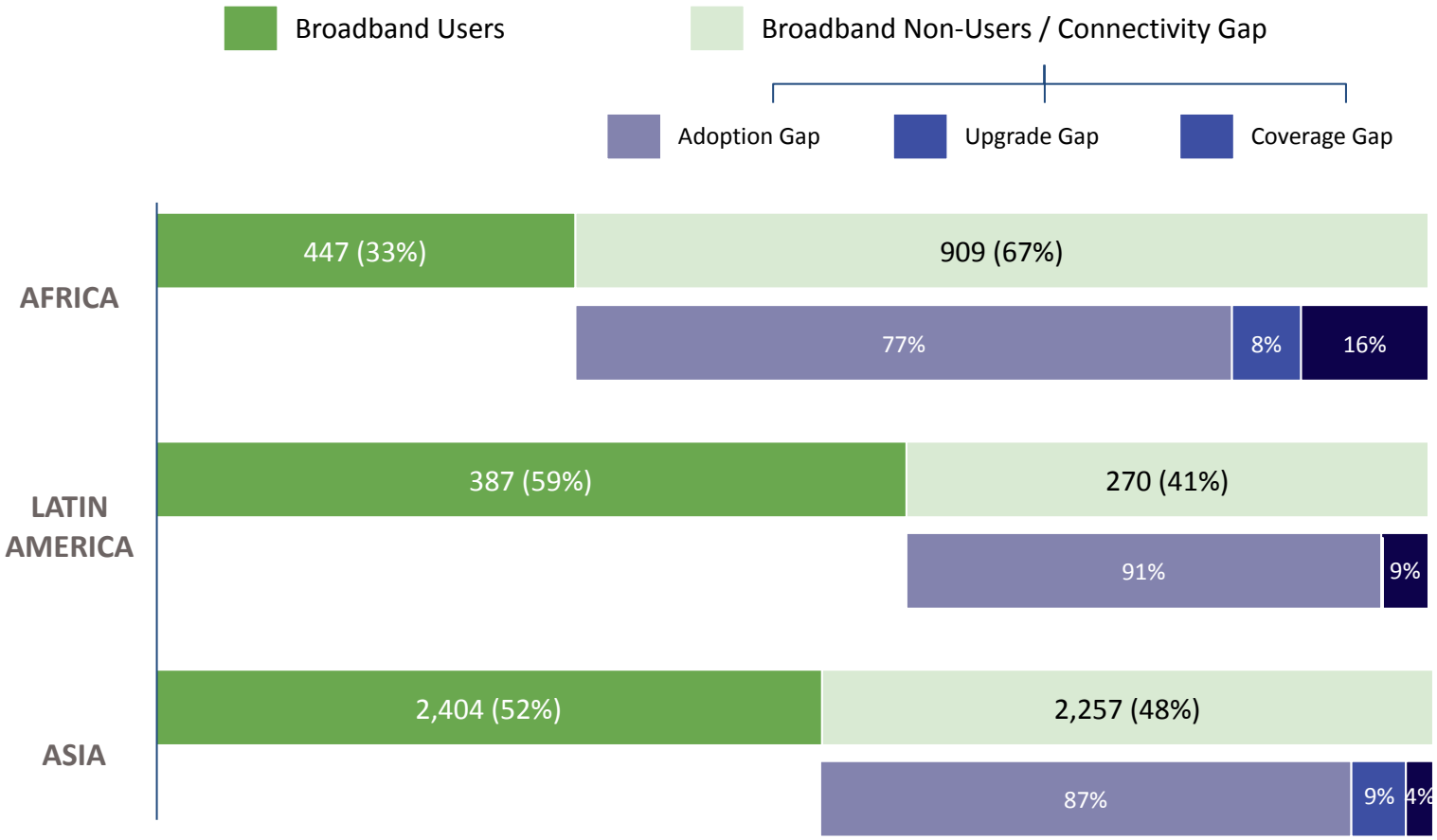


- The global online population has accelerated during the pandemic, increasing by nearly **20%** since 2019 to **4.8 billion** users.
- **96%** of the **2.9 billion** offline population live in developing countries and face multiple barriers to access.

Source: ITU Measuring Digital Development Facts & Figures, 2021; GSMA Mobile Economy 2021

State of Connectivity: Coverage has been steadily increasing but connectivity gaps still remain for various reasons

Broadband users and connectivity gaps across regions (in millions of users and % of population)



Adoption Gap

The part of the population that is covered but not connected - either because of a lack of **affordability**, **local content**, **digital skills**, or a variety of **complex cultural barriers**.

Upgrade Gap

The part of the population that is covered by mobile or fixed network services that do not qualify as broadband e,g, 2G mobile networks or dial-in PSTN/ ISDN fixed networks.

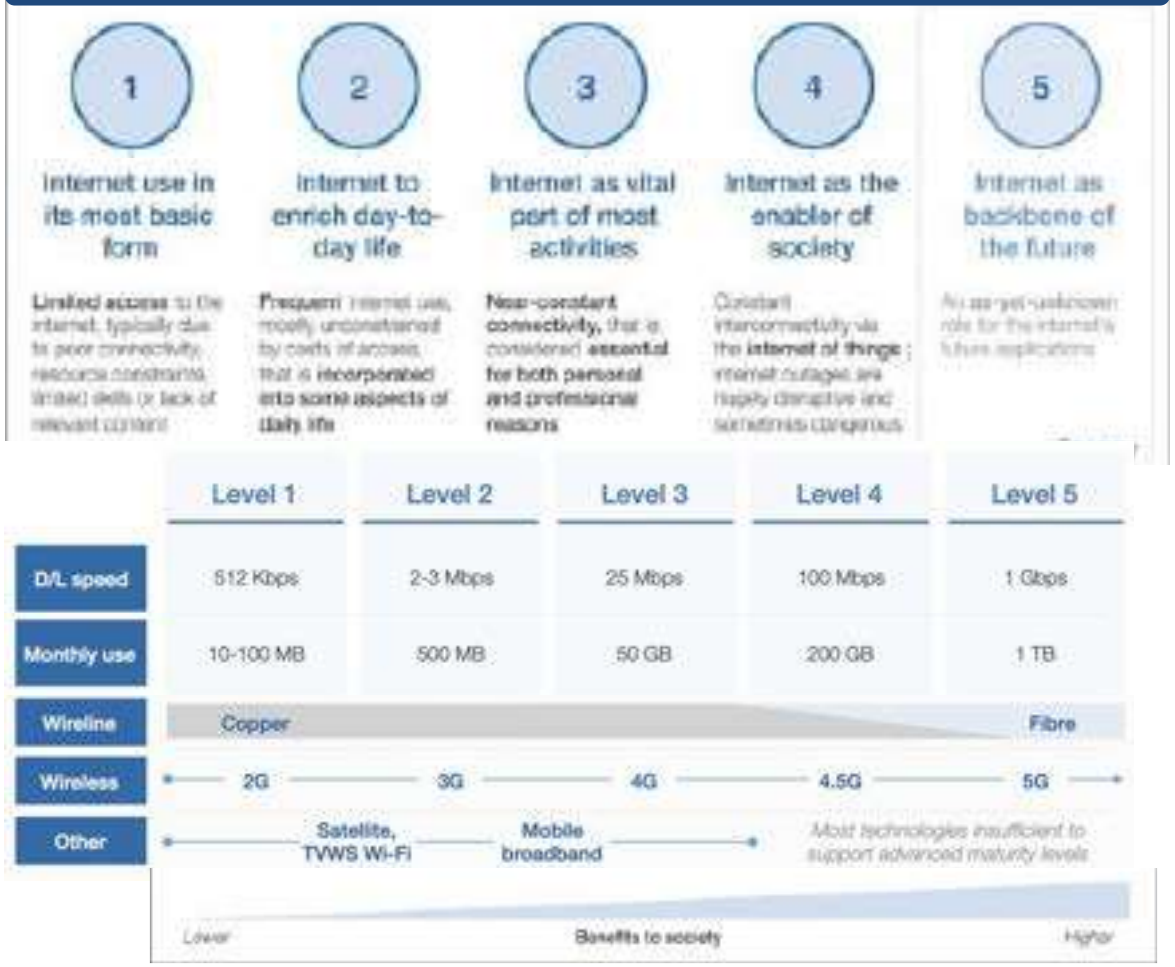
Coverage Gap

The part of the population that is not covered by any connectivity infrastructure, mobile or fixed - typically because they are in rural or remote areas with low population density.

Source: Adapted from 21st Century Financing Models for Bridging Broadband Connectivity Gaps

State of Connectivity: Inclusive growth stems from internet provision through networks with sufficient capacity, quality and speed to support more advanced usage

World Economic Forum Taxonomy of Internet Maturity

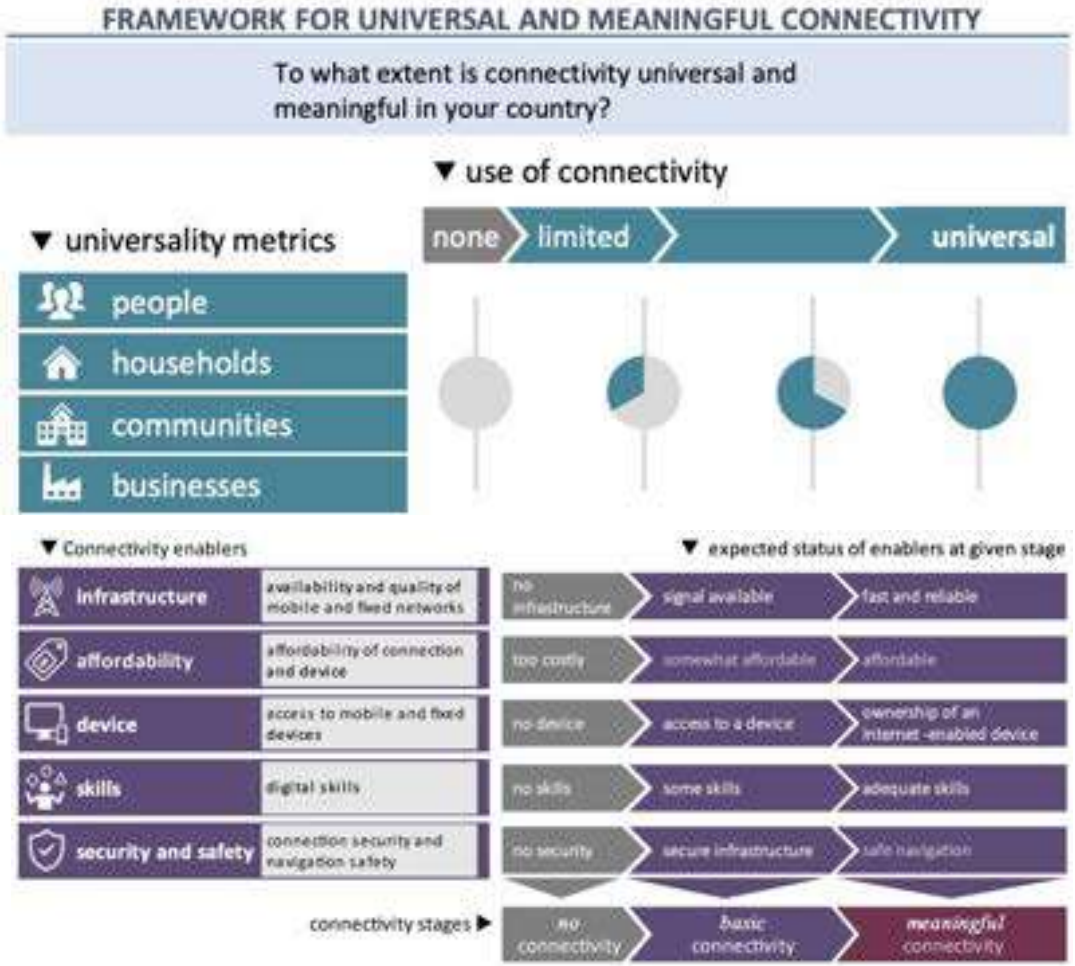


Source [World Economic Forum - Financing a Forward Looking Internet for All (2018) ;]

- An individual's use of the internet can encompass many characteristics depending on the user's skills, preferences, spending power and proximity to high-speed access.
- Current usage can be categorized into five distinct maturity levels, each characterized by what people do online and the skills their activities require, as well as by the minimum quality of service that allows them to carry out the activities.
- Importantly, the boundaries, definitions and number of maturity levels are likely to shift as additional uses of the internet emerge over time.
- While much of the developing world is still at 'Level 1' or 'Level 2' internet usage, the minimum standards of meaningful internet access are now increasingly being defined in terms of 'Level 3' usage - near-constant connectivity that is provided at 4G-like speeds (minimum of 25 mbps)

State of Connectivity: Moving beyond basic access to *universal and meaningful connectivity* is important to unleash the internet's true potential

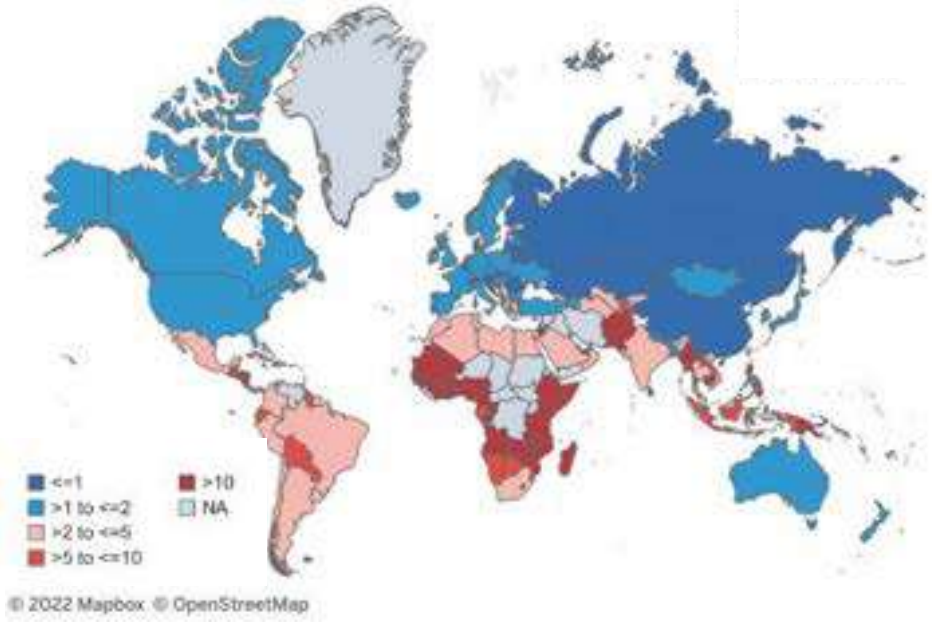
- The ITU has developed a new framework for assessing internet access which goes beyond a single metric such as 'share of the population connected'. The framework is deliberately agnostic about the interventions needed to achieve universal and meaningful connectivity, and the applications of connectivity.
- *While* ***'universal connectivity'*** means connectivity for all, ***'meaningful connectivity'*** is a level of connectivity that allows users to have a safe, satisfying, enriching, productive online experience at an affordable cost.
- The two dimensions are complementary: neither universal connectivity with poor quality nor meaningful connectivity for the few will yield significant, society-wide benefits. At the same time, the two dimensions obviously reinforce each other: more use can lead to more meaningful connectivity, and vice versa.
- Universal and meaningful connectivity is key for enabling digital transformation.

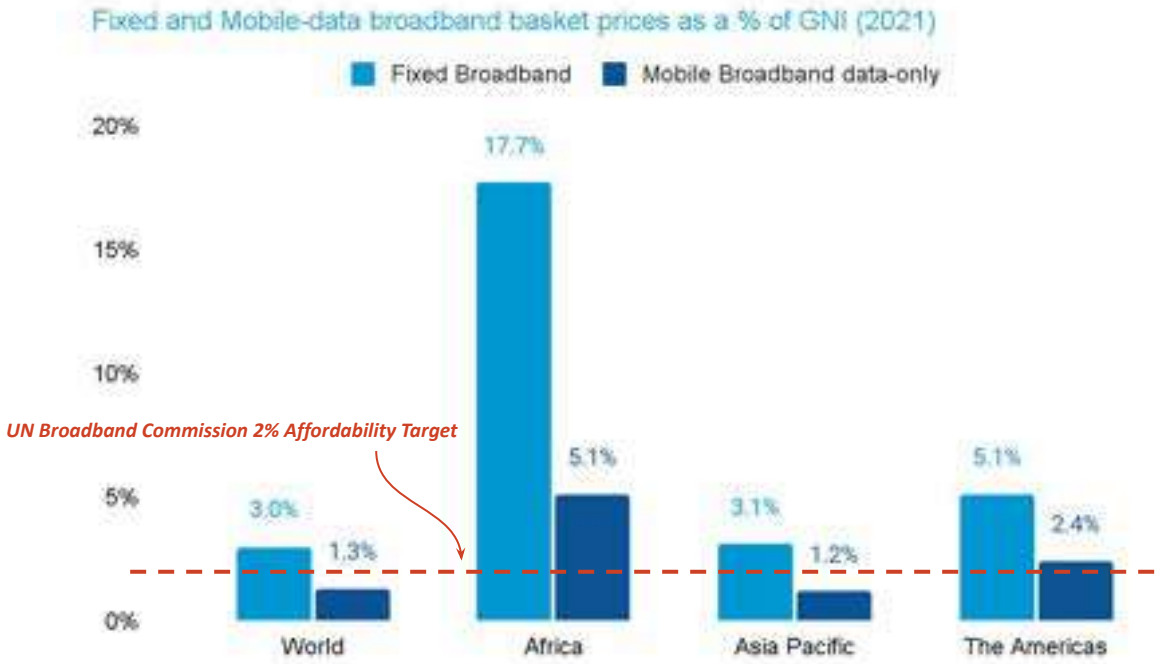


Source: ITU, Achieving universal and meaningful digital connectivity (2022)

State of Connectivity: Affordability continues to be one of the most significant barriers to sustained usage

Cost of a Fixed broadband basket (min 5GB) as a % of GNI (2021)





- In least developed countries (LDCs), while the median price for entry-level broadband has been declining, it remains beyond the means of the average consumer in all but 4 of the 43 LDCs for which data could be obtained.
- For fixed broadband, among the 33 LDCs for which data is available, only one has met the two per cent target.

Source: ITU Measuring Digital Development Facts & Figures, 2021, ITU ICT Price Baskets

State of Connectivity: A significant amount of investment is required to close the funding gap and ensure universal connectivity

Infrastructure Funding Gap - Key Statistics

$100 Billion

UN Broadband Commission estimate of additional investment requirement to connect 1.1 billion offline users in Africa

$428 Billion

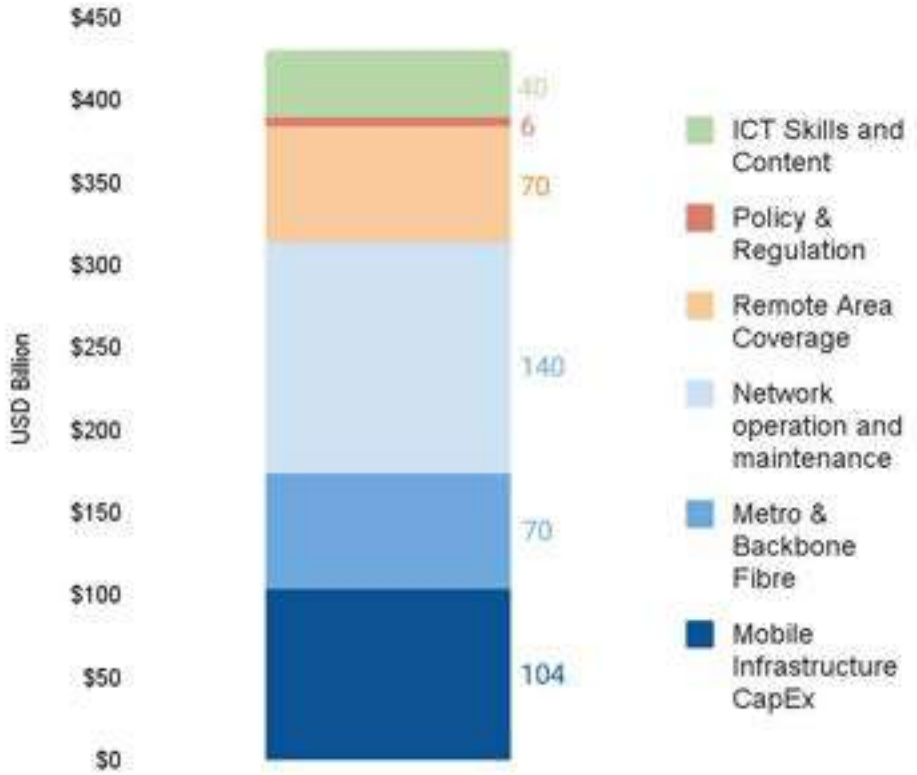
ITU, GSMA, A4AI estimate of additional investment requirement to connect 3 billion offline users globally

$1 Trillion

World Economic Forum estimate of global ICT infrastructure gap by 2040

Investment Gap for Universal Broadband Coverage

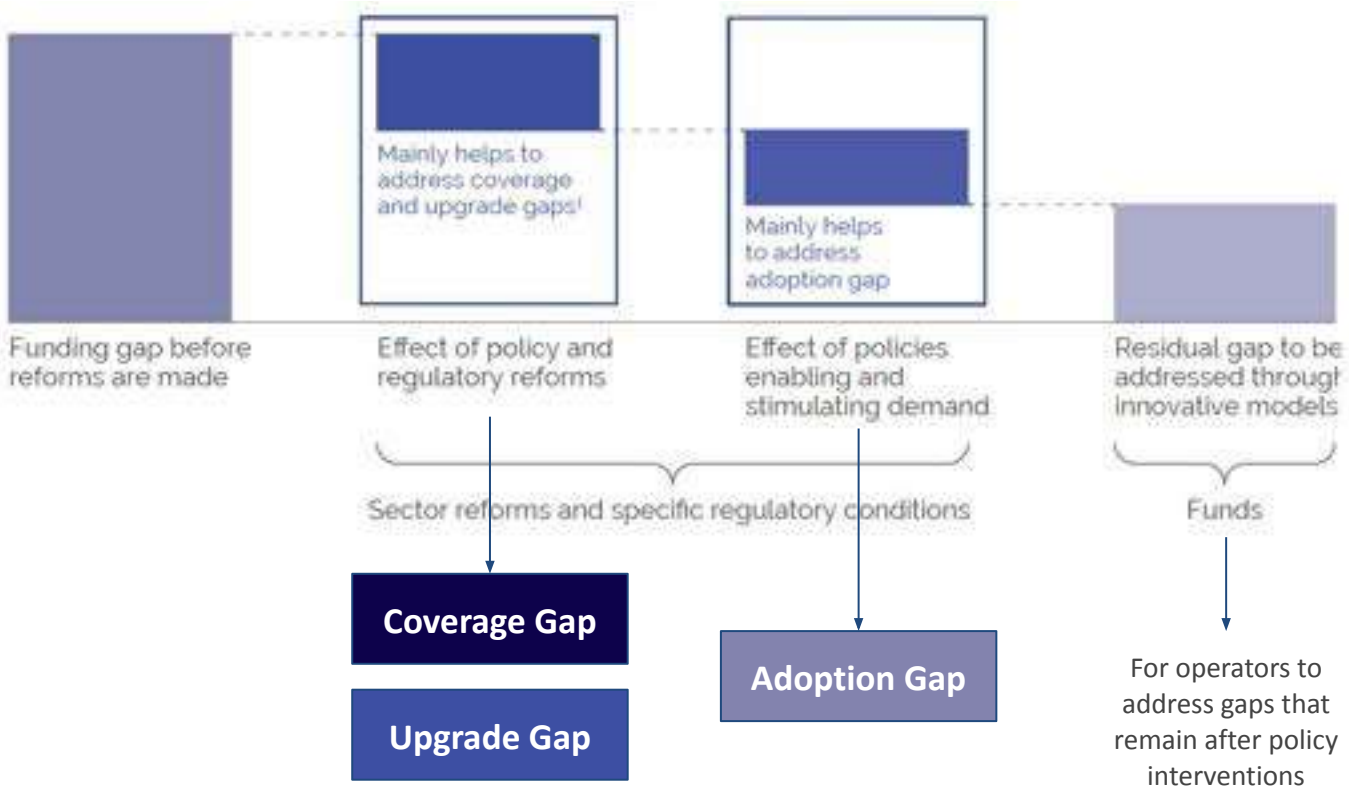
~USD 428 Billion is needed to achieve universal broadband connectivity across the world



Source: ITU Connecting Humanity (2020); Broadband Commission - Connecting Africa through Broadband (2019) World Economic Forum - Financing a Forward Looking Internet for All (2018)

State of Connectivity: Policy and regulatory reform can unlock tremendous value in the push towards universal connectivity

Illustrative impact of policies & regulations



- There is a 'trap of value' - locked out by current regulatory and policy guidelines that are stifling competition, demand and network deployment.
- The reform of policies and regulations is highly cost-effective as they can make a significant impact on the connectivity gap without requiring an equally significant budget effort.
- These efforts include facilitating an enabling environment for access to wireless spectrum, passive infrastructure sharing, open-access backbone networks, demand stimulating measures, etc.

Source: 21st Century Financing Models for Bridging Broadband Connectivity Gaps, World Economic Forum - Financing a Forward Looking Internet for All (2018)

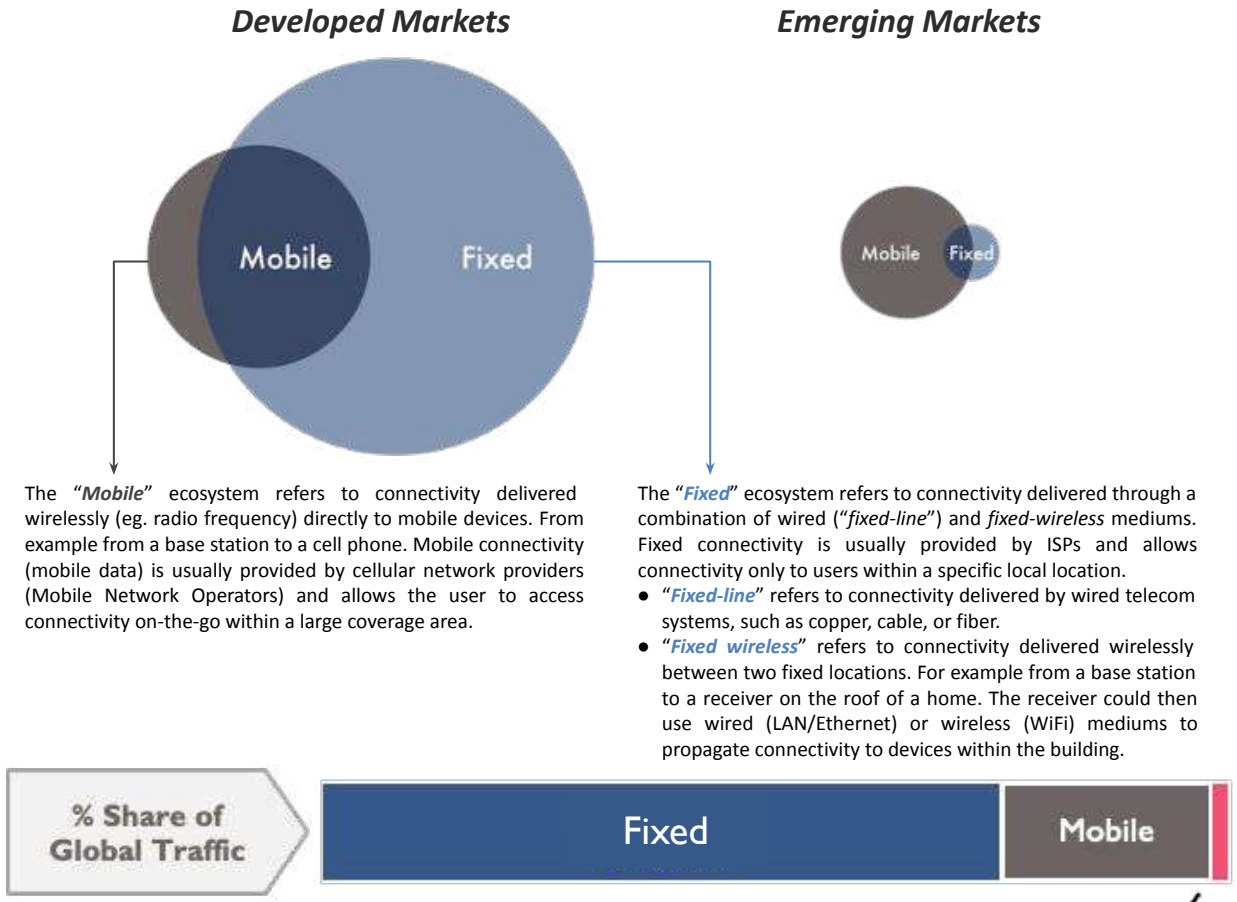
Section 1: Background

1.1 The state of global connectivity

1.2 **Connectivity in emerging markets**

Connectivity in emerging markets: In developed markets, a dual ecosystem approach is the norm but emerging markets lag behind due to historic geopolitical and infrastructure issues

IP Traffic Forecast (Illustrative)



The "***Mobile***" ecosystem refers to connectivity delivered wirelessly (eg. radio frequency) directly to mobile devices. From example from a base station to a cell phone. Mobile connectivity (mobile data) is usually provided by cellular network providers (Mobile Network Operators) and allows the user to access connectivity on-the-go within a large coverage area.

The "***Fixed***" ecosystem refers to connectivity delivered through a combination of wired ("*fixed-line*") and *fixed-wireless* mediums. Fixed connectivity is usually provided by ISPs and allows connectivity only to users within a specific local location.

- "***Fixed-line***" refers to connectivity delivered by wired telecom systems, such as copper, cable, or fiber.
- "***Fixed wireless***" refers to connectivity delivered wirelessly between two fixed locations. For example from a base station to a receiver on the roof of a home. The receiver could then use wired (LAN/Ethernet) or wireless (WiFi) mediums to propagate connectivity to devices within the building.

Source: Connectivity Capital Analysis, Cisco VNI Global IP Traffic Forecast, 2017-2022

- In emerging markets, mobile broadband is the predominant ecosystem due to a historic lack of major fixed-line telecom infrastructure (copper, cable, fiber).
- Dual ecosystem (fixed and mobile) use is the norm in developed countries, where users demand both affordability and convenience.
- Mobile internet has allowed emerging markets to leapfrog the infrastructure gap but fixed services must evolve to handle capacity needs over time.
- Fixed networks carry a majority of the global internet traffic and provide uncapped, affordable, reliable and high-speed connectivity, which unlocks the transformational potential of the internet.

Connectivity in emerging markets: Understanding the barriers to access within the context of the developed and emerging markets is important to initiate appropriate interventions

	Urban (Underserved)	Rural (Unserved)
Developed Markets	Largely addressed except for historically disadvantaged communities. The gating issue is market inefficiencies resulting in a lack of coverage, choice and affordability. *Availability* *Affordability* *Adoption*	Sparsely distributed populations over large areas. Some one-time subsidies may be required to build out infrastructure to these areas but generally, the population has the ability to pay for service. *Availability* *Affordability* *Adoption*
Emerging Markets	Mobile data is prevalent but is usage is capped and expensive. Affordability is the key issue stifled by a lack of fixed infrastructure and nascent market dynamics. *Availability* *Affordability* *Adoption*	Ongoing subsidies may be required to address the availability, affordability, and adoption barriers in these areas that are usually characterized by low per-capita income. *Availability* *Affordability* *Adoption*

Connectivity in emerging markets: The market is primed for a new fourth wave of internet infrastructure delivered by non-incumbent community connectivity providers

Major waves of investment in connectivity infrastructure

1 Mobile Networks
(1990s – present)

- Remains the largest with continuous investment by operators every year
- 4G and 5G expansion will drive further required investment

2 Submarine cables
(2009 - present)

- Investment continues and is quite similar in scale to mobile network investment *(2Africa, Equiano)*

3 Data Centers & National Backbone
(2013 - present)

- Pan-continental transactions and investment commitments of $2B in 2021
  (Equinix-MainOne, WIOCC-Open Access Data centers, Digital Realty, Liquid-Africa Data centers etc.)

4 Uncapped Fixed Broadband
Delivered by community connectivity providers

- **Uncapped connectivity is a prerequisite to a full potential, digital economy**
- Landed fiber capacity needs to be distributed to homes, SMEs, and businesses via fiber and high-capacity fixed wireless links

Source: Connectivity Capital Analysis

Connectivity in emerging markets: A confluence of positive developments over the last decade make this the right time to invest in community connectivity providers

Trends accelerating growth of connectivity across emerging markets are driven by secular supply and demand factors

Supply factors

Landed international bandwidth

- Several submarine cables arrived on the African continent from 2009 to 2012. New cables are expected to increase capacity further

Image: NBER, Jay Fitzgerald

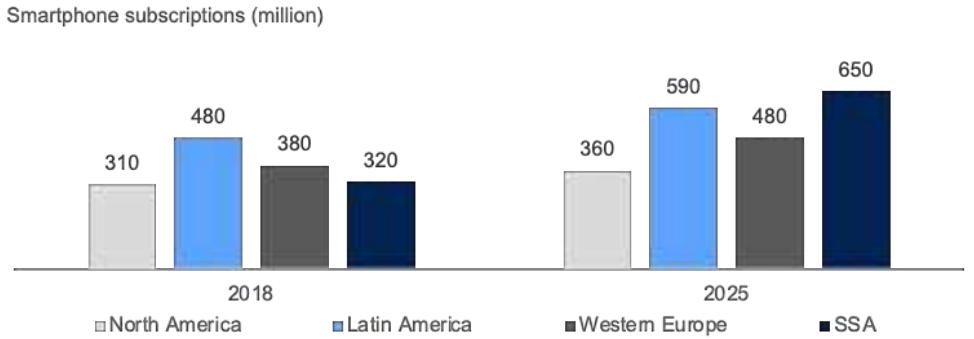
Falling capex

- The price of fiber and high-capacity wireless equipment (radios, antennas, etc.) has fallen significantly. The total CapEx for network build out is decreasing. However, this is fairly offset by persistent high labor costs to implement new infrastructure

Demand factors

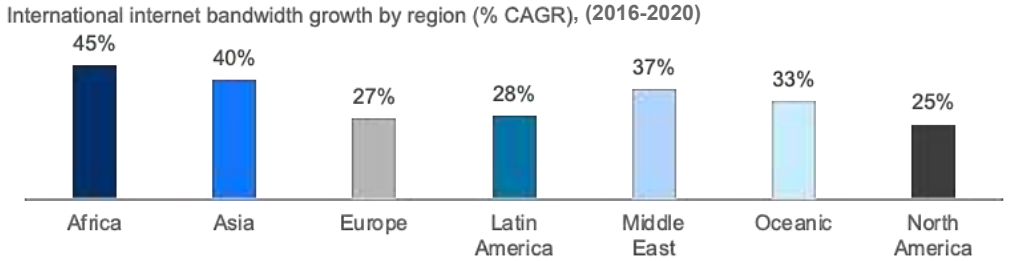
Device penetration

- The cost of smartphone devices has fallen significantly, dramatically increasing ownership and demand for more data



Explosion of applications and content

- New apps, including VoIP (voice over internet protocol), mobile money, and social media, provide considerable value to customers; driving demand for connectivity



Source: Hjort, et. al. (2019), TeleGeography (2021), Ericsson Mobility Report

“ Value continues to accrue to those with affordable access to communication infrastructure while **the unconnected fall further and further behind** by simply staying in the same place.

Those who most desperately need support are cut off from access to opportunity, to social and healthcare safety nets, to education, to information that can improve lives, and to platforms to demand change.

It is ironic, or perhaps tragic, that **the voices of the unconnected are not heard on this issue for the very reason that they are unconnected**. And the problem extends beyond the unconnected. There are also the underserved.

Lack of choice in access alternatives often results in a cost of access that is unaffordable for a significant percentage of the population (especially in rural areas) and/or in low quality or speed of service.

In a context where government shutdowns are becoming a trend, and data privacy is becoming a growing concern to many, this **lack of alternatives also compromises the freedom of expression** of many users.”

--- Extract from “The rise and fall of community networks”
by Steve Song, Carlos Rey-Moreno, Anriette Esterhuysen, Mike Jensen and Leandro Navarro
published in the Global Information Society Watch 2018, APC

Section 2: Role & Development of CCPs

Section 1	Background
Section 2	**Role & Development of CCPs**
Section 3	Ownership & Operating Models
Section 4	Financing mechanisms & de-risking strategies
Section 5	Recommendations

Section 2: Role & Development of CCPs

What to expect in this section?

'Section 2: Role & Development of CCPs' introduces and defines Community Connectivity Providers (CCPs). We discuss the different types of CCPs, their characteristics, and unique role in the connectivity ecosystem.

In this section, we consider the fundamental questions considered by CCPs regarding their purpose, operations and sustainability. Understanding the stages in the life cycle of network operators is critical to being able to appreciate the financial needs and underlying risks associated with different growth stages of operators.

This section also examines the economics of operating a network - the costs, potential revenue models, retained earnings & funding. We define different milestones and metrics to consider on the path to financial sustainability.

The section concludes with a host of tools, resources, and workbooks available for operators to understand their economic viability.

Key Takeaways

- CCPs are locally-owned and operated networks that fill gaps and provide access where traditional commercial networks do not. They have the potential to deliver uncapped connectivity to low-income and rural areas but are often constrained by a lack of capital.
- The stage of a network in its lifecycle often dictates its goals, key activities, and available financing mechanisms.
- The journey to financial sustainability for a CCP is a journey to decrease its dependence on external funding support by generating revenue or decreasing costs.
- Understanding the economics of operating a network is important to be able to manage, control, and optimize the levers of growth.
- Over time, as an operator evolves and matures, it must move upwards on the curve of financial sustainability from partial cost recovery (cover recurring operating expenses) to total cost recovery (cover past and future capital expenditures and service its cost of capital).

Section 2: Role & Development of CCPs

2.1 Community connectivity providers

2.2 Stages of network development

2.3 Economics of operating a network

Role of CCPs: What makes a Community Connectivity Provider?

COMMUNITY

- **'Community'**
  - People-built around a common interest or goal
- **Participation**
  - Build, maintain, operate or simply benefit from the infrastructure
- **Local Ownership & Governance**
  - Locally owned as a common-pool resource

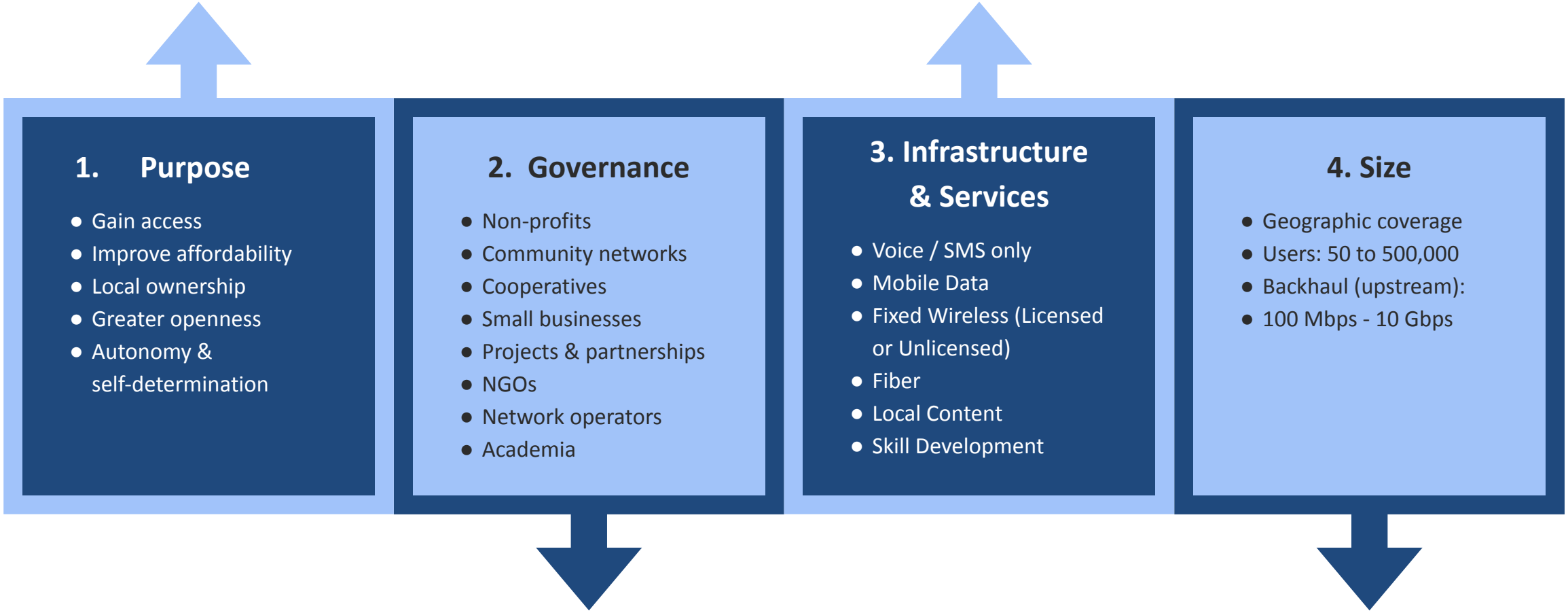
+

CONNECTIVITY

- **Nodes**
  (points of redistribution or delivery)
  - Routers
  - Clients & Servers
- **Backhaul**
  (interconnection within & between network)
  - Links (Wireless or Fiber) & Backbone
  - Gateway to the Internet

Community connectivity providers refer to a wide variety of efforts by local communities to build and manage all or parts of the infrastructure required to enjoy and co-create the internet.

Role of CCPs: CCPs come in a variety of different sizes, setups, purposes, governance models and levels of professionalism



Source: Adapted from ISOC, APC published material

Role of CCPs: Defining features & characteristics: Community Connectivity Provider vs Traditional Operators

COMMUNITY CONNECTIVITY PROVIDER

VS.

TRADITIONAL OPERATOR

- Socially focused & purpose-driven
- Community-led
- Open and carrier-neutral networks
- Decentralised nature
- Localised - locally owned or operated
- Not for profit / cost-recovery model
- Grassroots / bottom-up
- Collective ownership
- Self-deterministic

Illustrative

- Profit-driven
- Commercially-minded
- Centralized infrastructure
- Privately or state-owned
- Profit-extraction
- Professional and top-down
- Knowledge concentration / specialization
- Investment from traditional sources
- No / minimal user participation in network governance (design, deployment, operation)

Role of CCPs: Three broad categories of community connectivity providers

Community Connectivity Providers (CCPs)

Main Objective:

- Deliver affordable broadband connectivity to underserved urban, rural, and remote communities

Key Criteria:

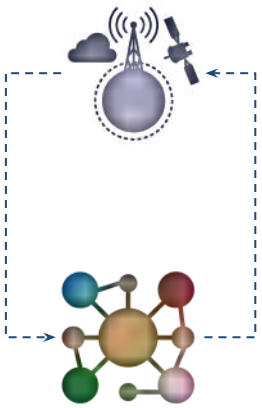
- Local ownership structure (reinvestment criteria)
- Accountability to the social mission (measurement)

Community-owned	*Publicly-owned*	*Privately-owned*
Community Networks (CNs)	**Municipal Networks**	**Social Enterprises**
CNs are owned by the local community of users and any returns are reinvested into the community or returned to members	Municipal networks are owned by the government within defined jurisdictions and any returns are used to service financial obligations or returned to government	Social enterprises are double bottom line businesses that seek both financial and social returns, and any returns are reinvested for growth or returned to shareholders

Role of CCPs: Community connectivity providers are often complementary - filling gaps and providing access where traditional commercial networks do not

The large-scale, commercial, telco network model has done wonders for coverage but, on its own, is insufficient to connect everyone affordably.

- **Traditional solutions are showing signs of having reached their limits**: Mobile network operators, who have been efficient in high-income & urban areas, are struggling to find viability in markets with subsistence-level incomes and/or in sparsely populated regions, where ROI is scarce.
- **Varied attempts to address this problem**, through universal service strategies/ funds, private sector initiatives or philanthropy, **have met with limited success**.



CCPs are feasible alternative solutions in environments where traditional networks fail or are reluctant to operate.

- **CCPs can move towards closing connectivity gaps:** They often service unconnected areas that are not profitable for commercial operators or precede other forms of internet development.
- **CCPs also bring connectivity to those otherwise excluded:** Either because of geography, topography, size, or income level, and enable local development, lead to local business development, and encourage civic participation.
- **CCPs help keep profits local**: Generally reinvest any proceeds in the local community and its network.

Source: Adapted from ISOC, APC published material

Section 2: Role & Development of CCPs

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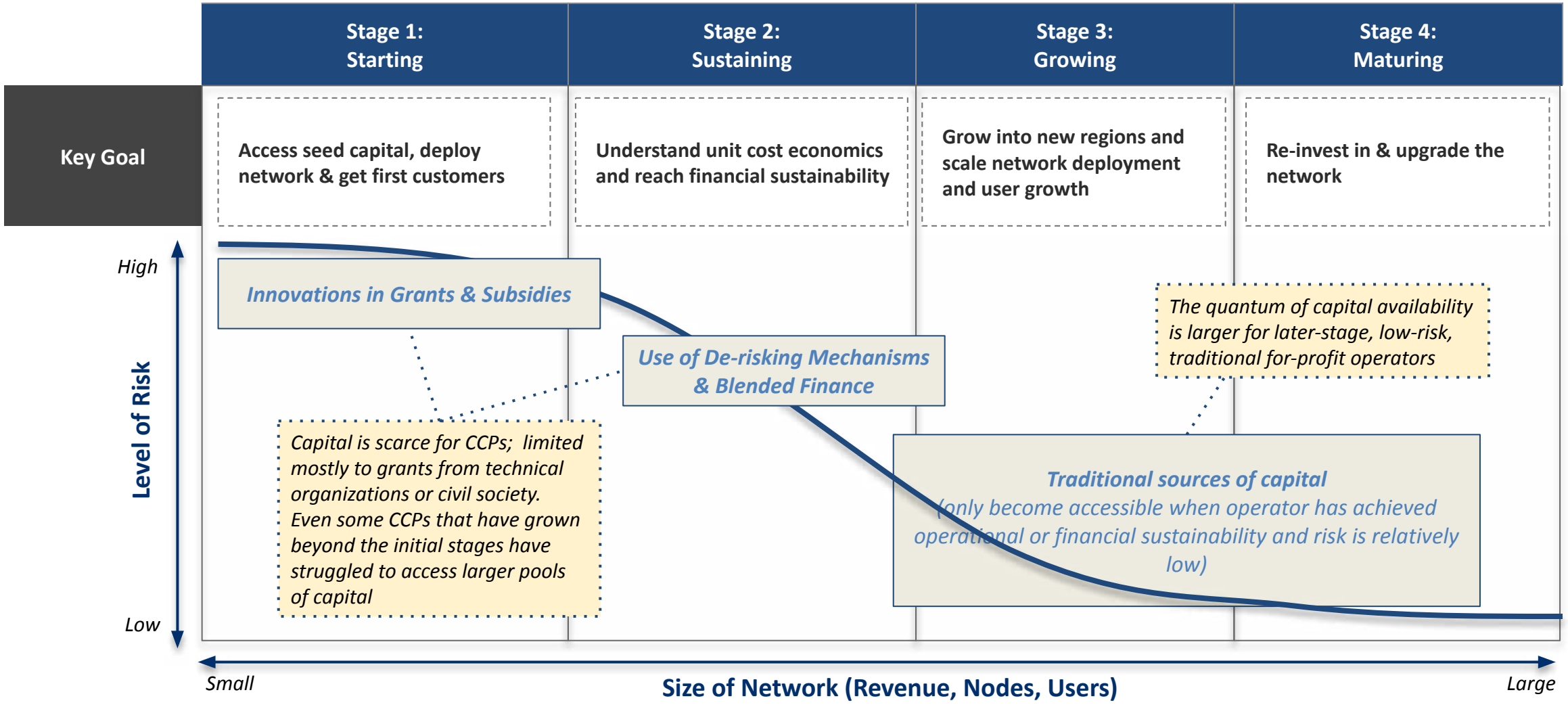
Stages of network development: Key characteristics of each network stage

	Stage 1: Starting	Stage 2: Sustaining	Stage 3: Growing	Stage 4: Maturing
Key Goal	**Operational** ● Plan and get equipment ● Find initial customers **Financial** ● Seek seed funding - grants or support to help maintain the network	**Operational** ● Understand economics to reach sustainability **Financial** ● Getting to operating break-even (EBITDA)	**Operational** ● Grow into new regions **Financial** ● Getting to total cost & financial break-even (EBIT)	**Operational** ● Scheduled CapEx upgrades **Financial** ● Moving beyond break-even to reinvesting
Core Activities	● Identified local community network champions "Digital Stewards" to manage network ● Identified need and coverage network area ● Established community partners that will develop, plan, and maintain the network ● Procured resources (fiber, active and passive infrastructure) ● Installation in key locations in a community (anchor institutions)	Network ● Increase node or fiber deployed Customers ● Generate enough revenue to sustain the initiative; grow customer base Finance ● Explore business monetization models ● Cost saving or cost recovery strategies	Identify adjacent areas to provide service coverage ● Assess needs ● Skill sharing related to maintenance and sustainability of community network implementation Explore more granular cost savings ● Local content cache	● Adding network in new locations ● SLOs around network performance
Examples	● Mamaila, South Africa ● Chak 26 S/P, Pakistan ● Murambinda Works, Zimbabwe ● Tusheti Community Network, Georgia ● Suusamyr, Kyrgyzstan	La Différence, NET2HOME, bosco UGANDA, COMMONROOM NETWORKS FOUNDATION	ALTER MUNDI, B4RN, CITY OF Ammon FIBER OPTICS	guifi.net, STOKAB, epb

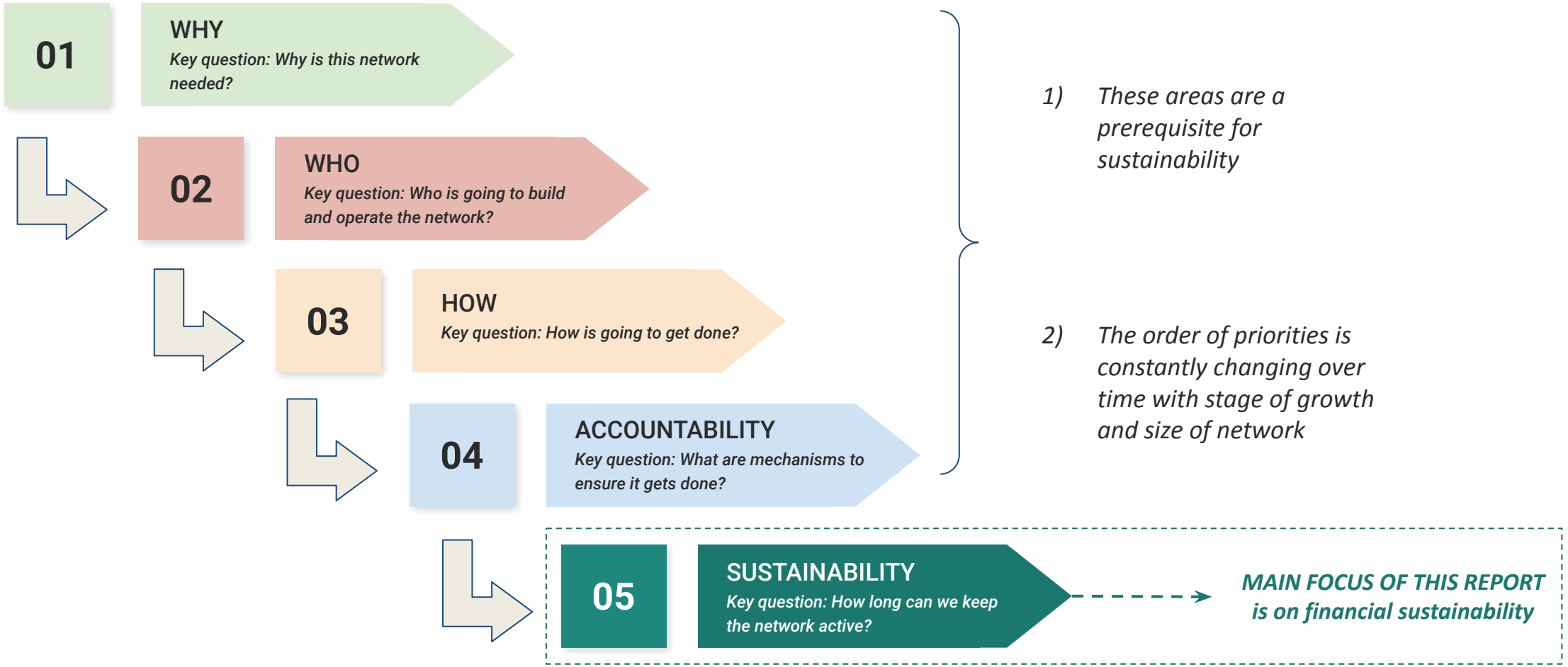
Stages of network development: The stage of the network determines the financing mechanism available to an operator



Stages of network development: Community connectivity providers must consider five fundamental questions relating to their purpose and operations

		KEY QUESTION	SCOPE
01	WHY	Why is this network needed?	• Market context that necessitated the network • Impact of not intervening - digital divide and communities left behind
02	WHO	Who is going to build and operate the network?	• The initiating energy for the project • The community champions
03	HOW	How is this going to get done?	• Area of coverage identified • Technical skills and expertise required • Equipment and infrastructure needs
04	ACCOUNTABILITY	What are mechanisms to ensure it gets done?	• Roles and responsibilities • Governance mechanism • Navigating the principal - agent relationship
05	SUSTAINABILITY	How long can we keep the network active?	• Financial (costs, revenue, and funding) • Non-financial sustainability (community participation, organizational, legal)

Stages of network development: While a lot has been researched about the first four aspects, this report focuses on financial sustainability of community connectivity providers



Stages of network development: The owners of the network often overlap with the beneficiaries in the case of community connectivity providers

PAYERS

- *Who finances the network build out?*
- *Who is the ultimate counterparty?*
- *Who pays for internet use?*

USERS

- *Who uses or benefits from the service?*

OWNERS

- *Who owns the network resources?*
- *Who governs the network assets?*

OPERATORS

- *Who manages the customer relationships?*
- *Who monitors and maintains the network operations?*

Goal: Alignment of incentives between different actors to push through difficult periods

Stages of network development: The owners of the network often overlap with the beneficiaries in the case of community connectivity providers

	PAYERS	USERS	OWNERS	OPERATORS
B4RN	*Government: voucher scheme Investors: crowdfunded bond Individuals: shares*	*Residences and businesses in rural Lancashire and neighboring counties in England.*	*Community members through shares. Registered as a Community Benefit Society*	*Dedicated local team of 70+ staff with support of landowners, contractors and volunteers*
La Différence	*Partial cost recovery from NGOs & local businesses. Grant supported by APC, ISOC, and other corporate partners.*	*Free public wifi access facility for individuals & Dedicated leased lines for NGOs and local business*	*Community cooperatives across Idjwi island*	*Co-designed, installed, and operated by La Différence along with local communities*

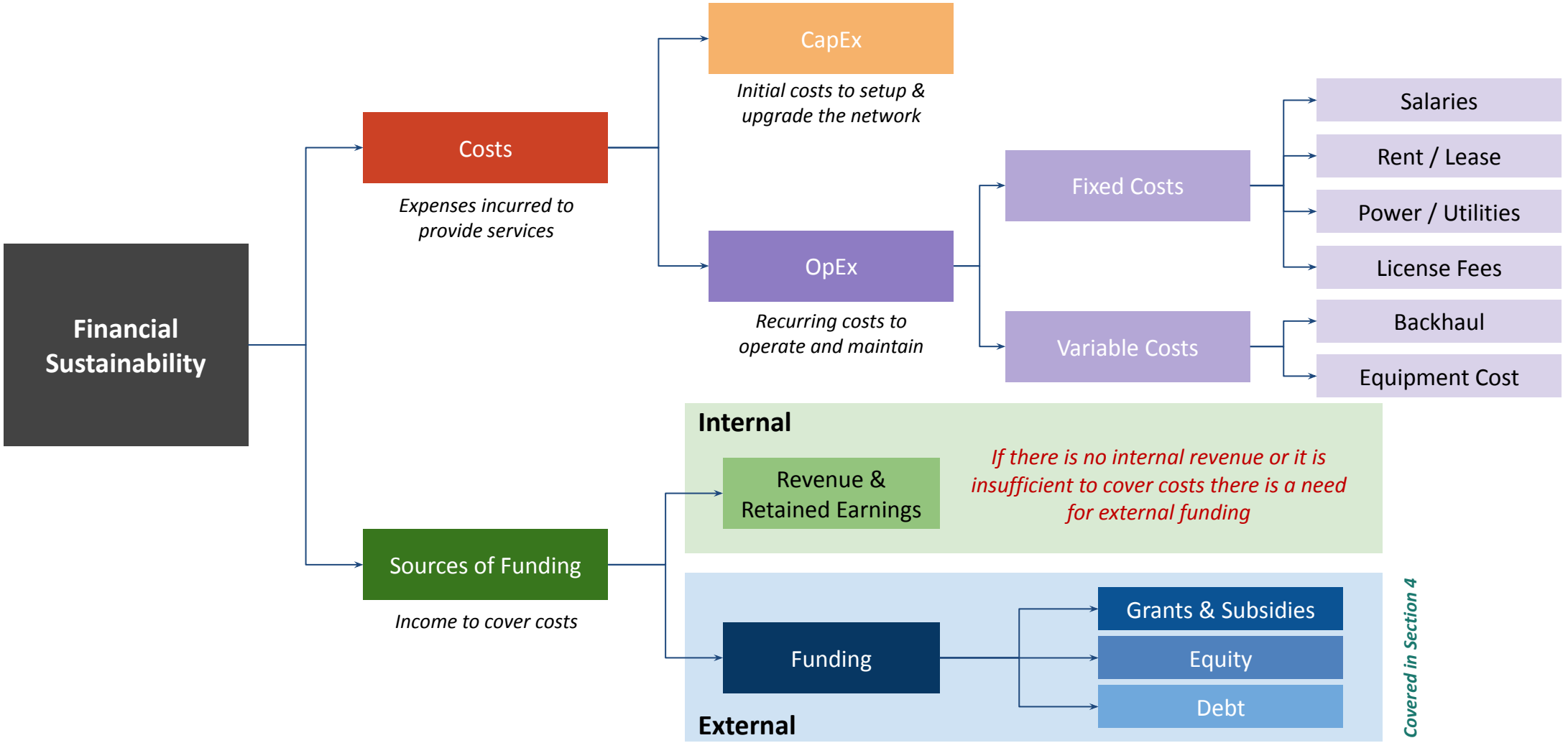
Section 2: Role & Development of CCPs

2.1 Community connectivity providers

2.2 Stages of network development

2.3 Economics of operating a network

Economics of operating a network: Financial sustainability is achieved by offering services in a manner that completely covers the cost of providing such service



Economics of operating a network: It is important to distinguish between initial and recurring costs and understand the importance of each cost category

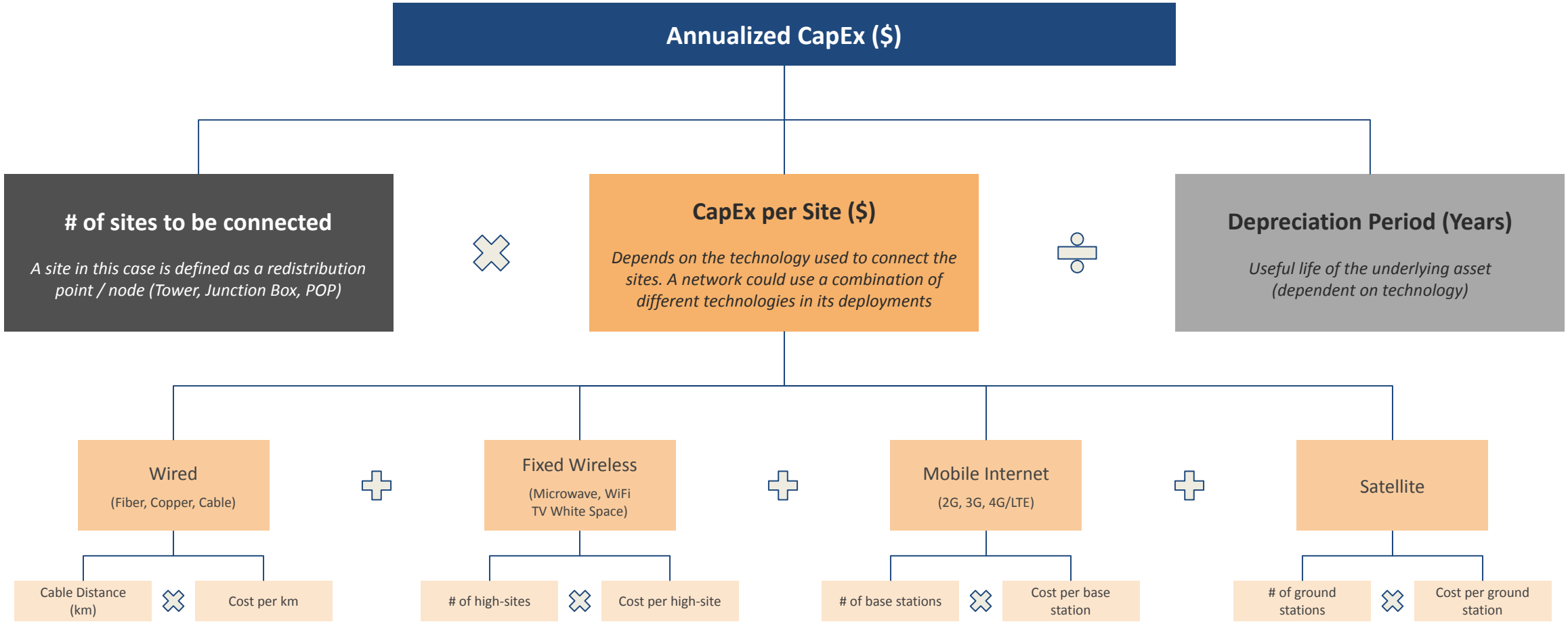
Initial costs: Everything you have to purchase to start – the one-off starting costs (equipment, license etc.) aka Capital Expenditures (CapEx)

Recurring costs: Ongoing costs to operate and maintain your network (labor, tower lease, backhaul etc. aka Operating Expenses (OpEx)

Cost Category	Impact on Sustainability
CapEx Cost	If CCP can't pay --> There is no new equipment, or capacity upgrades
Backhaul Cost	If CCP can't pay --> There is no active network
OpEx Cost	If CCP can't pay --> There is no network maintenance or new user installation

A CCP must continuously track the money needed to
(i) start the network, (ii) keep it up and running, and (iii) replace/grow/upgrade the network

Economics of operating a network: The CapEx spend is heavily influenced by choice of technology and represents a bulk of the upfront costs to deploy the network



Source: Adapted from the Meaningful school connectivity report published by Giga & BCG (2021)

Economics of operating a network: Operating expenses can be further broken down into fixed and variable costs

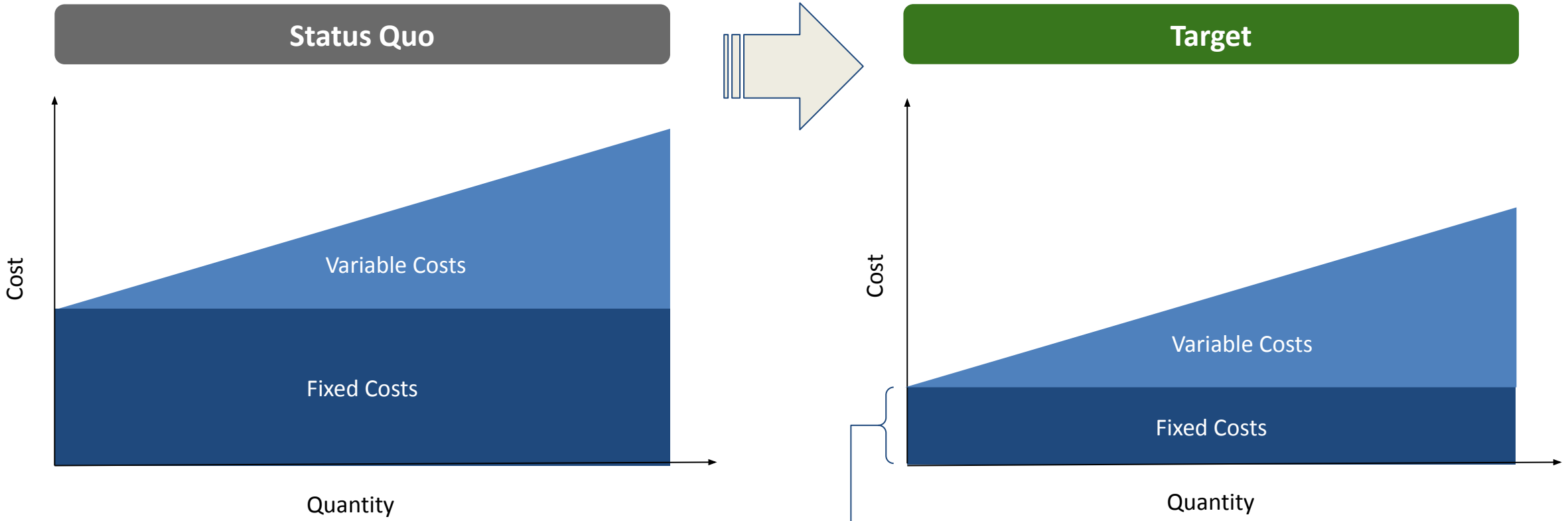
Fixed costs: Cost that stays the same regardless of the amount of goods or services produced or sold

- **Infrastructure Rent -** cost paid to lease/rent space on towers, buildings, or network equipment
- **Regulatory Costs -** Requirements to pay for license, spectrum, business, import duties, and other fees
- **Administrative and human resources costs -** costs of engaging talent and manpower
- **Insurance -** costs of protecting an organization from unexpected financial losses
- **Software** - cost of using or developing tools to monitor and optimize network performance

Variable costs: Costs that change in proportion as a company produces or sells goods and services

- **Backhaul Fee -** monthly fee to provision bandwidth and connect backhaul provider. Usually a large impact on overall operating costs.
- **Energy Costs -** cost of electricity generation and battery backups
- **Customer Installation Cost** - Cost to purchase and install equipment at a customer location (price of hardware and cost of labor)

Economics of operating a network: Keeping usage-independent fixed-operating costs to a minimum can unlock huge savings



Most networks start out with having a high fixed cost

CCPs try to keep fixed costs minimal to focus on customer acquisition.
Variable costs provide more flexibility.

Economics of operating a network: The financial feasibility of CCPs are largely determined by the degree to which they can avoid or decrease the costs of building & operating a network

Main Cost Categories	Strategy for cost avoidance or cost reduction
Equipment & Hardware - For Fixed-Wireless: Radios, Antennas, CPEs, Routers, Tower - For Fiber: ONUs, OLTs, Duct, Poles	• Donated or repurposed equipment from technical organizations (Network Startup Resource Center (NSRC), Internet Society (ISOC)), corporate partners (Microsoft, Meta, Alphabet etc.), or local charities • Low-cost, open-source, and interoperable equipment (LibreRouter); obtain waivers on import duties if possible • In-kind community contributed equipment • Lease space on nearby existing towers (if available) instead of constructing new tower/high-site • Opt for locally-constructed shorter towers on high-visibility taller locations • Buying in bulk or organising group purchases with other operators
Labour Cost - to construct (build high-site or deploy fiber) - to install at customer location - to manage (sales, support) & maintain	• Community volunteers to help build high-sites, dig trenches, erect poles, install equipment, especially on their own property • Community-led mapping of site locations and service coverage area • Self-installation of routers with guided tele or tech-based assistance • Network monitoring for pre-emptive troubleshooting and self-service FAQs/guides for customers
Backhaul Connectivity	• Free or subsidized upstream connectivity from local education or research institute • Agreements to lease off-peak capacity from local businesses or large institutions • Negotiate lower-cost backhaul from local/nearby telco or internet service provider • Pool in with other small local networks to form 'buyers club' with larger capacity requirements • Network optimization (pre-fetching content, install caching servers, refreshing mirror servers, link to local IXP etc.)
License & Spectrum Fees	• Operating on unlicensed spectrum or non-line of sight frequencies • Applying for license exemptions (as available locally)
Power & Utilities	• Using on-site renewable energy sources or donated battery and power equipment, if available
Rent / Lease	• In-kind agreements with owners of site (free connectivity to offset rent/lease cost)

Source: Adapted from Global Information Society Watch (2018) published by APC

Economics of operating a network: Generating revenue through a variety of business models can also decrease the dependence on external funding and increase self-sustainability

Model	Description
Usage-Based (Prepaid)	• The standard pricing system for consumer connectivity services in LMICs. Here the consumer pays for data services through a pay-as-you-go model.
Usage-Based (Postpaid Subscription)	• A subscription refers to a service where consumer is billed for the service on a monthly basis at the end of each monthly bill cycle after consuming services they are entitled to use.
Value-added services	• Operating expenses are covered by services other than data usage such as value-added services that subsidizes data provision (Ex. printing, internet cafes).
Limited revenue/Subsidized free services	• Operating expenses are covered by in-kind contributions or ongoing grant/subsidy. Typically relies on local authority paying for the build and operation of network.
Very low cost incremental pricing	• Provide users with very low cost, time-based packages for internet connectivity.
Action-based payment	• Customers undertake certain actions to receive blocks of connectivity time or capacity; This is a nonfinancial method to pay for connectivity but can be helpful to drive adoption outcomes.

For many CCPs in emerging markets, revenue is often insufficient to cover costs.

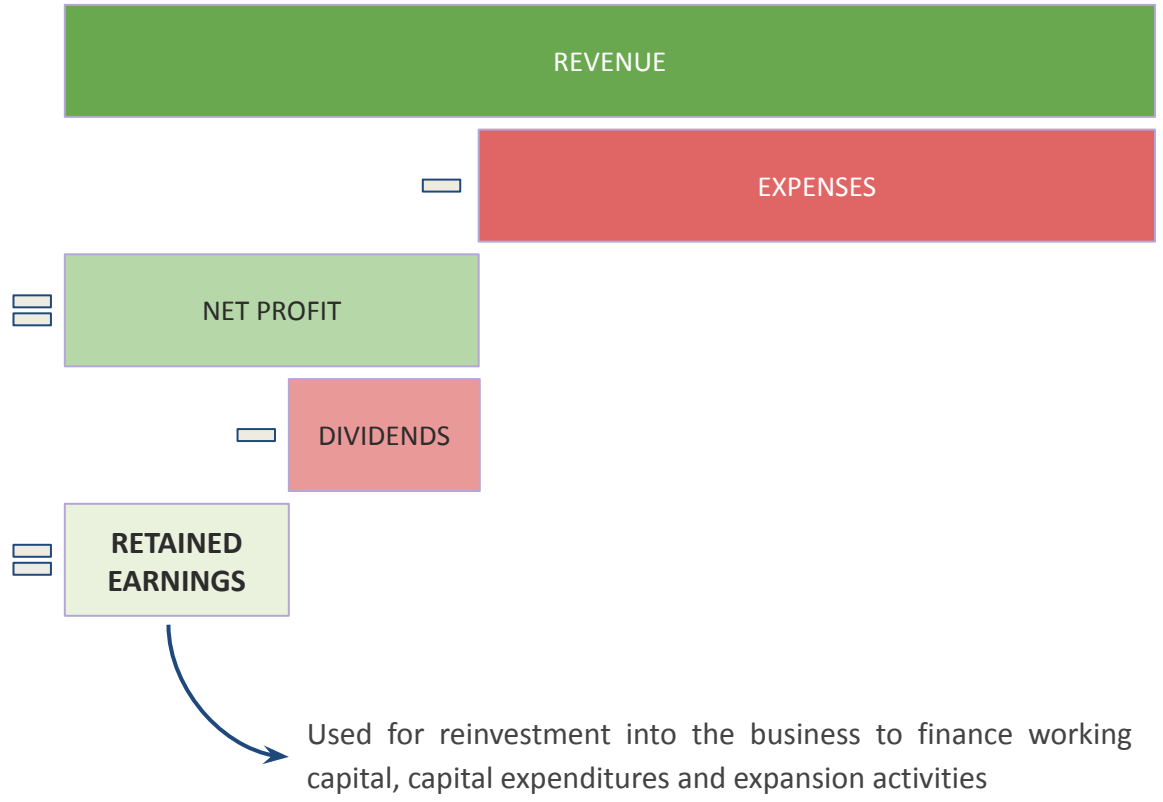
Source: Last-Mile Internet Connectivity Solutions Guide, ITU; Innovating Business Models, World Bank

Economics of operating a network: Retained earnings can be an important source of financing future capital expenditures and working capital

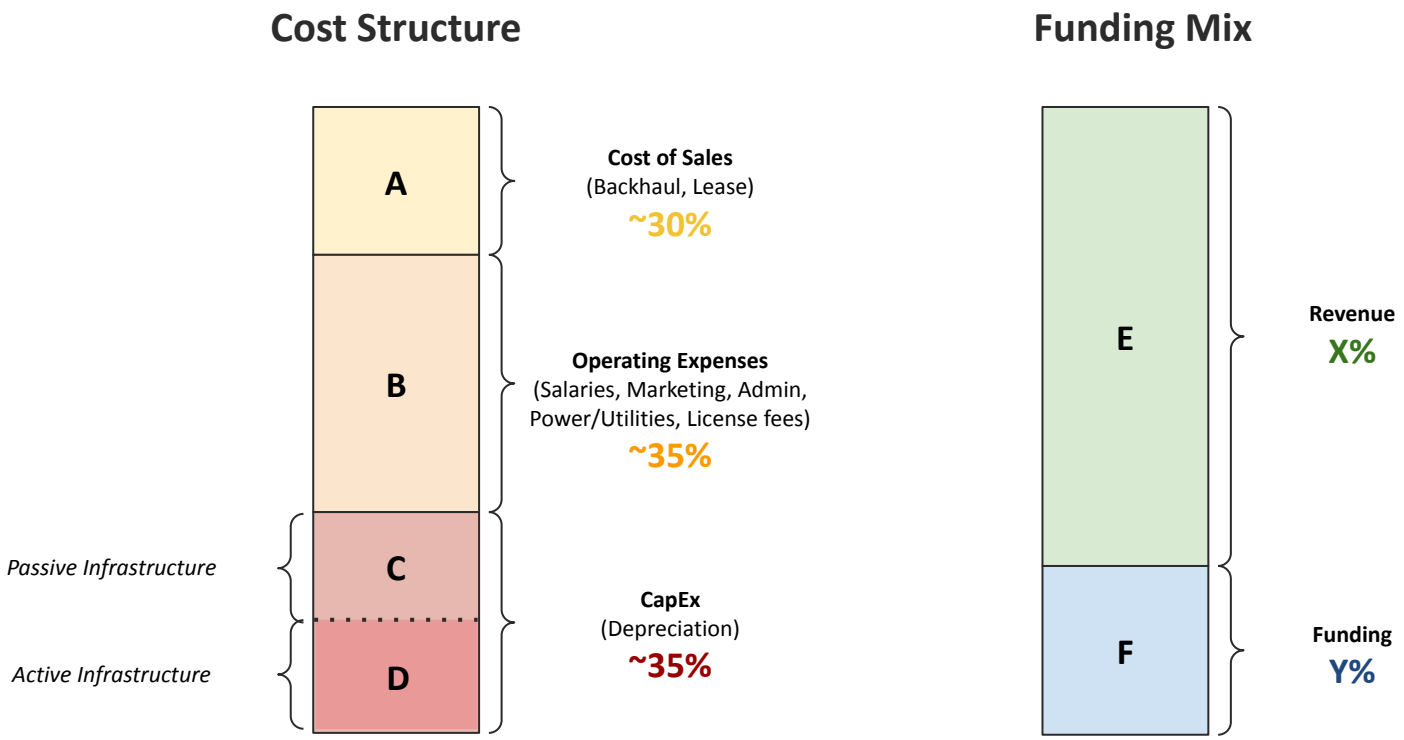
RETAINED EARNINGS

- **Definition**: Refers to the accumulated portion of a business' profits that are not distributed as dividends to shareholders but instead are reserved for reinvestment back into the business. The decision to retain the earnings or distribute them among the shareholders is usually left to the company management.
- **Key Principle**: Retained earnings can be used by an organization to finance its own expansion activities, for working capital or capital expenditures or to pay off any debt obligations
- **Connectivity Sector**: Many operators have used historical retained earnings to roll-out network deployments and expand into new markets. In fact, operator retained earnings, combined with other sources of financing are one of the primary sources of financing for ICT infrastructure.
- **Sources**: Operator revenue

Retained earnings via new paying customers can often be the cheapest form of financing



Economics of operating a network: Operators need to ascertain how much of their cost base can be covered through revenue or retained earnings



- **Key question for service providers/CNs:** How much of the *cost structure* (A+B+C+D) is supported by *existing revenue* (E).
- This will also enable operators to determine how much *funding* (F) is required.
- For **operational sustainability**, it is critical that operators are able to meet ongoing / recurring expenses (A+B) from revenue streams (E)

  i.e. $\mathbf{E \geq (A+B)}$
- This will enable any additional financing to fund one-time equipment or infrastructure costs.
- *Funding* can be any of the following: retained earnings, new equity, debt, subsidies etc.

Economics of operating a network: Thinking through the ROI equation can help operators identify levers to manage sustainability

How to reduce

- **CapEx**: Build to demand, access to poles, facilities, regulatory time
- **OpEx**: Integrate with existing customer service & billing platform, ongoing regulatory costs
- **Risk**: Demand aggregation, pre-sales, anchor tenants, train staff, systems & processes, develop business & management acumen
- **Churn**: Deliver a great service, leading to loyal customers

$$C + O \Leftrightarrow (1-r)R$$

$$R = (s - c)*a$$

C = Capital Expenditures (in $)

O = Operating Expenditures (in $)

r = Risk (Probability of project failure in %)

R= Revenue (in $)

s = No. of subscribers added

c = No. of subscribers churned

a = Average Revenue Per User (ARPU)

Takeaway

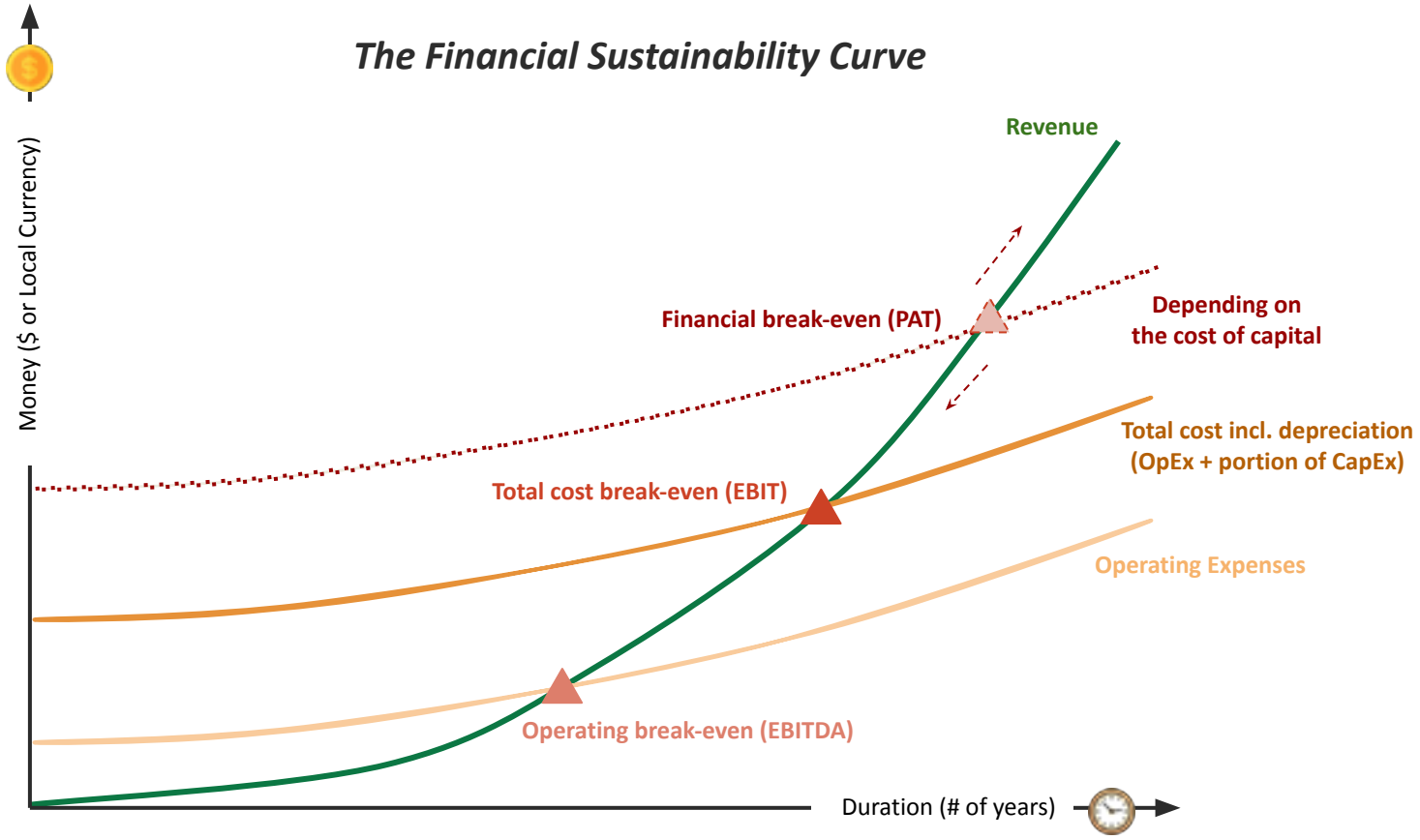
Identify deployment models that reduce CapEx + OpEx; focus on managing risk and booking revenue to hit ROI benchmark

How to increase

- **Subscriber Growth**: strategic & low cost-marketing initiatives, new regions & customer segments
- **ARPU**: new services, upselling & cross-selling, long-term anchor customers

Economics of operating a network: New sources of capital become available as operators navigate up the financial sustainability curve

There are various ways to track the network's sustainability ratio every month.
The aim should be to reach *100%*, which can be achieved either by growing revenue or cutting operating expenses



- There are 3 milestones to sustainability:

$$\text{Operating Break Even} = \frac{\text{Gross Revenue}}{\text{EBITDA}} \geq 100\%$$

$$\text{Total Cost Break Even} = \frac{\text{Gross Revenue}}{\text{EBIT}} \geq 100\%$$

$$\text{Financial Break Even} = \frac{\text{Gross Revenue}}{\text{PAT}} \geq 100\%$$

- The first goal of a CCP is to reach operating break even. Many CCPs leverage grants to be able to do so
- Many CCPs, especially those without external investors, may not need to go beyond Total Cost Break-Even as they may not have to service cost of capital

Economics of operating a network: Community connectivity providers are seen as having higher actual or perceived levels of risk; resulting in limited availability of financial resources

Regulatory Environment

- Restrictive license issuances
- High licensing costs
- Taxes, customs, and import fees
- Low availability / access to spectrum for smaller networks to use or share
- Government bureaucracy, delays and long waiting periods to obtain permissions & licenses

Technical and Organizational Expertise

- Lack of initiative, leadership & skills to set up broadband projects in rural areas
- Limited managerial experience
- Lack of awareness of benefits of creating own network
- Perpetual cycle of training and retraining because of talent drain to other opportunities

Operational Difficulties

- Lack of affordable or reliable energy supply
- High costs for backhaul connectivity
- Low availability of international bandwidth of transit
- Lack of coordinated activity between MNOs and infrastructure providers
- Lack of mapping of existing infrastructure
- Theft of equipment
- Political risk and currency volatility risk

Demand-side issues

- Limited availability of information on demand
- Low affordability of services
- Prohibitive cost of devices
- Lack of digital literacy and awareness
- Low perceived relevance and attractiveness of content for end-users
- Demand volatility

Financial Resources

- Very limited availability of financial resources
- High cost of credit
- Heavy reliance on philanthropy (limited pool of grant funders) and contributions from governments, USFs
- Limited options for monetizing services
- General lack of land or other marketable assets
- Choosing between other vital necessities such as food or healthcare

Source: Adapted from ISOC, Global Information Society Watch (2018) published by APC

Economics of operating a network: Tools and resources for operators to understand their economic viability and return on investment ROI

ISOC: CN Finance Workbook
https://www.internetsociety.org/wp-content/uploads/2022/05/Step-by-Step-Guide-to-Complete-the-Finance-Workbook.xlsx

USAID: LMC Business Modelling Tool
https://www.digitaldevelopment.org/resources/last-mile-connectivity-business-modeling-tool

Facebook: RoI Estimator Spreadsheet
https://www.facebook.com/isptoolbox/get-spreadsheet/?fin[0]=15000&fin[1]=1000&fin[2]=500&fin[3]=200&fin[4]=5&fin[5]=200&fin[6]=70

Outpost Plus: Start Your Own ISP
https://startyourownisp.com/

Connectivity Capital: ISP Toolkit
www.isptoolkit.org

Section 3: Ownership & Operating Models

Section 1	Background
Section 2	Role & Development of CCPs
Section 3	**Ownership & Operating Models**
Section 4	Financing mechanisms & de-risking strategies
Section 5	Recommendations

Section 3: Ownership & Operating Models

What to expect in this section?

'Section 3: Ownership & Operating Models' dives into the various parameters and trade-off that operators consider when deciding on their ownership structure, legal entity, and operating models.

One of the early decisions that a network needs to make is regarding its ownership structure and operating model. This choice has a major impact on the concentration in ownership, regulatory requirements, tax implications, operational complexity and ease of fundraising, among many other factors. We analyze a framework of different operating models along with the degrees of participation in the network architecture.

With real examples of a variety of CCPs, we discover the rationale behind the choice of their unique owner-operator model.

Key Takeaways

- In deciding their ownership model, CCPs usually consider trade-offs between concentration of ownership, regulatory compliance, and fundraising and tax-efficiency. While the type of legal entity is usually dictated by the laws of the local jurisdiction, ownership is usually either community, public, or private. Possible owners include governments & municipalities, communities, private businesses / individuals or some combination of these actors.
- The operator model adopted by a network usually reflects the local conditions present - community agency & participation, regulations & support from local authorities, income-levels of the region, technical & managerial know-how, availability of backhaul infrastructure etc.
- The choice of owner-operator model is also key in unlocking different pathways to financing - CNs primarily rely on the communities they serve, municipal networks rely on public funds, and social enterprises rely on equity investors.

Section 3: Ownership & Operating Models

3.1 Choosing an ownership structure

3.2 Choosing an operating model

Ownership models: CCP ownership varies from project to project and is often influenced by local institutional arrangements and regulations

As discussed in Chapter 2, three principal actors — local communities, municipalities, or private entrepreneurs —can own, install, manage, operate and/or maintain a community connectivity provider. In some cases, such as a public-private partnership there could be hybrid ownership.

Community Networks (CNs)	Municipal Networks	Social Enterprises
Community-owned	*Publicly-owned*	*Privately-owned*
CNs are owned by the local community of users and any returns are reinvested into the community or returned to members	**Municipal networks are owned by the government within defined jurisdictions and any returns are used to service financial obligations or returned to government**	**Social enterprises are double-bottom line businesses that seek both financial and social returns. Owned by entrepreneurs or investors and any returns are reinvested for growth or returned to entrepreneurs / shareholders**
Key Features		
• ***Usually receive external help*** *with financing, design and installation. An outside organization provides technical capacity building, and a public entity or donor provides grants or other financial assistance.* • ***Common in emerging markets*** *where incumbent operators lack the capacity or incentive to connect remote communities. In many remote & rural areas, where fees won't cover investment costs, community-based ownership may be the only option.* • *More likely to* ***succeed alongside programs that promote digital skilling and productive uses of connectivity****. Over time as customer demand and ability to pay increase, the CN becomes more financially sustainable.*	• ***Fully or partially facilitated, built, operated, or financed by local governments****, often in participation with private contractors.* • ***Can take various forms****: (i) a passive infrastructure model; (ii) a wholesale access model; or (iii) a fully integrated model.* • ***Often use subsidies*** *to keep tariffs affordable and in many cases cross-subsidize low-priced community connectivity with higher-priced dedicated connections to anchor and business customers.* • ***Limited in emerging markets*** *and more common in developed economies where there is government support for roll-out of municipal broadband.*	• *A private entrepreneur or investor pays to construct, operate and maintain the network.* ***Funding often comes from individuals, investors, and commercial loans****.* • *Typically* ***flourish in countries where the government supports small operator-led network development*** *via supportive policies and simple licensing procedures where investors can access credit, financing and subsidies and where bilateral donors and/or non-governmental agencies provide technical assistance. Government incentives in a supportive environment include concessions and output-based subsidies.* • ***Private-sector participation is challenging in small-scale projects*** *that may not be commercially viable.*

Ownership models: Choice of legal structure is driven by regulatory compliance and affects capital availability and tax efficiency

By owner type

1 COMMUNITY

owned by the local community of users and any returns are reinvested into the community or returned to members

Ex.: B4RN, Guifi, RS Fiber, Murambinda, CommonRoom, Zenzeleni etc.

2 PUBLIC

owned by the government within defined jurisdictions and any returns are used to service financial obligations or returned to government

Ex.: City of Ammon Fiber, EPB Chattanooga, Stokab

3 PRIVATE

owned by its founders, management, or a group of private investors. Owners can choose to have an explicit social purpose.

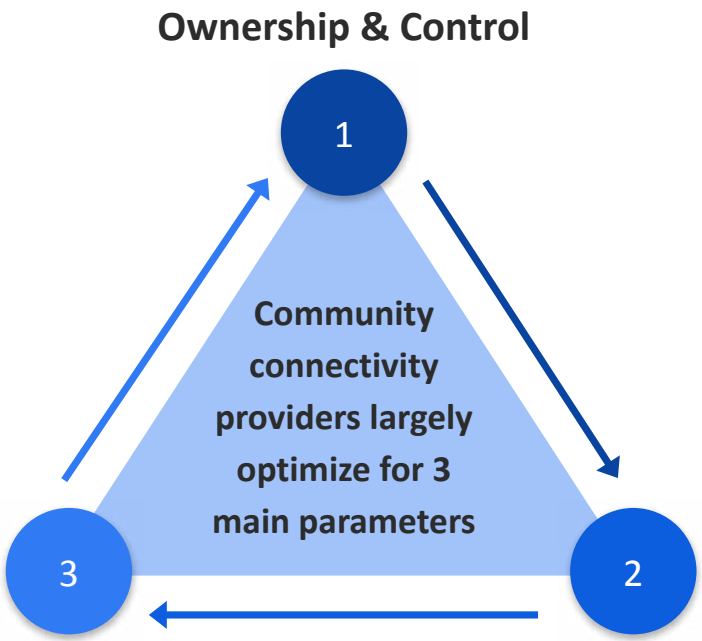
Ex.: Habari Node, AirJaldi, Althea, Net2Home

By *(explicit)* legal entity

Company	Shareholders with limited liability. Could be a private or a public limited company.
Govt-Owned Enterprise	Government or state has significant control through full, majority, or significant minority ownership.
Social Enterprise	Applies commercial strategies to maximize improvements in financial, social and environmental well-being. Can take various forms depending on local jurisdiction (ex. benefit corps, social business etc.)
Co-operative	an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned enterprise
Non-Profit	organized and operated for a collective, public or social benefit; subject to the non-distribution constraint; usually with tax-exempt status
Other	Other unique types of legal entities depending on local laws and regulations (for example - associations, societies etc.)

Ownership models: Community connectivity providers must balance various parameters to decide on an appropriate legal status and ownership structure

Key Parameters



Impact on CCP

- **Ownership Structure**
- **License Requirement**
- **Operating Model & Network Architecture**
- **Business Model**

Key questions to consider:

1. What legal risks are the owners and operators of the network subject to? (privacy laws, data protection etc.)
2. Does the operator face any significant barriers if they don't incorporate (ex.licensing, fees etc.)?
3. Which type of legal status can the operator consider? (depending on local & national laws)

Ownership models: CNs benefit from community-led initiation, muni networks often have a long-term horizon, while social enterprises can tap into technical & managerial expertise

	Community Networks (CNs)	Municipal Networks	Social Enterprises
BENEFITS	• Responsive to local community needs • Can connect areas where projects are not cost-effective for municipalities and private investors • High degree of local buy-in, which can facilitate proper management and delivery of high-quality services • Can create local jobs and training opportunities • Communities can keep proceeds local • Network self-determination	• Can often avail strong technical expertise, maintenance capacity and financial management systems • Often have good access to legal services and systems to manage regulations • Often have more relationships with local anchor institutions that can offset initial demand requirements • Long-term horizon with ability to prioritize low-cost service provision with access to budgetary resources	• Availability of technical expertise and acumen leading to more efficient operations, maintenance and management of the network • Political motivations are less likely to influence private actors • If the investment is profitable, private-sector investors can scale up operations

Ownership models: CNs often lack technical acumen, muni networks are plagued by bureaucracy and social enterprises struggle to navigate regulatory hurdles

	Community Networks (CNs)	Municipal Networks	Social Enterprises
CHALLENGES	• Communities often lack the financial and technical capacity to install, operate and manage networks. • Offering free or low cost services can compromise the financial viability of the project, rendering it perpetually dependent on grants or subsidies • Highly dependent on local participation and effective governance mechanisms • Enforcement and ensuring payment can be challenging	• Sometimes plagued by short-term political agendas and operational inefficiencies • Often require private actor participation for technical management and network deployment • The municipality's corporate structure and bureaucracy might not work for smaller projects • Critics argue that it is an inappropriate use of public funds that can disincentivize private actors	• Without supportive policies, regulations and financing for CCPs, rural or remote connectivity may not meet return expectations or may be too risky. • Small-scale private operators also struggle with finding local talent for network and business management • Changes in regulations or tariffs can jeopardize success. • In markets with extensive regulations governing networks, lengthy approval times can delay projects.

Ownership models: CCPs must understand the local context to choose an ownership model that suits their distinctive scenario

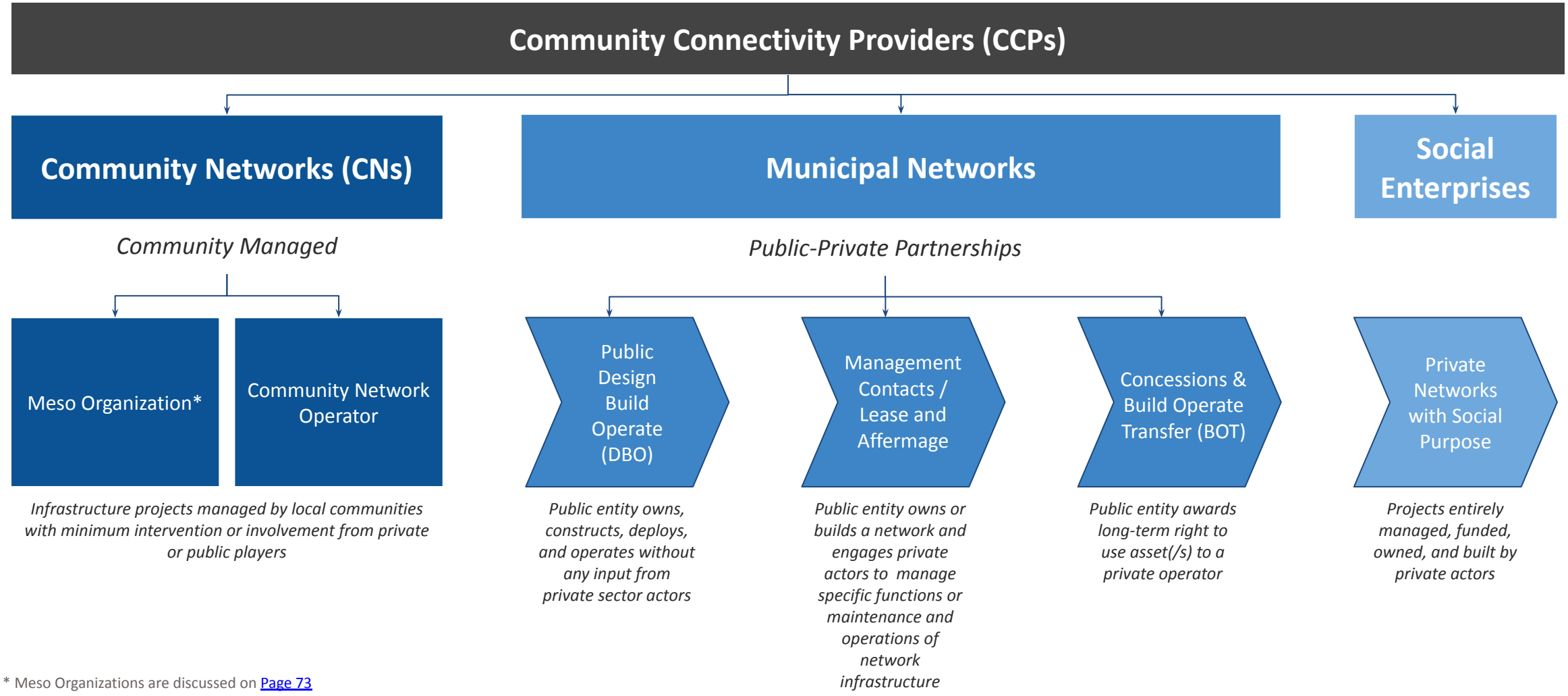
	Community Networks (CNs)	Municipal Networks	Social Enterprises
BEST FIT	In rural, remote, or low-income areas where connectivity isn't affordable, delivering services isn't profitable for private or municipal operators, and the community supports the project and is willing to contribute non-financial resources or pay for services.	When taking a long-term view of providing affordable connectivity for a region or population, especially when attempting to lower prices, spur more competition, and boost local economic development through the construction of infrastructure or open-access networks.	When government has created an enabling environment (policy, subsidies, concessions) and effective procedures (for licensing & spectrum use) that in turn, promote the deployment of private networks in hard-to-serve locations that can meet return expectations.

Section 3: Ownership & Operating Models

3.1 Choosing an ownership structure

3.2 Choosing an operating model

Operating models: Based on scope & size of the network and level of community involvement, there emerge various operating models for community connectivity providers



* Meso Organizations are discussed on Page 73

Source: Adapted from 21st Century Financing Models for Bridging Broadband Connectivity Gaps

Operating models: Community managed operator models can be further defined by degree of participation in the network architecture stack

A community network can choose to build, operate, and maintain one or several layers of the network

3-layer network architecture

A broadband network typically consists of passive infrastructure, active equipment components implementing the technology and services that are delivered on top of the infrastructure.

[P] PASSIVE INFRASTRUCTURE: The physical non-electronic medium over which information can be transmitted; typical lifespan of >50 years. Examples are ducts, Masts, Poles, NOC, Fiber etc.

[A] ACTIVE INFRASTRUCTURE: Electronic equipment needed to encode information sent over the network into physical signals; typical lifespan of 5-15 years. Examples are switches, routers, servers

[S] SERVICES: Sales, Customer Care, Billing, Internet, Conferencing and other services for end-users

Common CCP operator models*

1. *Integrated operator*

Operates across all layers of the network architecture

[P] [A] [S]

- Ex: B4RN, RS Fiber, EPB Chattanooga

2. *Open Access*

Builds physical network infrastructure and offers wholesale services

[P] [A] [S]

- Ex: Guifi, City of Ammon, Stokab, Dark Fiber Providers

3. *Service Provider*

Builds small sites or leases space on towers; installs own equipment to offer retail services

[P] [A] [S]

- Ex: Murambinda Works, Common Room, Net2Home

4. *Reseller*

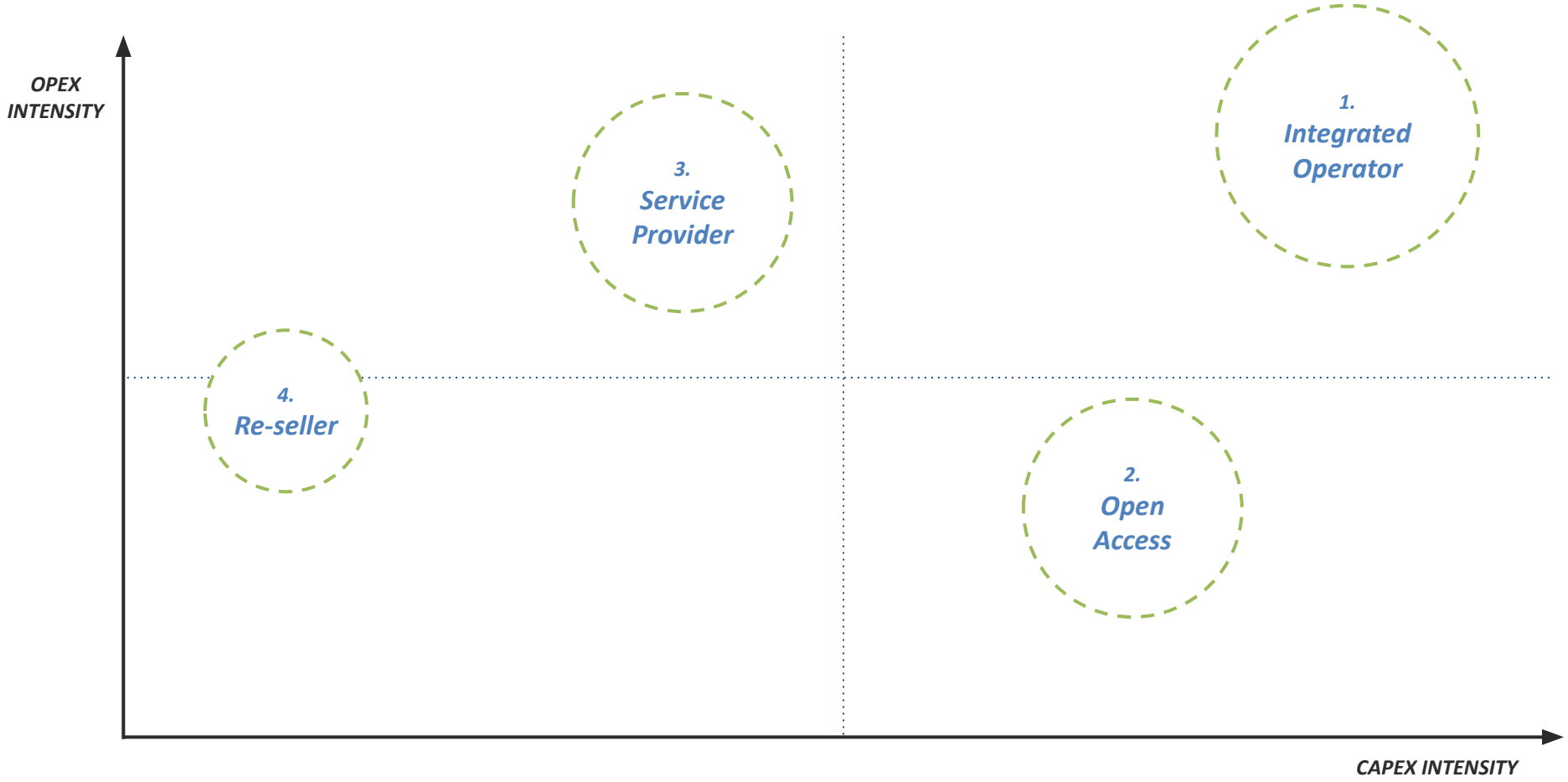
Does not own network infra over which it operates and provides services

[P] [A] [S]

- Ex: Wiki Katak

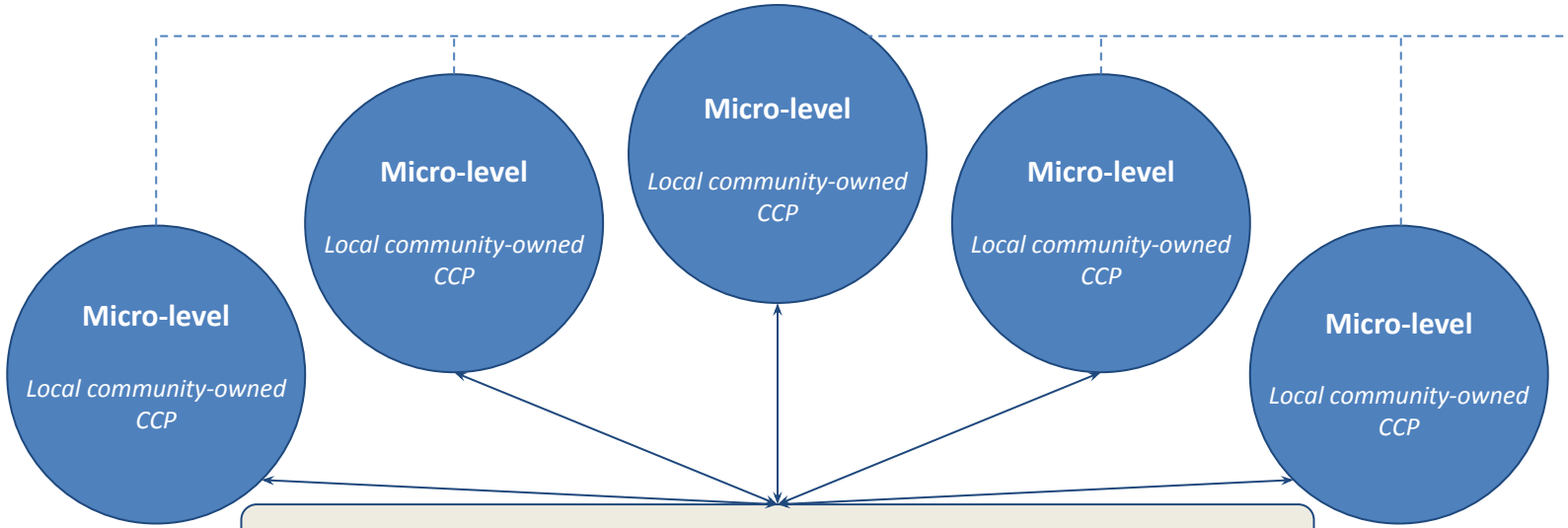
**Operator models listed here are a sampling of some of the most common types and are not meant to be an exhaustive list*

Operating models: CCPs may optimize their operating model based on capital availability and local context



Size of bubble represents the degree of operational complexity

Operating models: Meso organizations are emerging as a new class of CCPs that are seeding and supporting community networks while enjoying certain economies of scale



Meso Organization

(Typically) Registered as a Not for Profit entity

Role:

- Source funding to meet opex and capex financing gaps
- Seed and establish new micro-level CCPs in different locations
- Train and develop local capacity to ensure sustainability
- Provide technical expertise - develop and maintain backhaul infrastructure
- Integrate and develop free and open-source software to facilitate small-scale deployments
- Continuous technical support & mentorship on governance, legal, admin etc.
- Policy advocacy with local government (spectrum usage, license exemption, USAFs)

Micro-level Organization

(Typically) Registered as a cooperative or unregistered

Role:

- Own, govern, install, operate and maintain the network within respective communities
- Offer services to anchor customers, local businesses, and households
- Reinvest income back into networks
- Convene community for digital skilling & literacy initiatives

Examples

Rhizomatica *Zenzeleni* *AlterMundi* *CommonRoom* *La Différence*

Source: Adapted from Zenzeleni, Rhizomatica and Altermundi websites

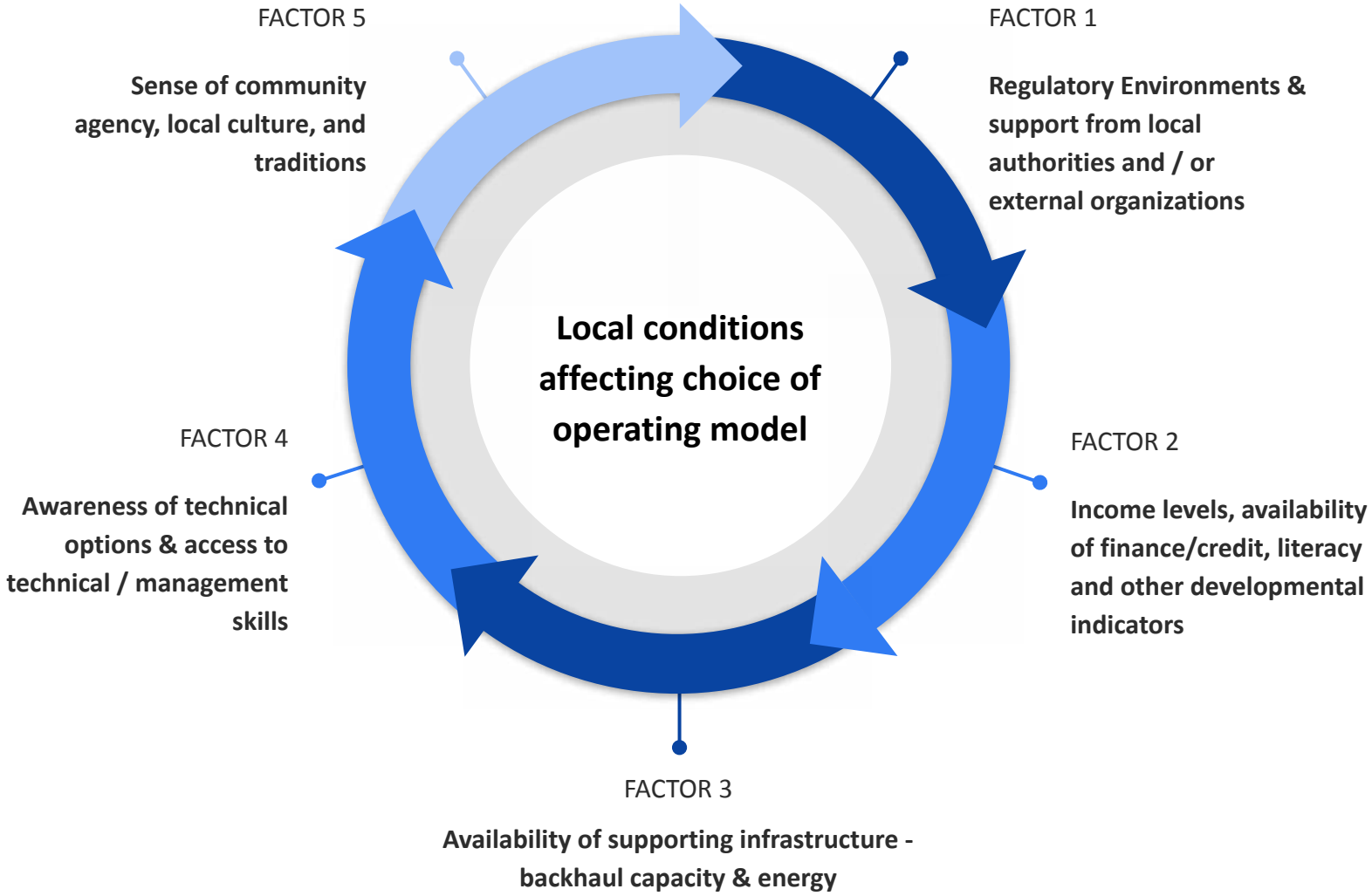
Operating models: Municipal networks can take on a variety of different operational partnerships

	Public Design Build Operate (DBO)	Management Contracts / Lease & Affermage	Concessions & Build Operate Transfer (BOT)
	Maturity *Replicability* *Scalability* *Sustainability*	*Maturity* *Replicability* *Scalability* *Sustainability*	*Maturity* *Replicability* *Scalability* *Sustainability*
Strengths	• Simple & well established model • Public sector retains control and decides priorities	• Least politically sensitive, ensure business continuity and can be implemented quickly • Transfer operational risks to private sector	• High level of private investment, reduce and transfer risk to private operator • High potential for efficiency gains
Weaknesses	• Public sector may lack technical & commercial know-how • Does not exploit economies of scale & efficiency	• Limited potential to incentivize investment • Lack of transparency and most risks borne by government • May need considerable regulatory oversight	• Require complex contracting that may take a long time • May require updated regulations for tariffs & performance monitoring
Takeaways	• Suitable when public sector needs to retain control or small targeted investment to spur pvt sector participation	• Good transitional arrangements • Good to combine public financing with private efficiency and risk transfer to private sector	• Suitable when government wants to profit from network and retain ultimate control but trusts private operator with responsibility over the long-term

Very High *High* *Medium* *Low*

Source: Adapted from [21st Century Financing Models for Bridging Broadband Connectivity Gaps]

Operating models: The choice of operator models adopted by a network reflect the different local conditions present at each location



The choice of owner-operator model also dictates, to a certain extent, the sources of financing available to a CCP

Sources of Financing	Community Networks	Municipal Networks	Social Enterprises
Current	• Customers and community members • Individual donors and volunteers • Grant-providing institutions • Government subsidies	• Public funds & budgetary resources • Municipal and infrastructure bonds • User financing (pre-sales)	• Bootstrapped by individuals • Seed funding from friends, family and angel investors • Impact investors
Future ?	• Universal service funds • Impact-first Investors • Multilateral development agencies • Cooperative or community banks	• Development finance institutions • Multilateral development agencies • Social Impact Bonds • Impact Investors • Financial Institutions	• Development finance institutions • Institutional investors • Commercial banks

Section 4: Financing mechanisms & de-risking strategies

Section 1	Background
Section 2	Role & Development of CCPs
Section 3	Ownership & Operating Models
Section 4	**Financing mechanisms & de-risking strategies**
Section 5	Recommendations

Section 4: Financing Mechanisms

What to expect in this section?

By pursuing network deployments in regions that are reportedly unprofitable for commercial operators, CCPs inherently operate in very challenging environments. Partly because of this, CCPs have historically had limited access to commercial financing, having been restricted to financing operations primarily through grants, in-kind donations, and in many cases, community contributions.

'Section 4: Financing Mechanisms' aims to help CCPs transition from these valuable but limited pools of philanthropic capital to accessing the larger quantum of commercial and sub-commercial financing that is potentially available. Readers are introduced to the process of developing a financing plan, the main financing instruments, and the sources of capital and return expectations.

This section also aims to help funders of broadband infrastructure identify opportunities for investing in CCPs. Funders can consider participating in the blended capital stack and identify the evolving financing needs and capital structures of an CCP over its life cycle. Presented is also a novel way to consider linking financing mechanisms to financial sustainability milestones.

Key Takeaways

- Financing internet infrastructure is ultimately a pathway from high-risk to long-term yield. Financing mechanisms are an exercise in blending sources of risk capital to get to that long term yield
- The variety and quantum of financing mechanisms available to an operator is directly linked to the stage in its lifecycle.
- The key trade-offs of the three main financing instruments (grants, equity, and debt) are between economics, control & transaction costs. Operators need to understand the true all-in cost of capital associated with each financing instrument when deciding their capital stack.
- De-risking strategies and tools form the bridge between sub-commercial or grant-supported financing and traditional commercial sources of capital - mitigating risk through financial and non-financial means to attract and mobilize greater private sector participation and investment.
- The innovation in financing mechanisms is less about novel funding approaches and more about accessing sub-commercial and traditional sources of capital.

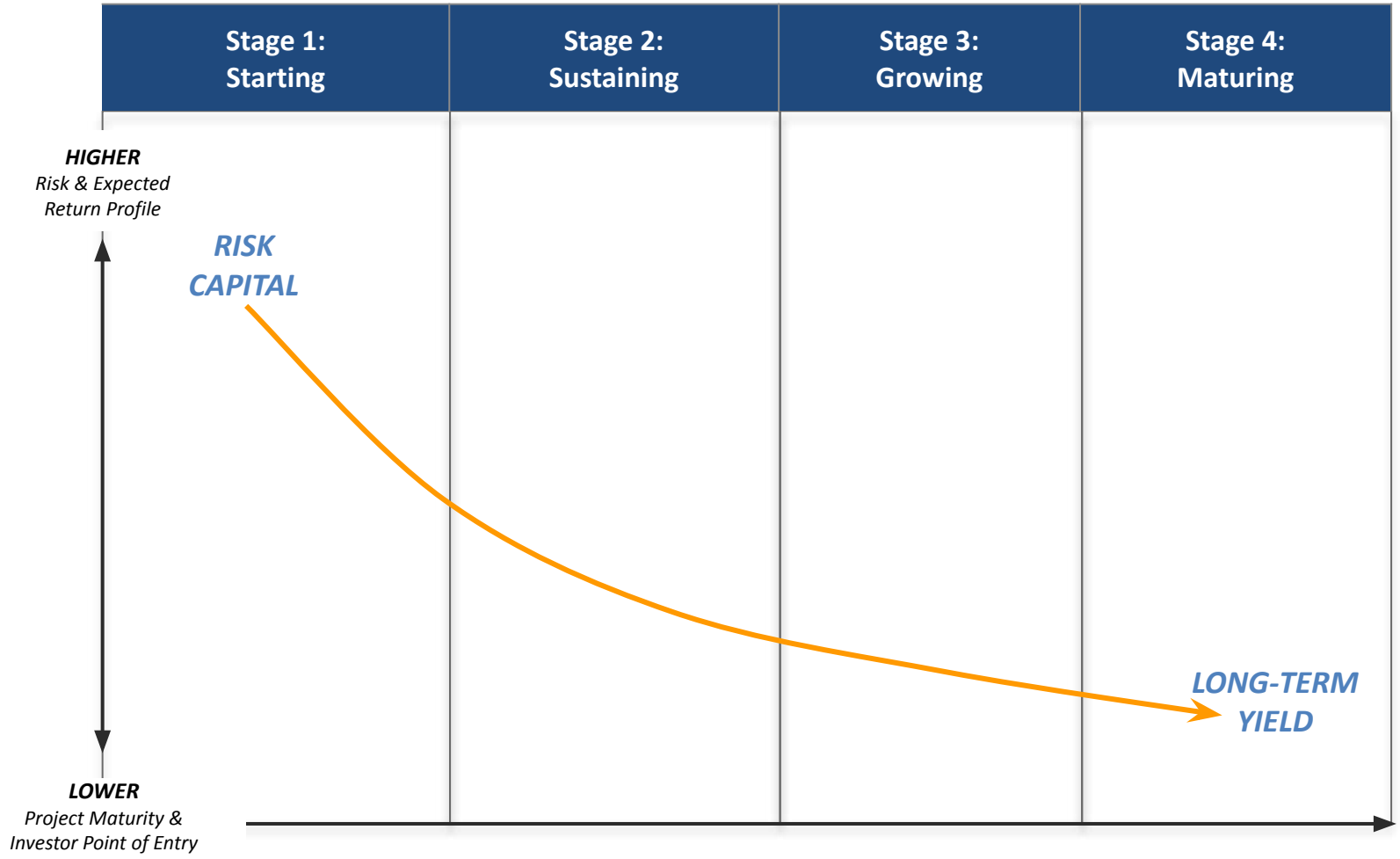
Section 4: Financing Mechanisms

4.1 Developing a financing plan

4.2 Financing mechanisms

4.3 Sources of capital

Developing a financing plan: Financing internet infrastructure and CCPs is a pathway from high risk to long-term yield



- Internet infrastructure is ultimately a long-term yield play
- Financing mechanisms are an exercise in blending sources of risk capital to get to that long term yield
- During early years of the network's conception and development, the investor pool is relatively limited as the risk and commensurate return expectation are very high
- As the network grows and matures, larger pools of capital become available as the risk profile steadies.

Source: Adapted from NetEquity Networks

Developing a financing plan: Investing in passive infrastructure is typically capital intensive and represents a critical hurdle in deploying networks

PASSIVE INFRASTRUCTURE

- High capital expenditure (CAPEX) & Low operational expenditure (OPEX)
- Low economies of scale
- Stable returns from low rates over a long period
- Inherently subject to regulation because it most often constitutes a natural monopoly. Regulations can be highly localized and fragmented to dig streets, for pole access etc.
- Higher risk and longer payback period
- Permanent asset - once deployed, life measured in decades

ACTIVE INFRASTRUCTURE

- High operational expenditure (OPEX)
- Economies of scale
- Subject to limited regulation
- Subject to fast obsolescence due to technological innovation and electronics development

ICT infrastructure investing differs from other types of infrastructure, most significantly in the relative extent of private and public-sector involvement. Most ICT infrastructure financing has traditionally come from private-sector companies.

Source: Adapted from European Commission's Guide to Broadband Investment (2014)

Developing a financing plan: 3 step process to match funding needs to capital sources

Once an operator has understood their financial position and funding gap (as discussed in Section 2.3 of this report), the following steps can help chart a path forward to a financing plan:

01 USE OF PROCEEDS

- Identify priorities for funding need
- Develop a short-term and medium term capital expenditure and procurement plan

02 SOURCES OF CAPITAL

- Identify available sources of capital and key trade-offs
- Understand qualifying criteria and cost of capital

03 DEVELOP CAPITAL STACK

- Design a blended capital stack to meet funding requirements

Section 4: Financing Mechanisms

4.1 Developing a financing plan

4.2 Financing mechanisms

4.3 Sources of capital

Financing mechanisms: The three main types of external financing instruments are unique in their characteristics and usage

	Grants	Equity	Debt
Key Characteristic	No repayment	Investment for ownership	Investment for yield return
Stage	Early (Stage 1-2)	Early & Growth (Stage 2-4)	Growth (Stage 3-4)
Pros	• Not repayable • Non-dilutive • Risk-tolerant	• No interest payments • Long term expectation	• Non-dilutive • Fixed length
Cons	• Cyclical Availability • Reporting Requirements • Restrictions on use	• Dilutes Ownership • Liquidity Expectations	• Repayments • Interest

Trade-offs: Economics - Control - Transaction Costs

Key Questions to Consider

1. What stage is the operator at in its ***company lifecycle***?
   Starting, Sustaining, Growing or Maturing

2. What type of ***control*** is the operator willing to give up?
   Ownership, approval, information, etc?

3. What is the true ***cost of capital***?
   Transaction cost, control premium, and all-in cost of capital?

Financing mechanisms: Introduction to Grants & Subsidies

GRANTS

- **Definition**: Funds given by an organization (generally without expectation of return) for a specific purpose linked to public benefit. Especially important in riskier countries and less mature sectors.
- **Key Principle**: Funds do not have to be repaid to the grantor, provided that the grantee complies with the contractual terms
- **Connectivity Sector**: Grants are often used to finance capital expenditures of network build out in an underserved region, to support ongoing operating expenses, or to support the provision of free-connectivity.
- **Sources**: Local and national government, international & multinational development agencies, telecom regulatory authority, internet technical community, CSR programmes, academic & research institutions, philanthropic organisations

SUBSIDIES

- **Definition**: Government-issued incentives, usually in the form of cash, grants or a targeted tax cut. They can be used at multiple stages in the investment process to either demonstrate a beneficiary's business case or reduce business model risk.
- **Key Principle**: Subsidies stimulate investment that would otherwise prove too costly for companies to pursue. Effective subsidies are outcome based and linked to certain policy conditions.
- **Connectivity Sector**: Subsidies are intended to encourage network deployment or local manufacturing by businesses and increase affordability for individuals.
- **Sources**: Local and national government, telecom regulatory authority

Grants and subsidies do not necessarily cover all the costs of a project. Beneficiary organisations often have to secure other means to finance their project, either with own equity or with support from a debt-providing institution.

Financing mechanisms: Types of Grants & Subsidies

GRANTS

- **Tax-exempt Donations**: Provision of tax benefits or deductions for donations to non-for-profit companies, as often local community connectivity providers are recognized as providing infrastructure for the public good

- **Asset contribution / In-kind Infrastructure**: Contribution that consists of giving (or allowing the use of) a physical asset (infrastructure or equipment for example) or an intangible asset (such as spectrum or permit/RoW).

- **Human Capital support**: Contribution that consists of offering human resources and/or technical expertise to build, operate, or commercialize the service.

- **Grants**: financial donation given to an organization for a specific social purpose. Grants are typically made by a foundation. corporation or government agency.

SUBSIDIES

- **Universal service and access funds (USAF)**: Public funds, financed primarily through contributions made by mobile network operators and other telecommunications companies, intended to expand communications services to underserved areas and populations.

- **OpEx/Roll-out subsidies**: Government subsidies distributed to compensate the operating costs of the network. Some countries are restructuring their USAFs to support local operators, such as Kenya's initial plans with the Universal Service Fund for CN funding exploration (Communications Authority of Kenya, 2021), and Argentina's new Roberto Arias Connectivity Programme which supports all startup costs and initial operating costs or community networks.

- **Connectivity coupons**: A demand-side subsidy at the user level that may target affordability issues, content attractiveness, and digital awareness and literacy.

Financing mechanisms: Introduction to Equity Financing

EQUITY

- **Definition**: Equity represents a share of a company. If a company decides to offer equity to finance its initiatives, a part of the company is being sold. As a result, for the investor, the return on investment is variable and is based on the company's cash flow and increased/decreased value of assets. Equity is, therefore, a risk-bearing instrument.
- **Key Principle**: Capital contribution in exchange for ownership via an equity stake
- **Connectivity Sector**: Most ICT infrastructure financing has traditionally come from private-sector companies, namely network operators, ISPs and tower builders, who are motivated to make often substantial equity investments based on the prospect of commercial return.
- **Sources**: Community, crowdfunding, impact investors, direct investment from government, development finance institutions, angel and seed investors, asset managers, pension funds, private equity & venture capital investors

Pros	Cons
• Permanent source of finance • No obligatory dividend • Open chance of borrowing • Retained earnings • Right shares	• Floatation cost and high cost of funds (high return expectation) • No tax shield • Underwriting of shares • Dilution of control • No benefit or leverage

Financing mechanisms: Types of Equity Financing

EQUITY

- **Patient equity:** Development and impact investor contribution to the infrastructure project that happens in the form of equity participation generally accept returns below market rates.

- **Government/Development Finance Institution (DFI) equity participation:** Equity financing through government or DFI capital contribution. Government/DFI has an equity stake and is directly involved in network deployment.

- **Social / Development impact bonds (SIB/DIB)**: Outcomes-based financing that does not offer a fixed rate of return but rather one in which repayment to investors is contingent upon specified social outcomes being achieved.

- **Quasi-equity**: Hybrid form of finance that offers non-dilutive equity risk capital that is paid back based on the performance of the company. Usually in the form of revenue shares or convertible loans.

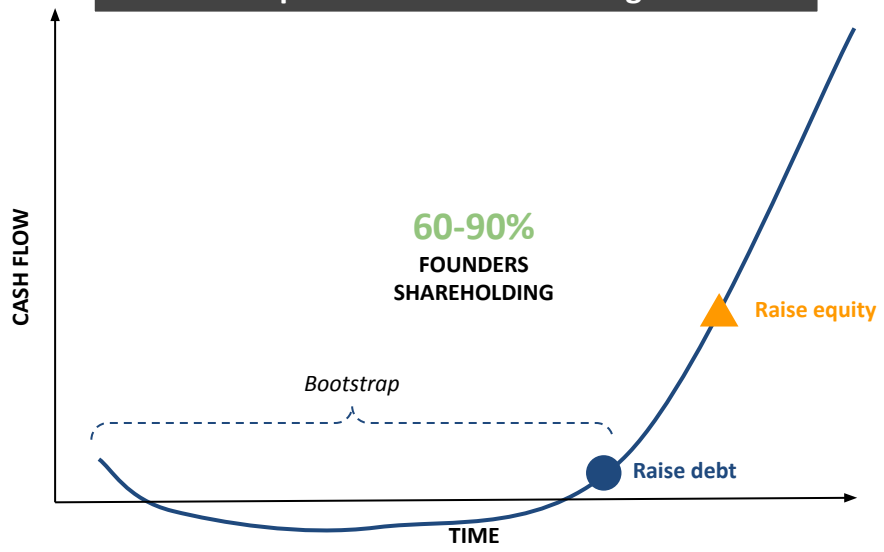
- **Market-return equity**: Capital for which the risk-adjusted expected return should be comparable with other forms of long-term equity market investments. Equity can be contributed both through private placements and through the issuing of securities.

- **Equity capital markets (ECM)**: Equity financing from global ECM where companies raise capital (in general with the help of a financial institution) from savers, banks, and investors. The ECM covers more activities and financial instruments than the stock market.

Example: A social Enterprise that expands with retained earnings vs. raising equity

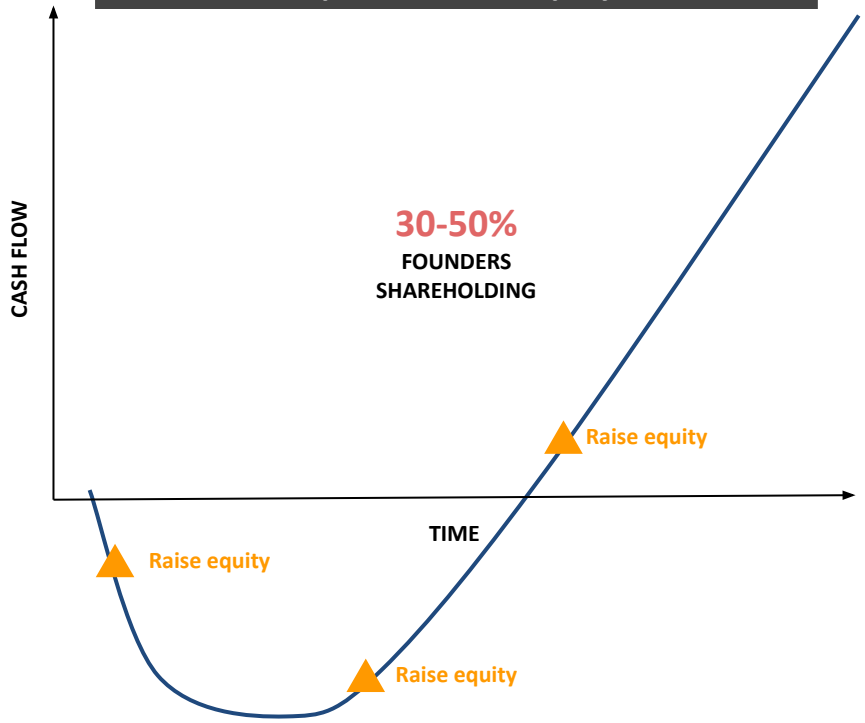
There are tradeoffs to ownership, control and growth expectations.

Option 1: Retained Earnings



- ➔ FLEXIBLE TIMELINES
- ➔ NON-DILUTIVE
- ➔ MORE FINANCIAL DISCIPLINE
- ➔ LESS OVERSIGHT / GOVERNANCE REQUIREMENT
- ➔ SLOWER GROWTH
- ➔ FEWER RESOURCES

Option 2: Raise Equity



- ➔ MORE RESOURCES
- ➔ SURVIVE IN COMPETITIVE MARKET
- ➔ COMPLIANCE COSTS / TRANSPARENCY
- ➔ RIGID TIMELINES
- ➔ HIGH GROWTH EXPECTATIONS
- ➔ LESS OWNERSHIP

Financing mechanisms: Introduction to Debt Financing

DEBT

- **Definition**: Debt is a deferred payment that becomes due in the future. It usually consists of the original amount to be repaid and a recurring interest payment due before a specified date, included in the contractual terms and agreement.
- **Key Principle**: Investment for yield return with a fixed cost of capital.
- **Connectivity Sector**: The various flavours of debt products have been used by public and private institutions and DFIs to finance ICT infrastructure, services and devices for many years
- **Sources**: Community, cooperative banks, impact investors, government, commercial banks, non-banking financial institutions, development finance institutions & multilateral banks, private debt funds

Pros	Cons
• Fixed claim • Tax deductible • High priority in financial trouble • Fixed maturity • No ownership dilution or management control • Provides leverage	• Usually requires some form of recourse either through collateral or guarantees • Amount that can be borrowed is usually limited and dictated by healthy financial position of underlying borrower • Obligation to pay back could cause stress on cash flow and may result in bankruptcy

Financing mechanisms: Types of Debt Financing

DEBT

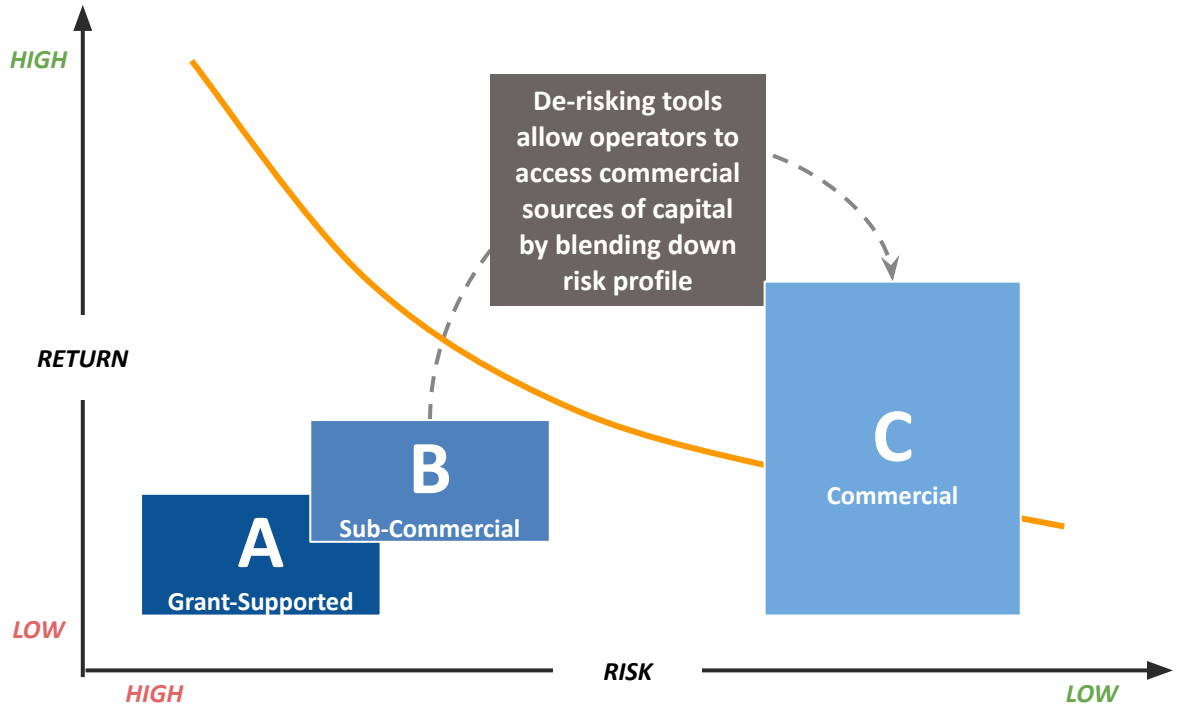
- **Concessional debt**: Soft loans offered for no interest or a below-market rate of interest. They could be offered with lenient terms, such as extended grace periods or interest holidays.
- **Government loan**: Contribution from the government through the provision of a loan to finance infrastructure set-up.
- **Vendor financing**: Equipment vendor contribution through financing the supplied equipment in full or in part.
- **Municipal bonds**: Debt securities issued by states, cities, counties and other governmental entities to finance connectivity projects and network roll-outs
- **Infrastructure bonds:** Whether secured or serviced by project cash-flows, are used to raise debt to finance construction of infrastructure facilities.
- **Market-return debt**: Capital for which the risk-adjusted expected return should be comparable to similar debt market investments. Usually made through private placement or issuance of securities.
- **Debt capital markets (DCM)**: International market where companies and governments raise funds through the trade of debt securities, including bonds.

Financing mechanisms: Introduction to De-risking Strategies

RISK MITIGATION / DE-RISKING STRATEGIES

- **Definition**: These strategies usually do not comprise direct financing but do protect financiers against regulatory, liquidity and sometimes technology and execution risks, facilitating access to commercial finance at a lower cost.
- **Key Principle**: Mitigate risk through financial and non-financial means to attract and mobilize greater private sector participation and investment
- **Connectivity Sector**: De-risking strategies and risk mitigation tools are especially important in incentivizing operators to expand connectivity to areas that are hard to reach and expensive to roll-out infrastructure. They also offer effective ways for public authorities to contribute to catalyzing private investment
- **Sources**: Government, regulatory authorities, impact investors, philanthropic donors, multilateral or international institutions

De-risking strategies and tools form the bridge between sub-commercial or grant-supported financing and traditional commercial sources of capital



Financing mechanisms: Flavours of De-risking Strategies

RISK MITIGATION / DE-RISKING STRATEGIES

- **Demand Aggregation**: Aggregation of multiple users to sign up for a service, which can help to finance the underlying infrastructure. Mitigates risk by reassuring investors that there will be users and revenue for their networks or users of their services and devices.
- **Pre-sales / down payments**: Cash contribution from advance sales closed before project completion and thus before service delivery.
- **Anchor tenant contract**: Agreement with a key client that engages to buy the service for many of its sites within a network coverage area. This client is often the government or a public entity willing to connect public sites, schools, hospitals etc., and provides enough revenue assurance to deploy the infrastructure.
- **Bundling / Dual service provision**: An additional product sold on top of connectivity subsidizes the service. As an example, the operator can roll out infrastructure to provide both energy and connectivity. This not only lowers costs, but the other service could be more profitable and cross subsidize the connectivity.
- **Technical assistance**: Specialized technical or expert consulting providing targeted support to an organization with a development need or problem. It is an effective method for building the capacity of an organization.
- **Credit enhancement / Loss guarantee schemes**: Complementary guarantee issued by governments or international institutions against the failure or unprofitability of the project, protecting especially against political or currency volatility risks that may deter private investors from investing or make them demand a high risk-adjusted yield
- **Investments in digital literacy and community engagement**: Some organizations, especially local grassroots organizations, play an important role in addressing barriers to digital adoption - digital literacy, local content, social and gender norms around technology usage etc. through community engagement, education, and awareness creation.

Financing mechanisms: De-risking deployments using the Anchor-Business-Community (ABC) model allows CCPs to effectively serve rural and low-income areas

***Step 1*: Identify and sell capacity to large customers in the community** *(eg. schools, libraries, banks, health clinics etc). These are usually financially sound, have consistent connectivity demand, and provide stable cash flow for the CCP. Access to stable revenue has a positive impact on sustainability and helps improve their bankability.*

***Step 2*: Expand deployments to serve local commercial business** *that require high-bandwidth, often dedicated, connectivity for productive use but do not require continuous demand. Business customers are connectivity power users during the day but generally do not require large bandwidth at night.*

***Step 3*: Expand to serve households and the broader community** *that require ad-hoc or inconsistent connectivity for basic household needs (information, education, services, etc.) and where affordability is a major concern. Community demand usually represents a risky segment to the operator as it can be highly intermittent or uncertain.*

The ABC model allows CCPs to:

(1) reduce risk by creating stable cash flow,
(2) reach financial sustainability faster, and
(3) lower cost of connectivity for the community

Source: USAID, GIZ, Duke University, GSMA

Financing mechanisms: The different financing instruments and risk mitigation strategies can be combined to make up a blended capital stack for an operator

BLENDED CAPITAL & WHY IT IS NEEDED

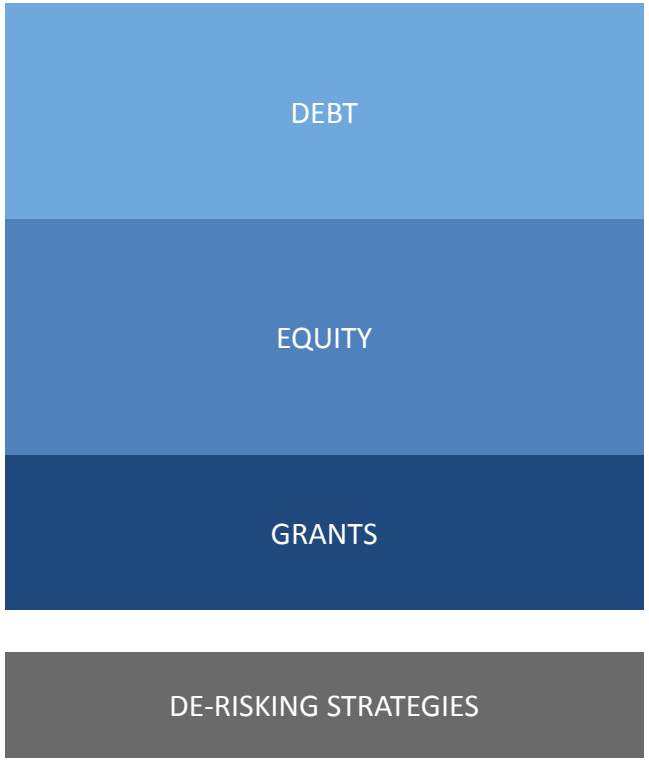
With the range of potential financiers and and magnitude of gaps in terms of connectivity, it is necessary to find strategic ways to pool resources to increase the available funding to close the related funding gaps.

Blended finance refers to the mixing of concessionary capital, which can take risk without commensurate return, with market-rate private investment. The concessionary capital ***catalyzes additional private capital*** for several reasons:

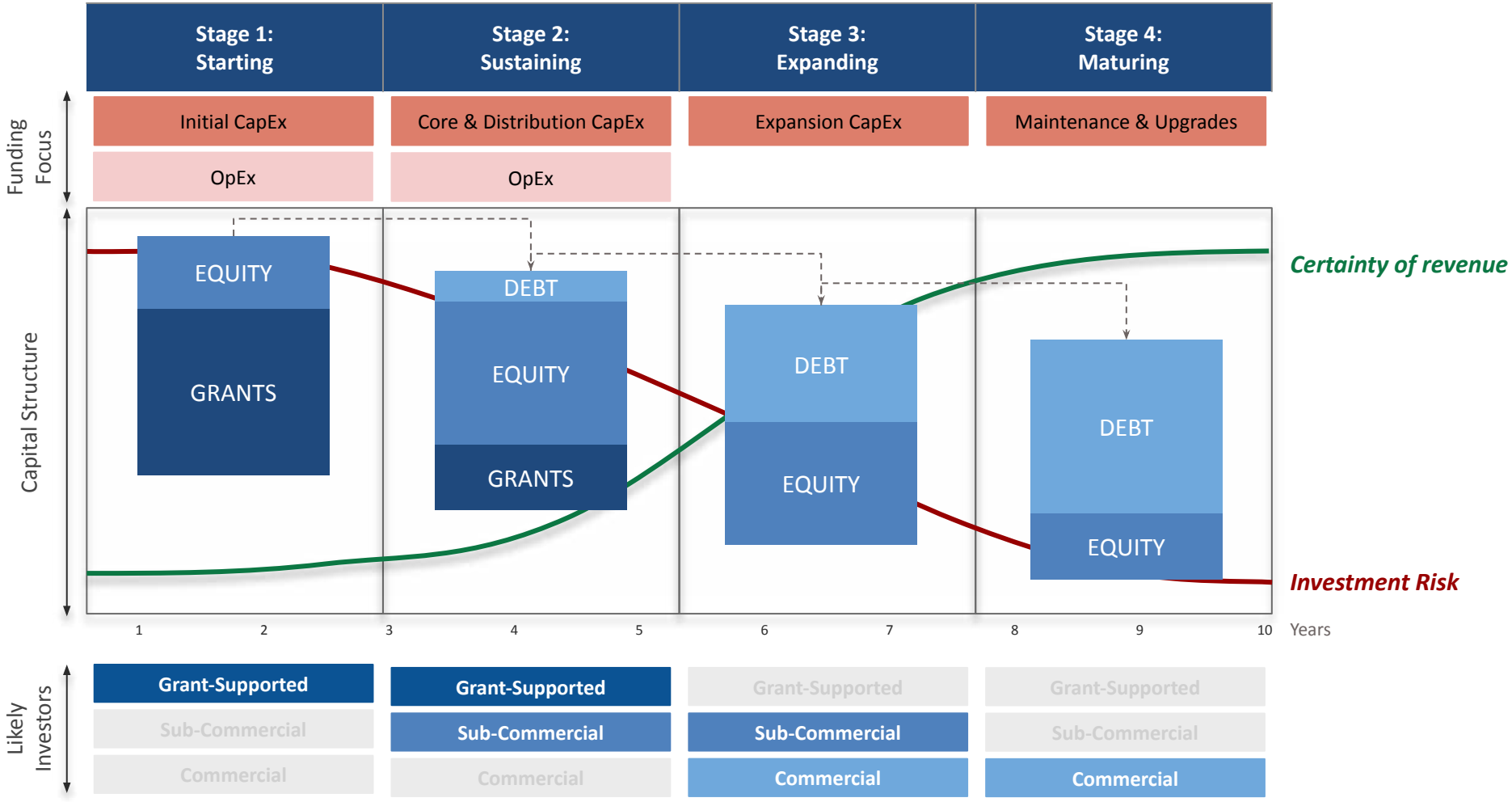
- **Viability / validity**: The presence of a sector-specific player acting as concessionary capital signals that the fund and investment thesis are sound
- **Risk-return profile**: The concessionary capital improves the risk-return profile of the investment for other investors
- **Impact**: The catalytic nature of the funding, and the improved viability of the fund, creates outsized impact

Blended finance allows organizations that have different objectives to collaborate and invest alongside each other while achieving their own financial and/or developmental objectives

BLENDED CAPITAL STACK OF A CCP



Financing mechanisms: The capital structure and funding mechanisms change based on the stage and risk level of the CCP



Source: Adapted from Meaningful school connectivity report published by Giga & BCG (2021)

Section 4: Financing Mechanisms

4.1 Developing a financing plan

4.2 Financing mechanisms

4.3 Sources of capital

Sources of capital: To obtain external funding, CCPs may need to achieve initial milestones and demonstrate a path to sustainability

ILLUSTRATIVE CHECKLIST FOR CCPs SEEKING EXTERNAL FUNDING

1. Strong local team with project champion

2. Community support and involvement

3. Access to land for site construction

4. Access to reliable & affordable backhaul

5. Regulatory approvals or exemptions

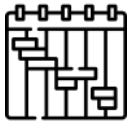
6. Strategic partners with technical expertise

7. Customer segments with purchase intention

8. Clear use of proceeds

9. Business plan & sustainability strategy

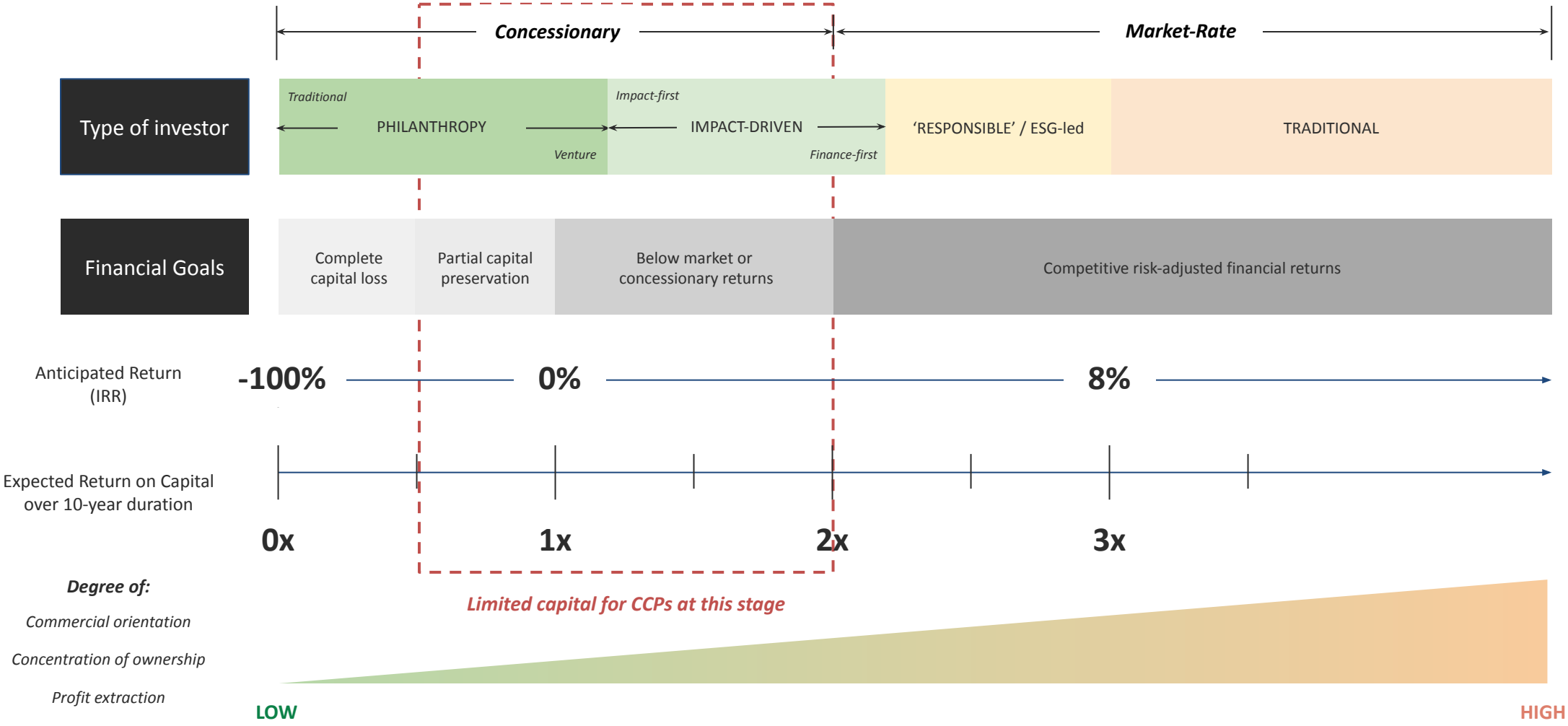
10. Social and environmental impact



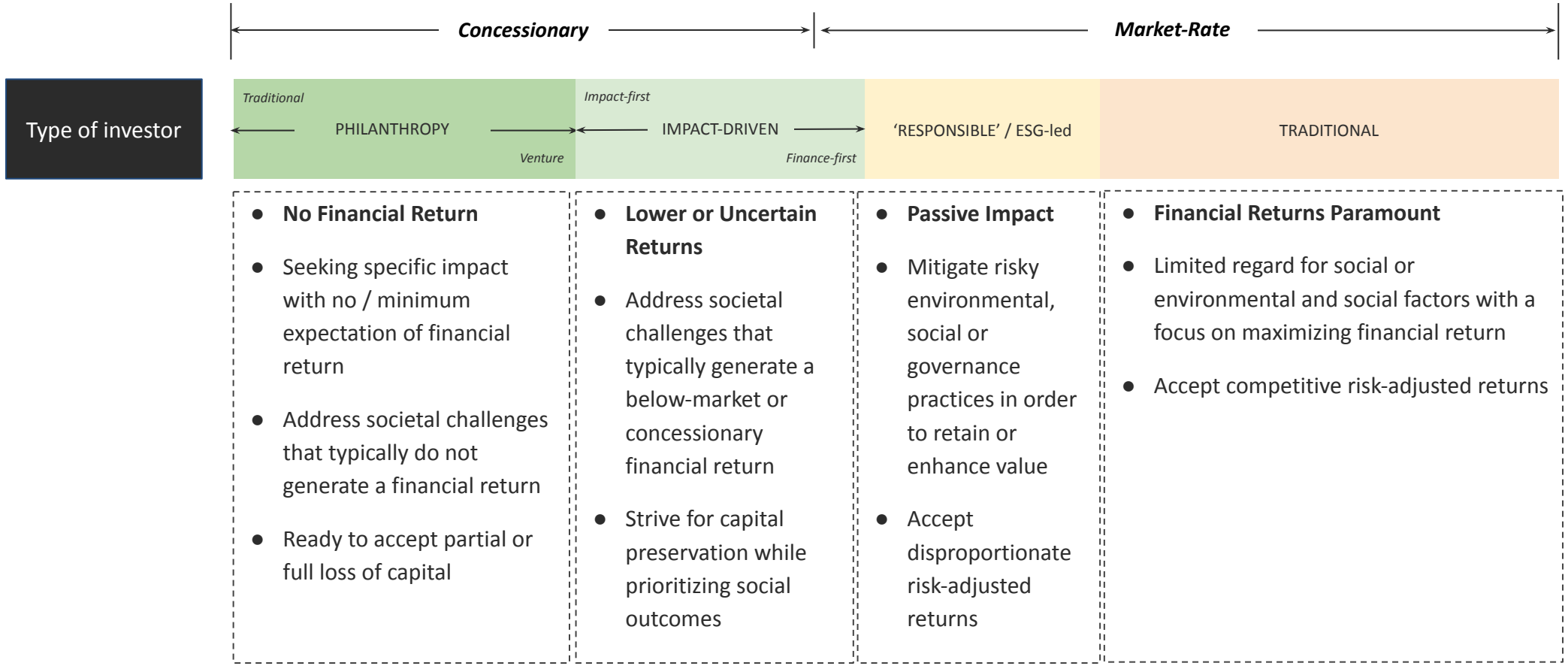
11. Project Plan & Timelines

12. Training & Capacity Building Plan

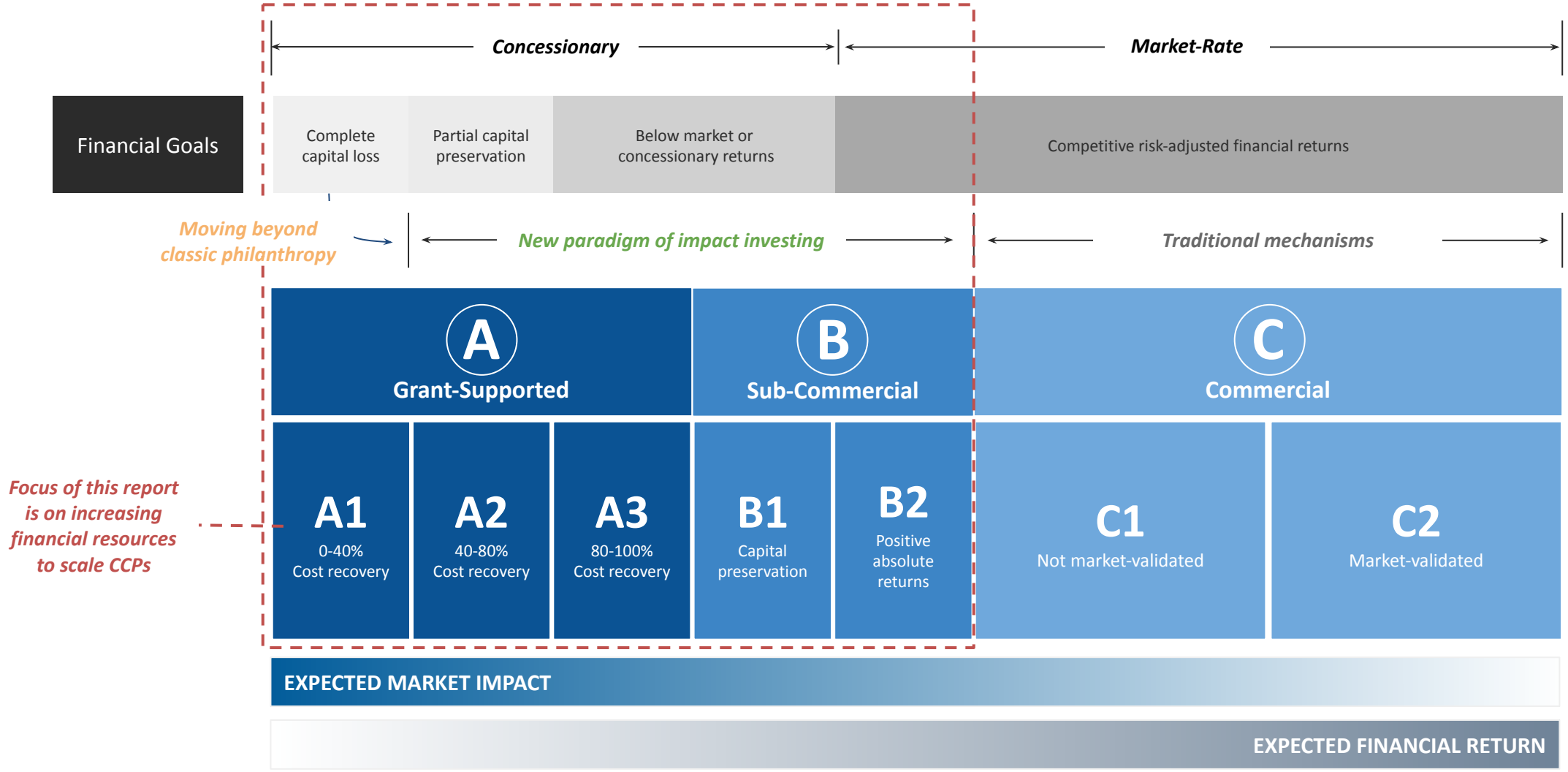
Sources of capital: The spectrum of financing providers range from no return expectation to capital preservation to above market-rate return expectations



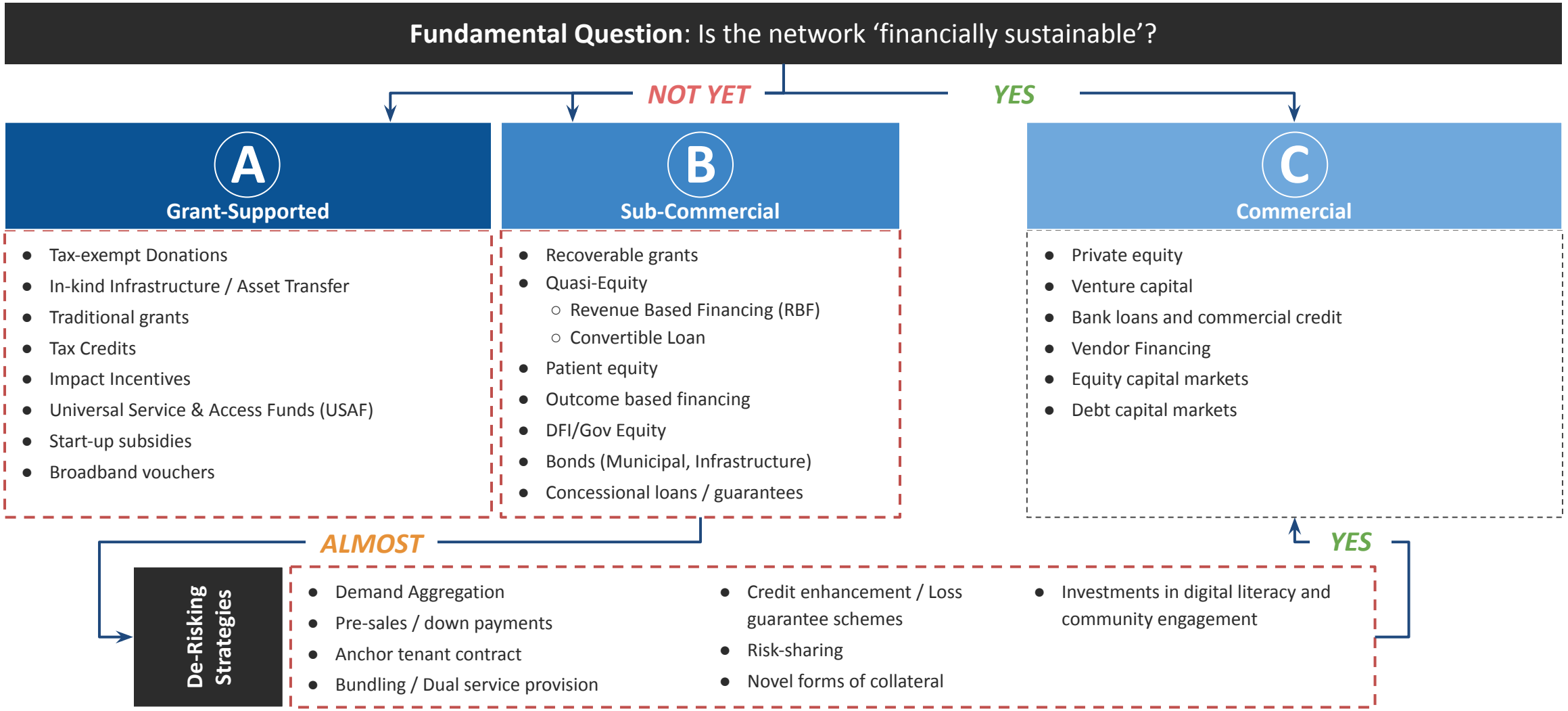
Sources of capital: Large quantum of capital is available to traditional operators and incumbents that prioritize maximizing financial return



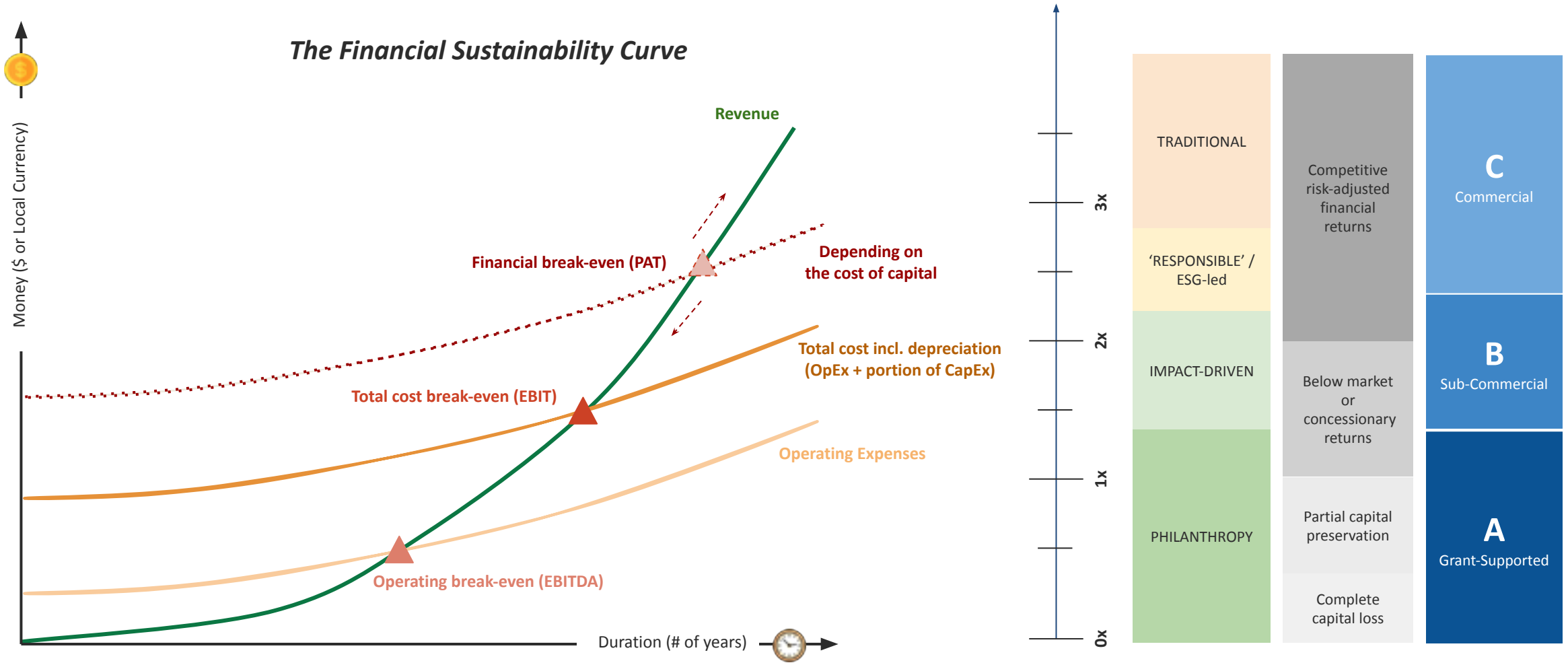
Sources of capital: More capital is required to support CCPs in early stages, especially those that are beyond the initial sustainability milestones and growing at a slow rate



Sources of capital: The typical financing pathway for CCPs depends on the financial sustainability of the underlying network



Sources of capital: The types of funding available changes as CCPs navigate along the Financial Sustainability Curve



Section 5: Recommendations

Section 1	Background
Section 2	Role & Development of CCPs
Section 3	Ownership & Operating Models
Section 4	Financing mechanisms & de-risking strategies
Section 5	**Recommendations**

Section 5: Recommendations

What to expect in this section?

The last section in this report is geared towards actionable recommendations for various stakeholders in the financing ecosystem.

First, we recap the key takeaways from this report, highlighting the distinct competitive advantages of CCPs, the stage-dependent availability of capital, and the importance of aligning financial expectations.

Next, we address the question of why CCPs are deserving recipients of additional financial capital.

Finally, we split our recommendations for three primary stakeholders - governments & policy makers, CCPs, and current & potential funders - to unlock more capital to this segment of operators.

Along with the case studies featured in Annex A and the country policy reform initiatives highlighted in Annex B, readers of this report should have a broad understanding of the background of connectivity, the role and development of CCPs, the various owner-operator models, and the financing mechanisms & de-risking strategies to fund and grow these networks.

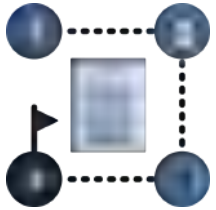
Key Takeaways

- Among other factors, the impact of CCPs depend on their ability to:
  (i) leverage community assets to lower the cost of deployment,
  (ii) optimize owner-operator model to appropriate stage & context,
  (iii) prioritize financial sustainability and align financial expectations
- CCPs play a vital role in addressing unserved & underserved regions in a cost-efficient and scalable way. Moreover, most CCPs operate to bridge the digital divide in regions that have traditionally been deemed “unprofitable”. Importantly, CCPs help create and retain value within local communities. For all these reasons and more, governments and investors should consider increasing capital allocations towards these type of operators.
- The key stakeholders can all play a role in unlocking more funding:
  (i) Government: Create an enabling regulatory environment that supports CCP development
  (ii) CCPs: Prioritize cost-effective deployments to achieve financial sustainability and maximize impact through each stage of growth
  (iii) Funders: Provide effective subsidies, multi-cycle grants & sub-commercial capital to financially sustainable CCPs

Key Takeaways

CCPs HAVE DISTINCT COMPETITIVE ADVANTAGES

- The financial feasibility of CCPs are largely determined by the degree to which they can avoid or decrease costs of building & operating a network.
- CCPs that engage local stakeholders, and leverage community resources to lower the cost of deployments have a higher chance of sustainability.



STAGE & STRUCTURE AFFECT CAPITAL AVAILABILITY

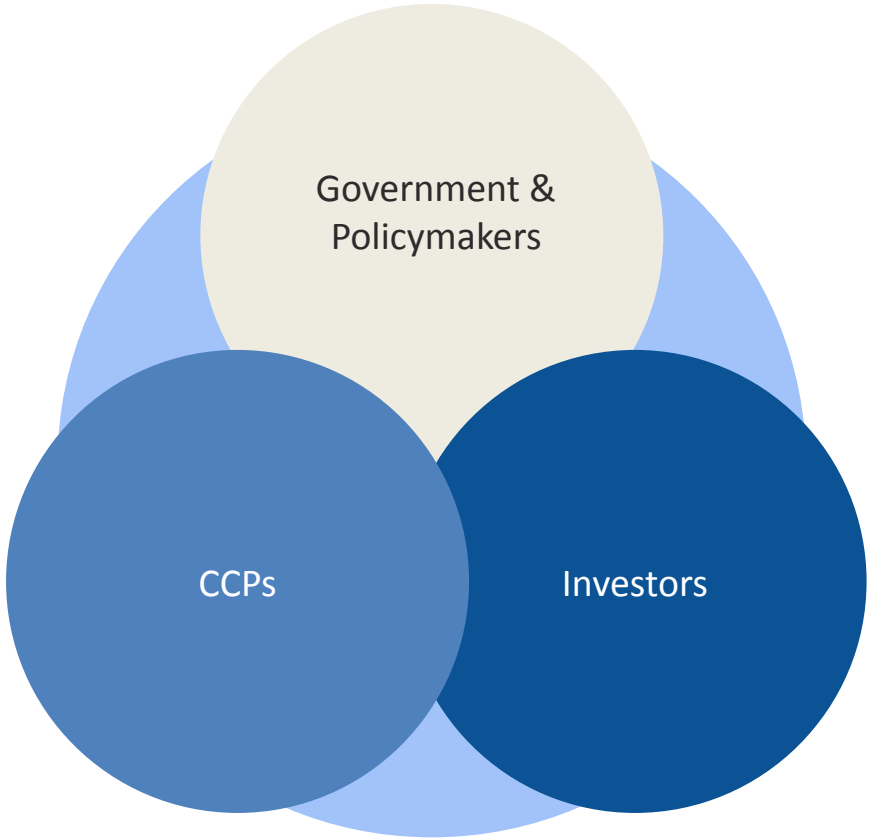
- The capital available to CCPs is a function of their stage of growth, financial sustainability, and choice of owner-operator model
- CCPs that are self-reliant, evolving into meso organizations, or have specialized local registration status have an enhanced ability to deliver connectivity at scale and attract larger amounts of capital.

ALIGNMENT OF FINANCIAL EXPECTATIONS IS KEY

- When choosing between different financing mechanisms, CCPs have to evaluate trade-offs, true cost of capital, and return expectations.
- CCPs that match financing sources with appropriate projects and return profiles are most likely to have access to sustained funding.

Three major actors influence the impact of CCPs

Major Stakeholders in Financing Ecosystem



Why Allocate Additional Capital to CCPs?

- CCPs operate in unserved and underserved communities where traditional commercial operators do not.
- CCPs address market failures and serve nascent markets that commercial operators believe to be unprofitable.
- CCPs have demonstrated viable, alternative, low-cost strategies that are adaptable to local context and can scale.
- CCPs prioritize locally owned and operated projects that retain value within the community, create local employment, and support self-reliance.

Recommendation for government & policy makers: Create an enabling regulatory environment that supports CCP development and encourages investment

Enabling regulatory environment for CCPs

- **INTEGRATE** all types of CCPs (CNs, Municipal Networks, Social Enterprises) into the national broadband strategy and digitization policies
- **SIMPLIFY** and streamline licensing regulations and procedures that provide legal status to CCPs
- **ESTABLISH** clear options for affordable spectrum usage, pole and duct access, and infrastructure sharing policies
- **CREATE** transparent wholesale open access to backhaul through open data platforms or investments in physical infrastructure (dark fiber, conduits, etc.)

Light-touch and proportionate regulations for CCPs to keep transaction costs affordable and reduce barriers to entry

Encourage investments into CCPs

- **FISCAL INCENTIVES:** Fee exemptions (customs waivers on import duties for open-source hardware/software) and tax breaks for investors
- **FINANCIAL CONTRIBUTIONS**: Dedicated USAF allocation for CCPs, voucher schemes, grants, low-interest loans and loan guarantees
- **TECHNICAL ASSISTANCE**: For capacity building, feasibility studies, quality assurance, technical and management expertise, governance models, open-source tools etc.

Targeted & transparent 'smart' subsidies that reduce over time with an end-point and incentivize investments

Source: Adapted from APC and ISOC materials

Recommendations for CCPs: Prioritize cost-effective deployments to achieve financial sustainability and maximize impact through each stage of growth

Recommendations by Stage			
Stage 1: Starting	**Stage 2: Sustaining**	**Stage 3: Growing**	**Stage 4: Maturing**
● Align mission with financial sustainability from the onset ● Keep costs low ● Engage community and chart a path to self-reliance	● Focus on user growth ● Maintain focus on lowering the cost of network build and operations by leveraging the strategic advantages of a community-driven model	● Leverage mechanisms to bring economies of scale: ○ Bandwidth buyers club ○ Shared technical & admin resources ○ Meso org structure	● Focus on replicability or sharing of best practices, open-sourcing information, influencing capital availability, and advocacy

General Recommendations

- **Right size costs for stage of life-cycle** with a sharp focus on network economics and sustainability metrics
- **Target the next sustainability milestone** by developing business models for sustained self-generated revenue
- **Diversify income streams** by creating multiple revenue and funding sources
- **Identify the stage-appropriate sources of capital** and consider key trade-offs, true cost of capital, and return expectations
- **Prepare for investment readiness** by showing demonstrable impact, defined use of proceeds, and pathway to sustainability

Recommendations for funders: Unlock additional funding for CCPs that are financially sustainable and generate significant social impact

A
Grant-Supported

- **Reduce the transaction costs** of subsidies & grants - increase flexibility, simplify impact metrics, and streamline reporting requirements
- **Consider one-time grants** to offset client installation costs
- **Right-size grant support** based on stage of CCP and scale of operations
- **New multi-cycle phased grant making strategies** that encourage operators to move to next sustainability milestone and unlock larger funds at each subsequent stage

B
Sub-Commercial

- **Recognize and value the unconventional assets built up by the community** - local community engagement and participation, access to property and rights of way, access to spectrum and/or social-purpose spectrum licenses
- **Reduce transaction costs** by fronting key issues (financial and impact targets, reporting frequency and metrics, terms)
- **Provide more capital and liquidity** to operators with demonstrated track record and meso organizations
- **Use innovative mechanisms** - blended finance, concessional loans, credit guarantees etc.

Annex A: Case Studies

Case Study

United Kingdom: B4RN

Government sponsored voucher schemes provided the incentive for B4RN to accelerate growth and reach scale to access a crowdfunded bond promoted by a bank

Company:	Broadband for the Rural North Ltd (B4RN)
Location:	Lancaster, United Kingdom
Year Founded	2011
Legal Registration	Non-Profit Community Benefit Society
Technology	Gigabit Fiber Optic Network
Network	20K+ properties passed with 9K customers & 3000+ km of fiber

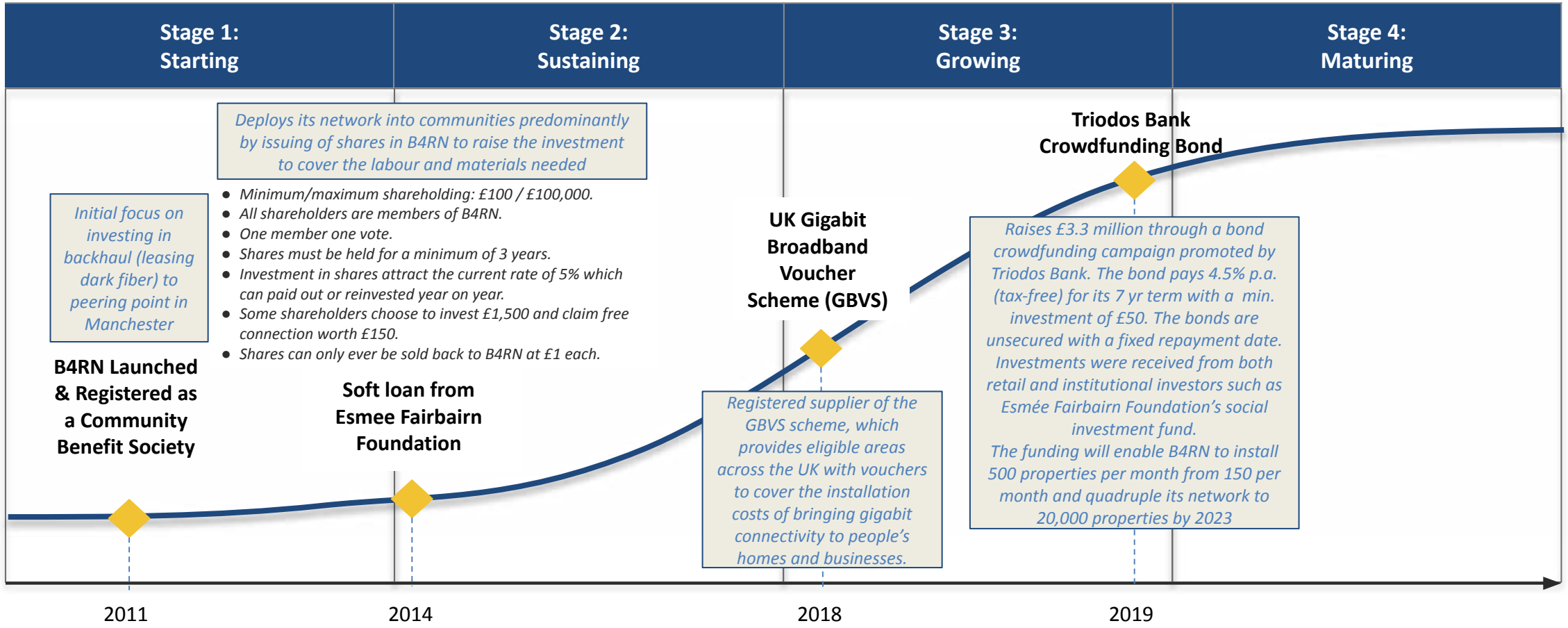
Ownership & Operating Model	• B4RN is a professionally designed fibre optic broadband network. • As a Community Benefit Society, B4RN, can never be bought by a commercial operator and its profits can only be distributed to the community or used to expand the network. • B4RN is run by a dedicated local team of 70 staff with the support of landowners, contractors and volunteers. • B4RN charges a one-off £150 connection fee and a monthly service fee (£30) for 1 Gbps FTTP broadband
Financing Mechanisms	Originally, the majority of the network was funded by communities investing in the company through shares, but more recently B4RN has harnessed millions of pounds worth of gigabit vouchers and community investor loans: 1. Individual investors can buy shares in B4RN for a target return of 5% p.a. 2. The Department of Digital, Culture, Media and Sport (DCMS) runs the UK Gigabit Voucher (UKGV) scheme to help improve broadband connectivity. Voucher applications tied to businesses can be worth up to £3,500 towards a community's network build. Residential ones are worth £1,500. Businesses and residences can also get a £150 dig grant to go towards the cost of getting B4RN ducting from the edge of their property to their wall. 3. In 2020, B4RN raised £3.3 million via a 7 year crowdfunded bond issued by Triodos Bank paying 4.5% gross per year.
The Impact	• B4RN has more than 2,900 shareholders • Local communities have invested more than £9m in B4RN • Uptake of B4RN averages about 75% of properties under coverage

Source: B4RN Bond Offer, Triodos Bank, ISPreview

Case Study

United Kingdom: B4RN

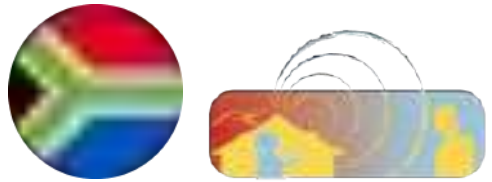
Financing mechanisms over the lifecycle



Source: B4RN Bond Offer, Triodos Bank

Case Study

South Africa: Zenzeleni



SA's first cooperative-owned ISP, Zenzeleni is pursuing financial sustainability aided by grant funding and anchor client revenue

Company:	Zenzeleni Networks
Location:	Rural Eastern Cape, South Africa
Year Founded	2012
Legal Registration	Non-Profit Company registered in 2017
Technology	Wireless Mesh & Fixed Wireless
Network	Several communities in the rural Eastern Cape province, specifically in Mankosi, Nomadolo and Zithulele

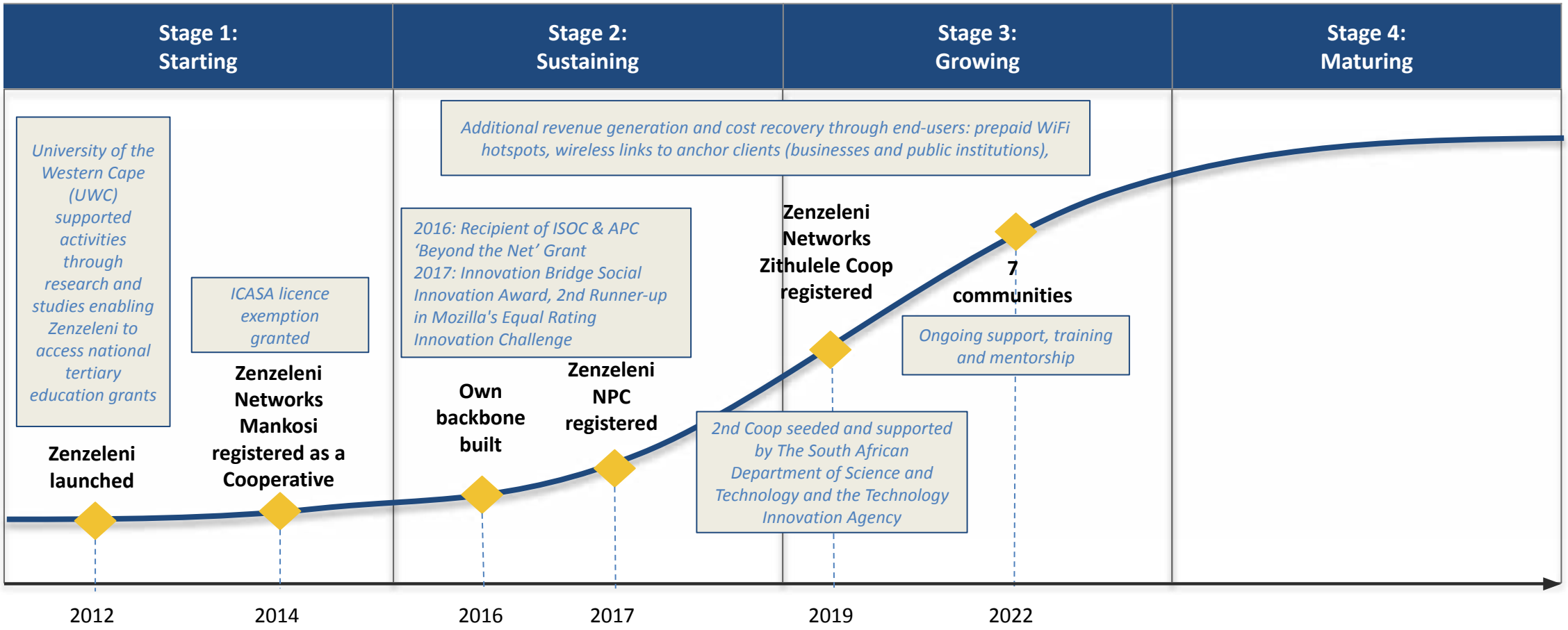
Ownership & Operating Model	• Zenzeleni is made up of community cooperatives and an umbrella non-profit company (NPC). The coops are the legal internet service providers that own, govern, operate and maintain the network within their respective communities. The NPC supports communities in seeding new cooperatives. • Communities help maintain the network and keeps it safe. All hotspots and backbone nodes are hosted and secured by families and individuals. Common assets and services are shared and aggregated to bring down costs. • In 2014, Zenzeleni established its first legal cooperative ISP and subsequently received full ICASA licence exemptions to offer communication services. • In 2017, Zenzeleni secured its first private sector client (anchor tenant), the local branch of a large corporate and continues to pursue this model
Financing Mechanisms	• Funds from various local and international awards allowed Zenzeleni to create its own wireless backbone (ISOC Grant, Mozilla Equal Rating Innovation Challenge and South Africa national award for Best Innovation with Social Impact): • At this stage, the coops generate enough income to pay for its own bandwidth, replace infrastructure and grow its network by adding more access points. Coops contribute a nominal fee to the NPC for the shared cost of a technician • The NPC has until recently run on a volunteer basis, with intermittent support from grants. • Zenzeleni's ecosystem (NPC and different coops) will reach sustainability when several coops serving different communities contribute a fee towards maintaining a network that is treated as a common-pool resource and managed by the NPC.
The Impact	• Just Zenzeleni Networks Mankosi Co-op Ltd, a 100% Black, 40% women-owned cooperative has connected more than 13,000 people and 10 institutions, offering prices as much as 20 times lower than those offered by existing operators.

Source Zenzeleni

Case Study

South Africa: Zenzeleni

Financing mechanisms over the lifecycle



Source Zenzeleni

Case Study

USA: City of Ammon Fiber Optics

CITY OF Ammon FIBER OPTICS when the media matters.

The Ammon model proves out the benefits of broadband infrastructure as a utility, where residents own the fiber and providers compete to serve

Company:	City of Ammon Fiber Optics
Location:	Ammon, Idaho
Year Founded	2011
Legal Registration	Municipal Utility
Technology	Software-defined networking over Gigabit Fiber
Network	Completed construction of 4 LIDs out of a total 7

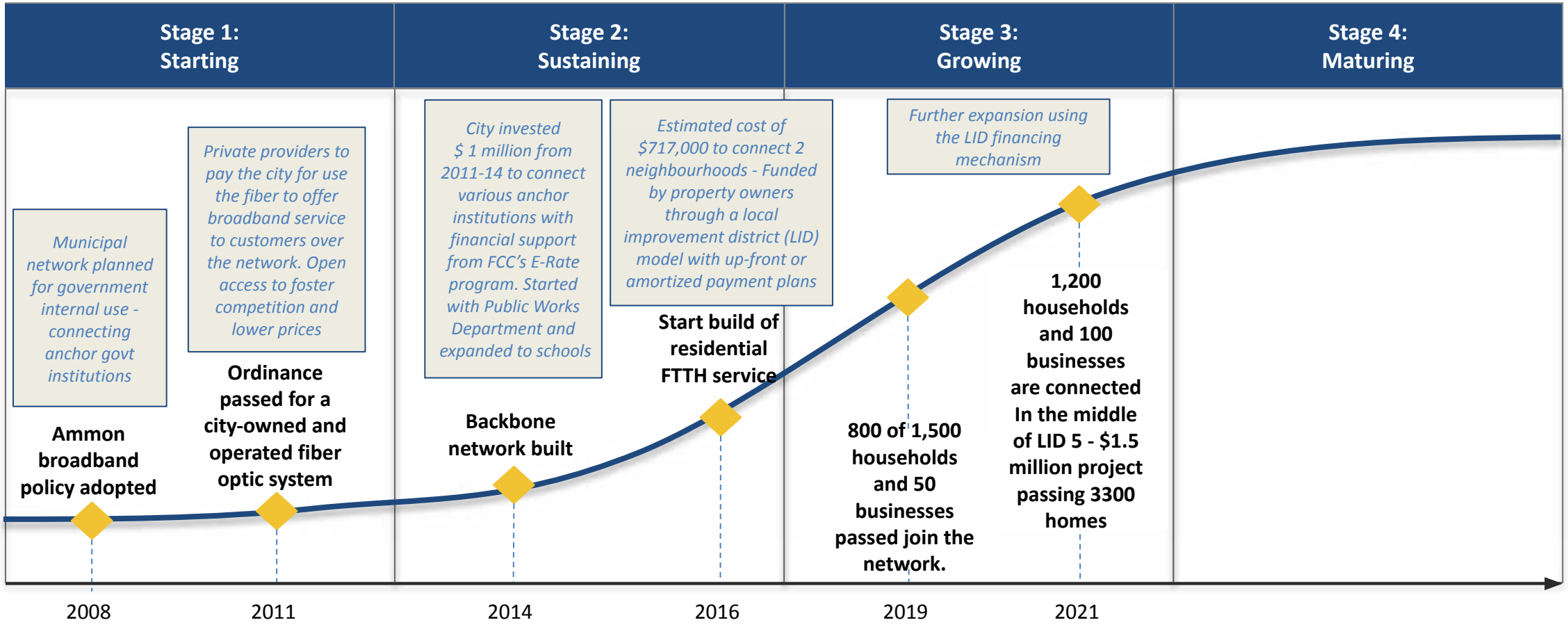
Source: Open Technology Institute, Strategic Networks Group, Information Technology & Innovation Foundation (ITIF), Benton Institute & ILSR, EntryPoint

Ownership & Operating Model	• Ammon provides an open access network, with multiple Internet service providers (ISPs) providing service over a common infrastructure. The municipality facilitates the financing and construction of the infrastructure and then takes on the responsibilities of maintenance and operation. • Property owners have the option to build and own their connectivity through the creation of **local improvement districts (LIDs)**. • Through software-defined networking, users have the option to switch providers instantly,
Financing Mechanisms	• Ammon attempts to overcome the challenging economics of an open-access system by essentially having groups of end users pay for the up-front costs of construction. A group of property owners in a particular area of town first commit to participate in the network, creating a 'LID'. As a part of this LID, customers face either long-term payment plans on a municipal bond to cover installation fees or face an up-front cost of $3,200 to $3,600. • This bond is attached to the property of the collective district, rather than the municipality, shifting the financial risk from the city and to the property owners. • The cost of the service is thus recouped through multiple streams: (1) a municipal bond attached to end users' properties, (2) ongoing payments to the utility for operating expense of the equipment, and (3) payment to the service providers that operate on top of the infrastructure.
The Impact	• Ammon's fiber network has reduced municipal costs and improved public service and community anchor institution bandwidth tenfold (1 gigabit to 10 gigabits) and seen prices drop for 1Gbps from $99 per month to $10 per month. • The annual business economic impacts better (faster, more reliable) broadband enables plus the household savings are additional layers of community benefits that make the case for public investment.

Case Study

USA: City of Ammon Fiber Optics

Financing mechanisms over the lifecycle



Source: Open Technology Institute, Strategic Networks Group, Benton Institute & ILSR

Case Study

Spain Guifi.net

Paves the path for a disruptive open and neutral model based on an "infrastructure-as-a-commons" network deployment

Company:	guifi.net Foundation
Location:	Catalonia, Spain
Year Founded	2004
Legal Registration	Private Not-for-Profit Foundation
Technology	Wireless & Fiber
Network	37,000+ active nodes covering 70,000+ km of links across the Catalonia and the Iberian peninsula. Traffic levels of 20-50 Gbps

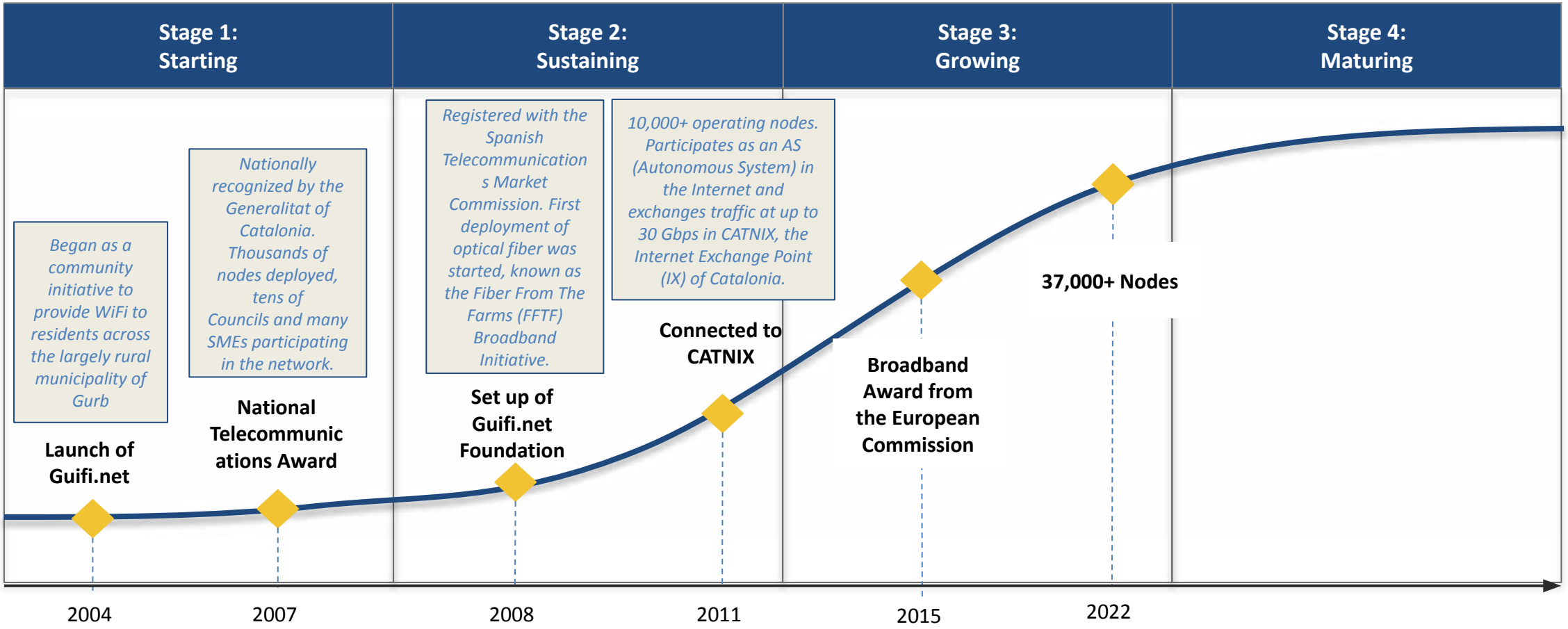
Source: Guifi.net, Telecommunications Reclaimed Handbook, IFIP World Information Technology Forum

Ownership & Operating Model	• A Not-for-Profit, a Volunteering Entity, an NGO for development and a telecommunications operator all at once. • Chose the 'Foundation' legal entity to protect against (i)privatization, (ii) the risk of unfair representation, (iii) hostile takeovers • The network infrastructure is treated as a common-pool resource & public good. • Collaboration occurs among four groups of participants: i) volunteers, ii) professionals / service providers, iii) customers, and iv) public administrations • Participation in the network is regulated by a set of governance tools (conflicts resolution system, economic compensations mechanism, etc).. • 20+ companies compete to provide professional services over the network but cooperate to deploy and operate the network.
Financing Mechanisms	• **Sponsorships**: The network grows and is maintained by volunteer or citizen-donated nodes forming the pooled network infrastructure. • **Public funds**: In many areas, networks are partially supported by funds via municipalities or education institutions that install nodes to facilitate internet use. • **Grants & Awards**: From various international, regional and local govt. agencies • Installation and maintenance costs can also be distributed among private operators who do business on these services. Commercial operators have to allocate a part of the fees they charge for their services to the maintenance, upgrade and development of the commons network.
The Impact	• Guifi has pioneered a new approach to common-pool infrastructure deployment with the participation of for-profit companies and governments in addition to volunteers and beneficiaries. • An estimated 50,000+ users are served through the guifi.net network, making it one of the largest community networks in the world.

Case Study

Spain Guifi.net

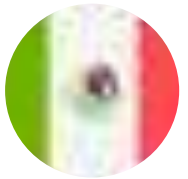
Financing mechanisms over the lifecycle



Source: Financial Times, Global Information Society (GIS) Watch 2018,

Case Study

Mexico: Rhizomatica



Demonstrates how flexible regulation can enable local sustainable economic development in underserved localities through community-owned infrastructure

Company:	Rhizomatica
Location:	Americas (Mexico, Brazil, Colombia)
Year Founded	2009
Legal Registration	Not-for-profit organization
Technology	Licensed IMT (mobile) spectrum
Network	20+ active networks across Central & South America

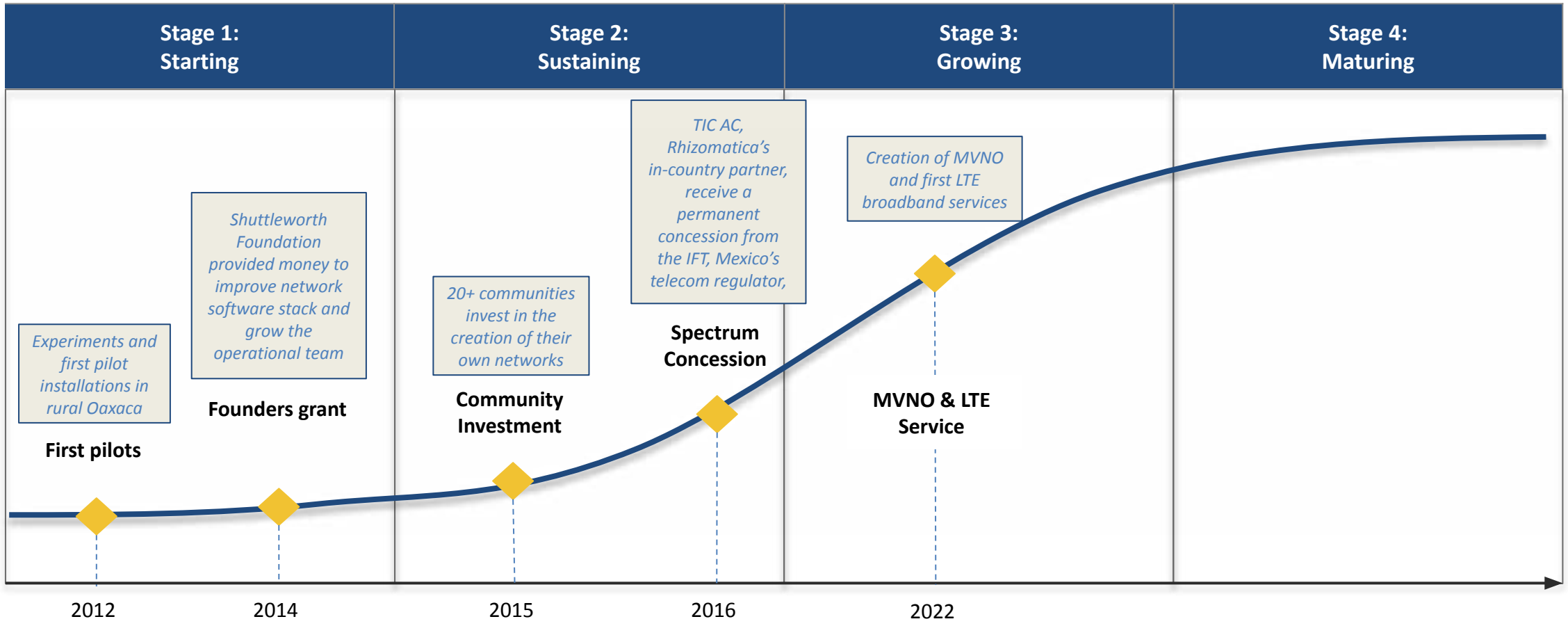
Ownership & Operating Model	• Rhizomatica is a non-profit that helps create regional community telecommunications cooperatives that enable low-income communities to own and operate their own small, local mobile networks. • As a result of Rhizomatica's ongoing advocacy in Mexico, the regulator officially allocated parts of the 850 MHz spectrum band to be designated for social use. • Networks are operated and managed locally. Rhizomatica works with in-country organisations to set up the network and troubleshoot problems. Rhizomatica supports ground operations teams to provide technical services, including backhaul & remote network management.
Financing Mechanisms	• Communities invest ~US$10,000 in CAPEX required for network installation. • The revenue model features fixed monthly membership fees that entitle users to unlimited calls within the local or any other Rhizomatica partner network. The monthly user fee is $2.00 USD, with $0.75 go to management fees, and $1.25 staying in the community to cover operating expenses and recover investment costs. Users also can purchase air-time credit to make long-distance calls. Any revenue generated above operating costs stays within the community. • Rhizomatica itself is supported through grants from various international organizations (ISOC, Mozilla, APC, Ford Foundation, etc.)
The Impact	• A key enabler of Rhizomatica's approach was gaining the Mexican regulator's approval to use licensed, but unused, spectrum for community-based networks where traditional service providers choose not to operate. • Rhizomatica's has supported the creation of 20 active networks with over 4,000 active users per month.

Source: USAID, Closing the Access Gap (2017); Rhizomatica

Case Study

Mexico: Rhizomatica

Financing mechanisms over the lifecycle



Source: Rhizomatica

Case Study

USA: RS Fiber

RS FIBER COOPERATIVE

A subordinated development loan backed by a general obligation tax abatement bond seeded the construction of RS Fiber's cooperative-owned broadband network

Company:	RS Fiber
Location:	Renville-Sibley counties in Minnesota, USA
Year Founded	2012
Legal Registration	Cooperative
Technology	Wireless & Fiber
Network	Service area of 700+ sq. miles and 6,200 households

Ownership & Operating Model	• Registered as a 308B Minnesota Cooperative. If profits are generated, the coop will allocate its earnings to members on the basis of use rather than investment. • The cooperative partnered with Hiawatha Broadband Communications (HBC), a growing ISP in southeast Minnesota, to operate the network. HBC provides telephone, television, and Internet access services across the RS Fiber network.
Financing Mechanisms	• The 10 cities and 17 townships that voted to join the network have formed a Joint Powers Agreement to collectively sell a $13.7 million Generally Obligated (G.O.) Tax Abatement Bond and make an economic development loan to the coop. The coop will make the bond payments on behalf of the cities and townships. The bonds and the loan was originally for 20 years at 4.5% • The loan was made subordinate to additional financing. Thus local governments would be repaid last if the network failed to meet financial targets. This structure was instrumental in attracting an additional $42 million in senior secured financing from private banks and investors. • As long as the network hits its financial targets, no taxpayer dollars will be used. The co-op will repay its loans to the local governments with revenues from the network, but local taxes will make up the difference if it falls short. • RS Fiber also received some grant funding as part of the CARES funding program, Office of Broadband Development and the Blandin Foundation.
The Impact	• In 2018, RS Fiber announced that it was falling short of its financial targets, requesting tax payers to cover the shortfall (~$1.07 million). The coop refinanced the bond and is now conservatively projecting that they will be able to resume loan payments within a 7-9 year timeframe. • RS Fiber continues to grow with increased coverage and new subscribers at exponential lower prices for high-speed fiber broadband

Source: RS Fiber, ILSR

Case Study

Argentina: AlterMundi

Systematically lowered the cost of deployments by developing their own low-cost hardware and gaining free access to unused upstream bandwidth

Company:	AlterMundi
Location:	Córdoba province, Argentina
Year Founded	2011
Legal Registration	Non-profit association / Civil association
Technology	Mesh WiFi
Network	100+ nodes across 5 villages/small towns around José de la Quintana

Ownership & Operating Model	• Households in multiple village-based informal groups install their own mesh Wi-Fi routers to connect with each other and to a shared mesh network operated by QuintanaLibre with a high site and low-cost long-distance backhaul • AlterMundi was formed as a non-profit association to manage the shared infrastructure for the village networks and to support technical development and community network movements around the world. Each community network is independently governed. • To participate in the network, purchase and self-installation of the equipment is expected, and regular training sessions are provided. There are also members of the community who can be paid to carry out an installation.
Financing Mechanisms	• Initially obtained 20 Mbps as a two-year donation from a local wireless ISP. Subsequently, a partnership was established with the National University of Córdoba, provides access to its unused internet capacity at no cost (20 mbps during the day, 200 Mbps at night). • IPv6 addresses and its AS number were provided without charge by LACNIC, the regional registry for Latin America and the Caribbean • Cost recovery from users - small monthly contributions to cover equipment replacement costs • Partnership with company to manufacture low-cost mesh wireless 'LibreRouter' to address deficiencies in existing commercial equipment, partially supported by a grant from the tech community
The Impact	• Design and development of innovative open hardware & software solutions • In 2021, Argentina launched the Roberto Arias Connectivity Program, advised by AlterMundi, to provide USF financing up to $10m pesos to community networks. • In late 2018 AlterMundi received a licence from the national regulator for provision of non-profit connectivity services in areas of less than 5,000 people.

Source: Bottom-up connectivity strategies (APC, 2019)

Case Study

Uganda: BOSCO

Leveraged local and international partnerships to provide connectivity to isolated communities in Northern Uganda

Company:	Battery Operated Systems for Community Outreach (BOSCO)
Location:	Gulu, Uganda
Year Founded	2007
Legal Registration	Not-for-Profit Organization
Technology	Unlicensed WiFi
Network	28 sites across villages, camps and small towns near South Sudan border spanning 160+km

Ownership & Operating Model	• BOSCO has two institutional structures – the Ugandan non-profit agency, and a US Section 501c charity (responsible for resource mobilisation and strategy) • The church-based NGO operates Wi-Fi links for public access centres and schools in an area affected by refugees, with a focus on solar power provision, enterprise development, youth business training. • BOSCO sets up public access centres in partnership with premise owners, and centres are managed by local youth groups. • Provides free Wi-Fi links to the centres and also to schools and other charitable organisations • BOSCO engages in digital literacy, entrepreneurship capacity building, and content for community radio station - supported through grants
Financing Mechanisms	• Funding from BOSCO Inc (USA entity) - fundraises to meet BOSCO Uganda's operational costs, donor funding, and clients who pay monthly subscriptions • External support from grants and donor funding from a wide range of partners - private foundations, UN agencies, governments and private sector that have contributed towards capacity development and equipment costs - UNICEF, DKA-Austria, 48percent, Geneva Global, APC, HORIZONT3000, ISOC, FIRE Africa, AFRINIC, SIGNIS, Trocaire, University of Notre Dame, Accenture, HP etc. • Partnerships with municipalities and refugee support agencies • Very slight cost recovery through local revenues from ICT centres • Subsidized backhaul from from the gov fibre backbone operator (NITA) in Gulu
The Impact	• 100,000+ ICT beneficiaries in a region often deprived of ICT knowledge and skills, 5 solar-powered energy centres powering 55 learning institutes and 54 ICT centres offering internet access to community anchor institutions across Uganda

Source: Bottom-up connectivity strategies (APC, 2019), BOSCO website, KICTANet

Case Study

Indonesia: Common Room

COMMONROOM NETWORKS FOUNDATION www.commonroom.info

In partnership with the local ISP and residents from the community, Common Room has brought affordable internet access to the indigenous communities in West Java

Company:	Common Room Networks Foundation
Location:	West Java, Indonesia
Year Founded	2006; ICT since 2013
Legal Registration	Non-Profit Organization
Technology	WiFi
Network	Ciptagelar village, Sukabumi regency

Ownership & Operating Model	• Public access facility in an indigenous community supported by Bandung-based NGO Common Room and the local regency (local authority). • The initial project was deployed by the residents of Kasepuhan Ciptagelar and was assisted by Awinet, a local internet service provider, and the community set up a network of wireless infrastructure across several villages. Awinet is also involved in training local residents to become prospective technicians and internet voucher vendors. • NGO-supported public access facility as part of a larger digital media, arts, and culture-based rural/urban development collaboration support programme
Financing Mechanisms	• Supported by the German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Common Room has been developing an "innovation factory" focusing on the use of ICTs in agriculture, with the aim of providing indigenous communities with scientific knowledge • Internet access cost is covered through internet vouchers that are sold and managed by the local community. In addition to funding the network development, some profit made from the voucher sale is being re-invested into the maintenance and the development of internet networks and infrastructure in some areas that still have no internet access. • Grant funding: Recipient of the Community Networks Learning Grant (APC, Rhizomatica, SIDA) program and the Pathfinder Grant program (APC) • Volunteers & community members work collectively to construct backhaul towers
The Impact	• Connected 1,000+ daily internet users in the villages of the West Java province. Priority is given to community anchor institutions - schools, health clinics, village admin offices etc. to enable them to optimize basic services for the residents.

Source: Bottom-up connectivity strategies (APC, 2019), Connecting the Unconnected (APC, 2019)

Case Study

D.R.Congo: La Différence

Cross-subsidizes its free off-peak public WiFi access by leasing fixed lines to local businesses and NGOs in Idjwi Island, DRC

Company:	Pamoja Net / La Différence
Location:	Idjwi Island, Democratic Republic of Congo
Year Founded	2017
Legal Registration	Cooperative and Charity
Technology	Unlicensed fixed wireless
Network	Rural settlements across the North and South of Idjwi Island in Lake Kivu

Ownership & Operating Model	• In 2016 - at the invitation of the Mwami (or King) on Idjwi - La Différence began collaborating with local stakeholders to co-design and install the island's first WiFi network, Pamoja Net. • La Différence provides free public wifi access to individuals and dedicated leased lines for local business. It has also set up a kiosk with tablet computers at a public access facility to assess the device ownership issue.
Financing Mechanisms	• The initial connectivity strategy was developed, and equipment sourced with assistance of the charity Falling Whistles, and design agency Fjord's Innovation Fund, which also trained local network technical support. • Partial cost recovery (~70%) via cross-subsidy from leasing fixed links to local NGOs and business who pay between $50-150 for dedicated internet access. This enables the network to provide free off-peak public Wi-Fi access through hotspots to the island community. • Recently received a grant from the Open Cellular Grants, programme of the Facebook-led Telecom Infra Project (TIP) to set up 4G base stations on the island and is now in the process of testing their deployment. • In 2019, Pamoja also received a grant from APC's Connecting the Unconnected initiative, which will run a training programme for technologists on Idjwi to gradually take-on technical management of Pamoja Net and also install an additional mast to help mitigate the risk of network downtime. ISOC's Beyond the Net Grant (2020-21) helped expand the service to South Idjwi.
The Impact	• La Différence is now also helping other communities seed a network in DRC • The network of Wi-Fi hotspots has steadily been expanded and now reaches eight different locations on the island, providing access through to about 5,000+ users & 10 businesses, and 3 free access points

Source: Bottom-up connectivity strategies (APC, 2019), La Différence

Case Study

Thailand: Net2Home

Combines external support and an entrepreneurial franchise model to provide affordable wireless internet access in a low-density rural agricultural area in Thailand

Company:	Taknet / Net2Home
Location:	Tak province, Thailand
Year Founded	2013
Legal Registration	Social Enterprise
Technology	Mesh Wi-Fi
Network	260+ Nodes across 24 villages near Mae Sot in Tak province

Ownership & Operating Model	• Affordable mesh Wi-Fi hotspots operated as a partnership between local entrepreneurs, the Thai Network Information Center (THNIC) Foundation and intERLAB, Asian Institute of Technology (AIT). • Research organization partnership with foundation that uses a local franchise model to repackage unaffordable retail fibre broadband into lower bandwidth, more affordable services for residences and small businesses • In 2016, intERLab started a social enterprise called Net2Home, in partnership with THNICF. Net2Home was adopted as the brand for the service, which is managed by THNICF. The foundation is the ISP licensee for the service and it provides the operational administration of the network via the local entrepreneur technicians who install and support the connections • The technicians receive a flat fee per month and incentives per install and sign-up. The network also employs bill collectors that follow a similar model.
Financing Mechanisms	• Volunteers from the THNIC Foundation have assisted in the initial deployment of the networks and trained the local entrepreneurs in network technologies. • Routers donated initially by companies and later provided through international research projects such as with the N4D group at the University of Cambridge • Mixed cost recovery for shared network operated by the foundation, with revenue generation for local entrepreneurs from fees charged to end-users. • Received a grant and special regulatory approval from the National Broadcasting and Telecommunication Commission to test the use of Carlson TVWS and LTE equipment for non-line-of-sight connections for base stations
The Impact	• Cost of internet services through Net2Home is 2-3x cheaper than local commercial ISP alternatives. The network now operates in 24 villages, serving 1,200+ paying subscribers accessing 260+ mesh wireless nodes.Net2Home is expanding coverage to Suphanburi and Chiang Mai province

Source: APC, Bottom-up connectivity strategies (2019), Net2Home

Annex B: Country Policy Reform

Argentina: An initial step to use the universal service fund to finance community networks, particularly in rural areas

2014

Argentina Digital Law

Established that the National Communication Entity (ENACOM) should foster and protect community networks, ensuring that their operations meet their specific technical, economic, and social needs.

2018

Argentina's Resolution 4,954/2018

Defined community networks as those managed by their own users and/or governing non-profit organizations. The community network can be expanded to include **no more than five thousand inhabitants**. This Resolution also enabled community network owners to apply for licenses for information and communication technology services, exempting them from paying a license fee. Specifically, it is not a new license, but rather a new registration category for community network owners, namely Value-Added Service – Internet Access, Community Network Owners (VARC). This change opened the possibility for community networks to apply to call for proposals of ENACOM's programs financed by FFSU **non-refundable contributions**.

2020

ENACOM approved the Internet Infrastructure Development Program

For low-income neighborhoods, funded by FFSU non-refundable contributions. ENACOM granted licenses to two community networks: Asociación Civil la Poderosa and Asociación Civil El Hormiguero

2020/2021

ENACOM approves projects and grants funds

Granted ~$380,000 to El Hormiguero's project to provide connectivity services to Villa Soldati.The project seeks to provide connectivity to five low-income neighborhoods – Barrio Fátima, Ramón Carrillo, Los Piletones, Las Esperanzas, and Los Pinos. Subsequently, La Poderosa's project was approved and was granted ~ $140,000 to provide connectivity to 16 low-income neighborhoods of nine provinces.

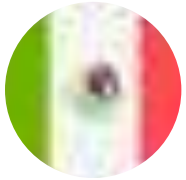
2021

Launch of the Roberto Arias Connectivity Access Program

Aims to finance the development of Internet Community Networks, supported by the FFS), through Non-Reimbursable Contributions. The FFSU is fed by contributing 1% of the total income of telecommunications service providers. The amount that has been initially assigned is 300 million pesos (~$2.3 million). Only those with VARC license (or in process of obtaining) are eligible.

Source: A4AI, Altermundi

Mexico: The first time that specific radio frequency bands have been designated for social use services in the telecommunications sector



Mexico reformed its constitution in 2013 and passed the Federal Telecommunications and Broadcasting Act (FTBA) in 2014 to include a new legal framework for community and indigenous social concessions.

In accordance with **Article 67, section IV of the FTBA**, such concessions are granted for the following purposes:

1. **Concessions for social community use:** To non-profit civil society organizations
2. **Concessions for indigenous social use:** To the country's indigenous peoples and communities

Mexico's telecom regulator, the **Federal Telecommunications Institute (IFT)**, issued guidelines for the **Annual Program for the Use of Frequency Bands (PABF)**.

Guidelines **reserve a small segment of frequency bands for this new type of concessionaires** to provide telecommunications and broadcasting services **in remote and rural areas with no connectivity.** Concessions are for both **spectrum and services** on a not for profit basis.

Article 83 of the FTBA: establishes that concessions for the social use of radio spectrum are granted through direct allocation, without requiring an auction or any other bidding process.

Article 174-L and Article 239 of the Federal Fees Act: exempts indigenous networks from paying any spectrum use fees for telecom spectrum and broadcast radio.

The reserve created in the GSM band resulted in the world's first indigenous cellular telephone network, a pioneer in that it managed to offer sustainable telephone services in highly marginalized populations of 200 to 3,000 inhabitants.

Source: ISOC

FINANCING MECHANISMS FOR LOCALLY OWNED INTERNET INFRASTRUCTURE

Connectivity Capital in collaboration with Association for Progressive Communication (APC), Internet Society (ISOC), and Connect Humanity

Connectivity Capital

APC
ASSOCIATION FOR PROGRESSIVE COMMUNICATIONS

Internet Society

Connect Humanity

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