Geneva Research Lab for Digital Impact

May-2026

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Compendium of Use Cases

Public-private Collaborations for Connectivity

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Mini-Case

The Universal Communications Service Access Fund in Tanzania

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The Universal Communications Service Access Fund in Tanzania [1]

1. Background

In the early 2000s, Tanzania's telecommunications landscape exhibited extreme lack of coverage and spatial inequality in access. While sector liberalization in the 1990s led to increased private entry, infrastructure deployment remained overwhelmingly concentrated in urban areas. In 2005, for instance, only 1.1% of the population – which numbered approximately 38.3 million at the time – were using the internet,[2] and the entire country had only 2,539 fixed broadband subscriptions,[3] which concentrated in an urban elite. Tanzania's tele-density outside major cities was among the lowest in Sub-Saharan Africa, and fewer than one in ten Tanzanians had reliable access to telecommunications services.[4]

In 2003, the National ICT Policy of Tanzania explicitly identified universal access as a core development challenge, in particular due to low rural tele-density, limited backbone infrastructure, high costs of international bandwidth, and an absence of incentives for private operators to expand networks into high-cost regions.[5] The policy acknowledged that liberalization alone would not achieve nationwide connectivity and called for targeted public intervention to bridge the digital divide, particularly in rural and underserved communities. Currently, the landscape is governed by the 2016 National ICT Policy, and the updated 2024 National ICT Policy is in the final stages of adoption. For these policies, the focus has pivoted from basic connectivity toward "Digital Economy.". As part of these pivots, UCSAF's mandate has expanded to include broader digital transformation, and digital skills capacity building for women, girls, and people with disabilities.

2. Establishment of the Universal Communications Service Access Fund

In 2006, reflecting the commitment to expand access to connectivity in the country, the Government of Tanzania issued the Universal Communication Service Access Act, which established the guidelines

[1] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[2] "Individuals using the Internet (% of population) – Tanzania," 2026, World Bank Group Data. Accessible in: https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=TZ
[3] "Fixed broadband subscriptions – Tanzania," 2026, World Bank Group Data. Accessible in: https://data.worldbank.org/indicator/IT.NET.BBND?locations=TZ
[4] "Allocating universal service subsidies using electronic multi-round reverse auctions: Telecommunications in Tanzania," 2023, World Bank Group. Accessible in: http://documents1.worldbank.org/curated/en/099651211282373597/pdf/IDU0dbf327200338f04d3e0baf708920f13a346c.pdf
[5] "2003 National Information and Communications Technologies Policy," 2003, The United Republic of Tanzania, Ministry of Communications and Transport. Accessible in: http://www.tzonline.org/pdf/ictpolicy2003.pdf

for the creation of the Universal Communications Service Access Fund (UCSAF). UCSAF was designed as a state-managed institution with a clear mandate: to promote universal access to communications services in rural and underserved areas.

In operations since 2009-10, UCSAF operates as a financing and procurement authority, not as a service provider. Its funding comes primarily from a mandatory levy on licensed communications operators which gradually increased from 0.3% of gross operating revenues originally, to 1% in 2019-20, 1.25% in 2023-24, and 1.5% as of 2025-26.[6] Other sources of funds include: Government, Parliamentary Allocation, Development Partner grants (e.g., the World Bank), among others.[7]

UCSAF essentially works as an internally financed redistribution mechanism within the telecommunications sector to procure projects to expand connectivity to previously underserved areas by contracting private-sector providers. It defines service gaps, designs subsidy schemes, procures connectivity outcomes, and monitors compliance, while leaving ownership and operation of infrastructure in private hands. Governance is anchored within the broader regulatory ecosystem, with coordination roles played by the Ministry responsible for ICT and the national communications regulator.

3. Infrastructure Investment and Service Provision

UCSAF's core activity has been the subsidization of telecommunications infrastructure deployment in areas deemed commercially unviable under normal market conditions. Its projects focus primarily on last-mile telecommunications infrastructure, particularly mobile network base stations, towers, and transmission links. The Fund subsidizes part of the investment cost required to deploy infrastructure in commercially marginal locations, while private operators retain ownership and operational responsibility. The dominant investment model has involved co-financing the construction of mobile base stations, towers, and associated transmission facilities, enabling the provision of voice services (i.e. services that transmit voice calls over the internet rather than traditional landlines), and data services to rural communities.

While early projects emphasized basic voice coverage, later initiatives increasingly prioritized 3G and 4G broadband-capable infrastructure, as well as connectivity for schools, border regions, and other forms of underserved regions.

Crucially, UCSAF does not retain infrastructure assets. Private operators build, own, and operate the networks, while subsidies are structured to cover part—but not all—of the capital and operational costs. This design ensures that operators retain long-term incentives for maintenance, service quality, and incremental upgrades.

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[6] "Government Notice No. 210 published on 24/03/2023 – The Universal Communications Service Access Fund (Cap. 422)," 2023. Accessible in: https://www.ucsaf.go.tz/uploads/documents/sw-1731650959-Tozo%20kwa%20watoa%20huduma.pdf

[7] "Allocating universal service subsidies using electronic multi-round reverse auctions: Telecommunications in Tanzania," 2023, World Bank Group. Accessible in: http://documents1.worldbank.org/curated/en/099651211282373597/pdf/IDU0dbf327200338f04d3e0baf708920f13a346c.pdf

4. Evolution

According to a World Bank Report,[8] UCSAF's implementation history can be divided into the following distinct phases:

- 2013–2015: Projects in these years covered approximately 230 administrative wards and relied on administratively defined subsidies awarded through relatively simple contracts.
- 2016–2021: Covering roughly 550 wards, projects in these intermediary years introduced static reverse auctions, where operators competed to deliver coverage at the lowest subsidy level. This shift reflects a least-cost contracting archetype, increasing cost efficiency and transparency.
- 2021–2025: In the most recent years, with projects accounting for over 1,100 wards and the majority of contracted towers, procurement mechanisms evolved further toward multi-round reverse auctions using electronic platforms, enabling iterative bidding and improved price discovery. The Digital Tanzania Project alone, for instance, includes 758 planned towers, targeting approximately 8.5 million beneficiaries.

Beyond the stages above and as alluded in the introduction, the 2024 update of the National ICT policy is currently reorienting UCSAF toward an expansion of the "Digital Economy." This expansion aims to incorporate more advanced forms of connectivity by explicitly focusing on 5G deployment and Fiber-to-the-x (FTTx) technologies to provide last-mile connectivity.

5. Public and Private Sector Stakeholders

UCSAF's operating model depends on a clearly structured division of roles between public and private actors, forming a hybrid governance arrangement for rural connectivity provision. On the public side, UCSAF functions as the central procuring and financing authority, responsible for identifying coverage gaps, designing subsidy schemes, conducting competitive procurement, and monitoring contractual compliance. These activities are aligned with the broader policy direction of the ministry responsible for ICT and implemented within the regulatory framework overseen by the national communications regulator, which manages licensing, spectrum allocation, and service standards.

On the private side, mobile network operators and infrastructure providers compete for UCSAF subsidies, co-invest private capital, deploy network infrastructure, and operate services on a commercial basis. Some of these providers include Airtel, Vodacom, TTCL, Halotel, and Honora Tanzania – this last operating under the brand name "Yas Tanzania" and originating from a 2021 merger between Tigo and Zantel, two previously independent telecommunication providers)—. Development partners, most notably the World Bank, play a complementary role by providing financing, technical assistance, and support for procurement innovation, particularly the transition toward electronic and multi-round auction mechanisms under the Digital Tanzania Project. Together, these actors form a

[8] "Allocating universal service subsidies using electronic multi-round reverse auctions: Telecommunications in Tanzania," 2023, World Bank Group. Accessible in: http://documents1.worldbank.org/curated/en/099651211282373597/pdf/IDU0dbf327200338f04d3e0baf708920f13a346c.pdf

public–private collaboration in which the state defines objectives and mitigates marginal risk, while private firms retain ownership, operational responsibility, and long-term commercial incentives.

6. Outcomes

By 2024, UCSAF had generated substantial and measurable outcomes across multiple dimensions of connectivity expansion, infrastructure delivery, and service enablement.

Between 2013 and 2025, UCSAF has supported projects in rural areas covering 1,974 wards nationwide, encompassing 5,111 villages, allocating a subsidy of over 133M USD, targeting a population exceeding 23 million people. These projects resulted in contracts for approximately 2,143 telecommunications towers, of which more than 1,600 had been completed and operational by 2024, with the remainder under implementation. A significant share of the remaining towers—particularly those associated with the Digital Tanzania Project—were under active implementation, bringing the total number of planned towers to more than 2,100 as of 2024, with completion timelines extending into 2025. Between 2013 and 2020, 351 schools were connected, with an additional 159 school connected by June 2021. This included a total distribution of approximately 800 PCs and 120 printers across these schools. By June 2022, another 219 schools were connected. Additional projects, such as the iKnowledge Projects connected 302 schools, with an additional 87 schools receiving computers through supplementary connectivity projects.[9] These infrastructure outputs have contributed to national-level improvements in access indicators: mobile penetration surpassed 95 percent, while internet usage reached approximately 31percent of the population by 2024[10], up from single-digit levels in the early 2000s.[11] [12]

Project type	Industry-focus	Time-frame	Funding
Universal service fund subsidizing rural telecom deployment via competitive auctions	Telecom infrastructure (rural)	2006–present	Operator levies, government, donor funding

Role of the government	Role of private firms	Outcomes	Success factors
Identifies gaps, runs auctions, allocates subsidies	Mobile operators co-invest, build, and operate networks	2,100+ towers, 31% internet usage, 95% mobile penetration	Competitive auctions, risk-sharing, private ownership incentives

[9] UCSAF Public Register of Universal Service Provision, May 2025. Available via: https://www.ucsaf.go.tz/uploads/documents/sw-1752395808-PROJECTS%20PUBLIC%20REGISTER%20MAY%202025(1)%20(1).pdf

[10] Individuals using the Internet (% of population) – Tanzania, May 5 2026, obtained via: https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=TZ

[11] "Connecting Rural Communities: UCSAF's Role in Tanzania's Digital Transformation," 2025, Available in: https://www.ucsaf.go.tz/uploads/documents/sw-1736250043-ATTACHMENT%20(1)%20(1).pdf

[12] "Public Register of Universal Service Provision," 2025, Universal Communications Service Access Fund. Available in: https://www.ucsaf.go.tz/uploads/documents/sw-1752395808-PROJECTS%20PUBLIC%20REGISTER%20MAY%202025(1)%20(1).pdf

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Mini-Case

DigiSchool: Internet Connectivity for Basic Education in Kenya

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DigiSchool: Internet Connectivity for Basic Education in Kenya[13]

1. Background

Kenya's integration of Information and Communication Technologies (ICT) into education has started decades ago. The National ICT Policy (2006; revised 2019), the National ICT in Education and Training Policy, and the National Education Sector Strategic Plan (NESSP 2018–2022) positioned ICT as a tool to improve access, quality, and system efficiency. The Basic Education Act (2013) further emphasized equitable access and provision of infrastructure and equipment in schools.

Beginning in 2013/14, the Government launched the Digital Literacy Programme (DLP), distributing over 1.1 million learner devices to 22,468 public primary schools, training more than 228,000 teachers, and equipping schools with projectors and content servers. By early 2020, the learner-device ratio in primary schools was approximately 1:8.[14] Electrification efforts ensured that nearly all public primary schools receiving devices were connected to power.

Despite progress in device deployment, Internet connectivity remains uneven, particularly for rural schools in ASAL regions, given challenges in establishing electricity and other basic services still affecting last-mile connectivity. While the National Optic Fibre Backbone Infrastructure (NOFBI) connected county and constituency headquarters, last-mile links to schools were incomplete. Many rural schools relied on slow or costly mobile data, limiting access to online content and digital administrative systems. The COVID-19 pandemic highlighted these disparities and reinforced policy attention on broadband-enabled learning environments.[15]

2. Establishment of DigiSchool

The DigiSchool Internet Connectivity Project was launched in 2020 as a model/pilot initiative (instead of a national policy) through a collaboration between Kenya's Ministry of Education, ICT Authority, UNESCO, and Huawei under UNESCO's Global Education Coalition framework.[16]

The Ministry of Education provided policy oversight, and Kenya's ICT Authority coordinated implementation. Huawei, through its TECH4ALL initiative, played a central operational role: conducting technical assessments, designing connectivity solutions, supplying equipment, and managing deployment. The project leveraged the government's National Optic Fibre Backbone (NOFBI). Schools within one kilometer of fiber nodes were directly connected; more remote schools used point-to-point

[13] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[14] "Internet Connectivity to Schools: Experiences and Lessons Learnt from Digischool Project in Kenya," 2023, Ministry of Education in Kenya.
[15] "Internet Connectivity to Schools: Experiences and Lessons Learnt from Digischool Project in Kenya," 2023, Ministry of Education in Kenya.
[16] "Financing the digital transformation of education - DigiSchool Kenya," 2026, UNESCO webpage. Available in: https://www.unesco.org/en/dtc-financing-toolkit/digischool-kenya

microwave links. Within schools, Huawei deployed all-optical access and FTTR-B solutions to enable high-speed Wi-Fi coverage.[17]

3. Infrastructure Investment and Service Provision

Where schools were located near existing fiber nodes, direct fiber connections were established. In more remote locations, point-to-point microwave links were deployed to bridge last-mile gaps. Within schools, the private partner implemented all-optical access and FTTR-B (Fiber-to-the-Room for Business) solutions to provide high-speed, campus-wide Wi-Fi coverage capable of supporting simultaneous classroom and administrative use. Broadband speeds of approximately 100 Mbps or higher were reported in pilot deployments, enabling stable access to the Kenya Education Cloud and other approved digital platforms. [18]

Connectivity infrastructure was complemented by network equipment, access points, and, in selected cases, video conferencing systems. The Kenya Power & Lighting Company facilitated fiber deployment in several locations by providing access to electricity poles for aerial cable installation. In schools serving learners with special educational needs, video conferencing tools enabled remote instruction and teacher training in collaboration with the Kenya Institute of Special Education (KISE).

Service provision also extended beyond classroom instruction. Teachers used connectivity for lesson preparation, multimedia content integration, online assessments, and professional development. Administratively, schools accessed digital systems such as the National Education Management Information System (NEMIS) and Teacher Performance Appraisal and Development (TPAD), supporting school-level student data management and national reporting requirements.[19]

4. Evolution

The project had two phases. Phase I functioned as a pilot, testing fiber and microwave connectivity models in rural and underserved regions and generating evaluation evidence 18 months after deployment. Phase I (2020–2021) connected 13 schools—9 primary and 4 secondary—benefiting approximately 6,000 learners and 200 teachers. In this phase, schools reported reduced reliance on mobile data bundles, with estimated annual savings of approximately US$800 per school.[20]
Phase II expanded coverage and strengthened inclusive education components, integrating remote learning tools in special education institutions and consolidating lessons into a formal evaluation

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[17] "Digischool Kenya: Transforming Education with Connectivity," 2025, Huawei Media. Accessible in: https://www.huawei.com/en/tech4all/stories/digischool-kenya-transforming-education-connectivity
[18] "Connectivity Comes to Kenya's Digischools" & "DigiSchool Kenya: Transforming Education with Connectivity," 2025. Huawei Media. Accessible in: https://www.huawei.com/en/tech4all ;
"Internet Connectivity to Schools: Experiences and Lessons Learnt from Digischool Project in Kenya," 2023, Ministry of Education in Kenya; "UNESCO Factsheet – DigiSchool Kenya," 2025. UNESCO. Available in: https://media.unesco.org/sites/default/files/webform/gec002/digischool-kenya.pdf
[19] "Internet Connectivity to Schools: Experiences and Lessons Learnt from Digischool Project in Kenya," 2023, Ministry of Education in Kenya.
[20] "DigiSchool Phase I: Lessons in Connecting Kenya's Schools," 2025. Huawei Media. Accessible in: https://www.huawei.com/en/tech4all/stories/digischool-lessons-in-connecting-kenya-schools

report to inform potential scale-up. Phase II, completed in 2024, expanded connectivity to 21 additional schools, including six.[21]

5. Public and Private Sector Stakeholders

The governance structure of the DigiSchool Kenya project combined public authority with private technical expertise. The Ministry of Education set the overarching policy direction; the ICT Authority coordinated implementation; and Kenya Power facilitated the corresponding infrastructure deployment. UNESCO contributed advisory and sector expertise, particularly in STEM mentoring and inclusion. UNICEF in Kenya equally provided technical and financial support to the Ministry of Education and CEMASTEA for the development of the STEM Strategy and Guidelines in 2024. Lastly, Huawei was responsible for solution design, equipment provision, installation, and technical project management.

6. Outcomes

An evaluation conducted 18 months after Phase I reported that 98% of learners indicated the Internet met their needs. Eighty-four percent reported that connectivity made learning more engaging, and 71% reported improved understanding of complex concepts.[22] [23] Teachers expanded their use of multimedia materials and online tools, and administrative processes were digitized more consistently.

By 2024, 34 schools—including six serving learners with special educational needs—had been connected. While limited relative to the national school system, the initiative established an operational model leveraging national fiber infrastructure and private-sector delivery.

Importantly, DigiSchool Kenya formed part of a broader portfolio of similar initiatives developed by Huwaeii through its TECH4ALL initiative. Comparable DigiSchool projects have been implemented in Senegal, and in Morocco.[24] These cases indicate the potential replicability of combining government partnerships with Huawei’s technical platform and social engagement for future connectivity projects.

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[21] “Financing the digital transformation of education - DigiSchool Kenya,” 2026, UNESCO webpage. Available in: https://www.unesco.org/en/dtc-financing-toolkit/digischool-kenya

[22] “Internet Connectivity to Schools: Experiences and Lessons Learnt from Digischool Project in Kenya,” 2023, Ministry of Education in Kenya.

[23] “DigiSchool Phase I: Lessons in Connecting Kenya's Schools,” 2025. Huawei Media. Accessible in: https://www.huawei.com/en/tech4all/stories/digischool-lessons-in-connecting-kenya-schools

[24] “Tech4All – Stories,” 2026, Huawei webpage. Available in: https://www.huawei.com/en/tech4all/stories/tags/digi-school

6.1 Outcomes

Project type	Industry-focus	Time-frame	Funding
Public-private project connecting schools using fiber, microwave, and Wi-Fi solutions	Education connectivity, hard-to-reach schools	2020–2024	Public support plus Huawei technical contributions

Role of the government	Role of private firms	Outcomes	Success factors
Sets policy, coordinates implementation, leverages national backbone	Huawei designs, deploys, and manages connectivity solutions (social project)	34 schools connected; improved learning engagement	Private-sector engagement, leveraging existing capabilities

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Mini-Case

Bharatnet in India

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Bharatnet in India [25]

1. Background

In 2011, broadband penetration in India was limited and uneven. India had roughly 100 million internet users—less than 10 percent of the population—while rural penetration remained particularly low, often below 5 percent in many states. Fixed broadband was concentrated in metropolitan areas, and most rural regions lacked high-capacity fiber backhaul. Although mobile telephony expanded rapidly, broadband-quality connectivity lagged, constraining the delivery of e-governance, telemedicine, digital education, and financial services. [26]

Other countries globally at the time were increasingly endorsing national broadband plans to support economic recovery and inclusive growth. In India, the absence of fiber connectivity at the level of 'Gram Panchayats'— regions representing the lowest tier of government in India for rural regions, roughly translated as "village councils"—was identified as a structural bottleneck. In October 2011, the Government of India launched the National Optical Fibre Network (NOFN) to provide at least 100 Mbps connectivity to approximately 250,000 Gram Panchayats. At the time, a majority of India's population resided in rural regions, many of which lacked reliable internet access, limiting access to e-governance, education, healthcare, and digital markets.

2. Establishment of Bharat Broadnet Network Limited

To implement the project, the government created Bharat Broadband Network Limited (BBNL) on 25 February 2012 as a Special Purpose Vehicle. BBNL was mandated to design, deploy, and manage the rural optical fiber backbone connecting Gram Panchayats. It functioned as a wholesale infrastructure provider rather than a retail service provider, offering non-discriminatory access to telecom service providers, internet service providers, cable operators, and content providers.

The project was funded through the Universal Service Obligation Fund (USOF), which was later replaced by the Digital Bharat Nidhi (DBN) under the 2023 Telecommunications Act.[27] The DBN is essentially a pool of funds originating from a 5% levy on the Adjusted Gross Revenue of telecom providers in India. Following slow initial progress, the NOFN project was restructured and renamed BharatNet in 2015, with modified implementation models and expanded scope. By 2023, India's Cabinet had approved ₹42,068 crore (approximately 3.9 billion euros using March/2026 exchange rate)

[25] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[26] "The Evolution of BharatNet: Lessons From India's Largest Rural Broadband Project," 2024, Bhargavee das Krithika Ramnath. Available in: https://icrier.org/publications/the-evolution-of-bharatnet-lessons-from-indias-largest-rural-broadband-project/
[27] "The Telecommunications Act, 2023" Government of India. Available in: https://egazette.gov.in/WriteReadData/2023/250880.pdf

for the project, and disbursed approximately 95% of this figure.[28] The funding model relied primarily on public subsidies, reflecting the limited commercial viability of rural broadband rollouts.

3. Infrastructure Investment and Service Provision

BharatNet's core activity has been large-scale optical fiber deployment to create a national rural backbone. The network connects Gram Panchayats and, under later expansion, extended connectivity to villages beyond Gram Panchayats. Optical fiber cable serves as the primary technology, supplemented by radio and satellite links in difficult terrain.

Public actors financed and owned the backbone, while private and public service providers leased capacity to deliver retail services. Common Service Centres facilitated Wi-Fi and fiber-to-the-home activation, while telecommunications service providers expanded last-mile connectivity through commercial offerings.

4. Evolution

BharatNet was initially designed to position BBNL as a middle-mile infrastructure/fibre optic provider, while retail access and last-mile delivery were expected to be handled by private or public operators. Over time, however, implementation models evolved to include both state-led models and private-sector participation, reflecting learning from early execution challenges. The project has had three phases up until 2025.[29] [30] [31] [32]

- Phase I (2011–2017): The initial target was to connect 100,000 Gram Panchayats by 2014. By March 2014, only 58 had been connected. Implementation relied primarily on public sector undertakings—Bharat Sanchar Nigam Limited, RailTel Corporation of India Limited, and Power Grid Corporation of India Limited. The target was achieved only in December 2017.
- Phase II (2017–2023): Phase II expanded coverage and introduced state-led and private-sector models. Deadlines were extended from 2019 to 2021 and then to 2023. In 2021, global tenders worth ₹29,500 crore were invited under a public–private partnership model across 16 states.
- Phase III (2023–present): In August 2023, the government Amended the BharatNet Program, approving a project to upgrade the network to ring topology and extend fiber to non–Gram

[28] "BharatNet: Expanding Internet Access, Expanding Rural Progress," 2025, Government of India – Press Information Bureau. Available in: https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2123137&reg=3&lang=2

[29] "BharatNet Unplugged: Transforming Rural Connectivity in India," 2024, India Brand Equity Foundation. Available in: https://www.ibef.org/blogs/bharatnet-unplugged-transforming-rural-connectivity-in-india

[30] "Global tenders worth Rs 29,000 crore invited for BharatNet," 2021, MoneyControl. Available in: https://www.moneycontrol.com/europe/?url=https://www.moneycontrol.com/news/india/global-tenders-worth-rs-29500-crore-invited-for-bharatnet-7198471.html

[31] "The Evolution of BharatNet: Lessons From India's Largest Rural Broadband Project," 2024, Bhargavee das Krithika Ramnath. Available in: https://icrier.org/publications/the-evolution-of-bharatnet-lessons-from-indias-largest-rural-broadband-project/

[32] "BharatNet: Bridging the Digital Divide – From Remote Villages to Smart Communities," 2024, Government of India – Press Information Bureau. Available in: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2086701&reg=3&lang=2

Panchayat villages , that is, rural areas without a formal elected village council. This Amendment aims to connect all 650,000 villages by 2025 through architectural upgrades and long-term maintenance contracts. By 2025, the cost budgeted was of ₹1.3 lakh crore (approximately 12.5 billions euros using March/2026 exchange rate).

5. Public and Private Sector Stakeholders

The Department of Telecommunications provides policy oversight, while funding flows through the Digital Bharat Nidhi. BBNL was established as the implementing agency, with early fibre deployment led by public sector undertakings.

Under state-led models, states such as Maharashtra, Gujarat, Tamil Nadu, Telangana, Andhra Pradesh, Odisha, and Jharkhand assumed responsibility for implementation. In private-sector models, firms including HFCL, Vindhya Telelinks Limited, and Polycab participated in fibre rollout in states such as Punjab and Bihar. The 2021 public–private partnership tenders sought broader private participation in network construction, maintenance, and utilization. In later phases, Bharat Sanchar Nigam Limited was appointed as the single project management agency for operation and maintenance under service-level agreements.

The governance arrangement thus combines centralized public financing, state-level execution, and selective private-sector engagement.

6. Outcomes

BharatNet has expanded rural fibre infrastructure substantially. By May 2025, approximately 693,303 kilometers of optical fibre had been laid, 214,325 Gram Panchayats were connected, 1,282,564 fiber-to-the-home connections are commissioned and 104,574 Wi-Fi hotspots had been installed. [33] Rural internet subscribers increased from 115.06 million in the financial year 2016 to 405.3 million by September 2024.[34]

However, utilization has lagged infrastructure provisioning, with uneven last-mile activation reported across states. Indeed, universal access remains incomplete. Only 31.16 percent of villages under the expanded 650,000-village target had broadband access as of January 2025.[35] [36] Furthermore, despite the substantial number of Wi-Fi hotspots installed, only 766 of them remain active.[37] Repeated deadline extensions and gaps between middle-mile infrastructure and effective household connectivity indicate that full realization of universal rural broadband is yet to be achieved.

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[33] Bharatnet Project, May 2025, Available in: https://usof.gov.in/en/bharatnet-project
[34] “BharatNet Unplugged: Transforming Rural Connectivity in India,” 2024, India Brand Equity Foundation. Available in: https://www.ibef.org/blogs/bharatnet-unplugged-transforming-rural-connectivity-in-india
[35] Bharat Broadband Network Limited, Accessed May 7 2026, Available in: https://bbnl.nic.in/
[36] “Why BharatNet Remains an Unfinished Dream,” 2025, The Wire. Available in: https://thewire.in/government/why-bharatnet-remains-an-unfinished-dream
[37] “India should launch National Satellite Connectivity Mission: SIA-India,” 2025, Daily Excelsior, Available: https://www.dailyexcelsior.com/india-should-launch-national-satellite-connectivity-mission-sia-india/#google_vignette

6.1 Outcomes

Project type	Industry-focus	Time-frame	Funding
National program deploying rural fiber backbone to connect villages via public infrastructure	Broadband infrastructure (rural backbone)	2011–present	Universal Service Obligation Fund (levy on telecom firms) with additional public investment

Role of the government	Role of private firms	Outcomes	Success factors
Funds, owns backbone, sets targets, oversees implementation via public entities	Multiple forms of private-sector engagement across the evolution of the program and across regions	692,000 km fiber; 405M rural users; persistent last-mile gaps yet to be resolved	Scale, evolving PPP models. Still incomplete, however

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Mini-Case

Building Resilient Digital Infrastructure for Growth in Nigeria - Project BRIDGE

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Building Resilient Digital Infrastructure for Growth in Nigeria - Project BRIDGE[38]

1. Background

Nigeria faces persistent constraints in broadband access despite its digital ambitions and its large population of +230M inhabitants, being the most populous country in Africa. Fixed broadband penetration stood at 8.4 percent in Q4 2024, with median fixed internet download speeds of 23.2 Mbps and mobile speeds of 18 Mbps. Roughly 70 percent of fixed internet tests recorded speeds below 30 Mbps, reflecting limited quality and reliability.[39]

Although eight submarine cables with 350 Tbps capacity land in Nigeria, only about 10 percent of that capacity is utilized due to insufficient backbone and middle-mile infrastructure. Nigeria has deployed approximately 30,000 km of terrestrial fiber, compared to an estimated 120,000 km required to meet national objectives. Rural areas are particularly disadvantaged: low population density raises per-subscriber construction costs and weakens commercial incentives for private operators. [40]

The implications extend to service delivery. Approximately 38,800 public schools, 16,900 health facilities, and 3,400 local government offices are identified as priority institutions for connectivity expansion. Limited broadband access in these facilities constrains digital public services, education delivery, and healthcare management. These infrastructure gaps, combined with affordability constraints, underpin the case for public intervention.[41]

2. Establishment of Project BRIDGE

Project BRIDGE—Building Resilient Digital Infrastructure for Growth—was prepared as an International Development Association (IDA)-financed Investment Project Financing operation, with expected approval in the fiscal year 2026.[42] Its development objective is to expand the inclusive use of high-quality, and climate-resilient broadband in selected unserved and underserved areas.

The project builds on Nigeria's National Digital Economy Policy and Strategy (2020–2030) and National Broadband Plan (2020–2025), which highlighted backbone deficits as a structural constraint. In May

[38] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[39] "*Report No. PADHI01185 – Project Appraisal to the Federal Republic of Nigeria for a Building Resilient Digital Infrastructure for Growth – Bridge Project*," 2025, the World Bank.
[40] "*Stakeholder Engagement Plan (SEP) – BRIDGE*," 2025, Federal Ministry of Communication, Innovation and Digital Economy of Nigeria
[41] "*Report No. PADHI01185 – Project Appraisal to the Federal Republic of Nigeria for a Building Resilient Digital Infrastructure for Growth – Bridge Project*," 2025, the World Bank.
[42] "*Report No. PIDDC01172 - Project Information Document (PID) – Concept Stage – BRIDGE*," 2025, The World Bank.

2024, the Federal Executive Council approved the creation of a Special Purpose Vehicle (SPV) to deploy 90,000 km of fiber nationwide.[43]

BRIDGE adopts a public–private joint venture model. The SPV will be majority privately owned and managed, with the Federal Government holding no more than 49 percent equity through the Ministry of Finance Incorporated. IDA financing of US$500 million will leverage approximately US$1.1 billion in commercial financing, yielding a total envelope of US$1.6 billion. The Federal Ministry of Communication, Innovation and Digital Economy of Nigeria will oversee implementation through a Project Implementation Unit, while the SPV will manage rollout and wholesale services. [44]

3. Infrastructure Investment and Service Provision

At least in the current proposed stage, [45] the project aims to finance rollout of 90,000 km of climate-resilient fiber backbone and middle-mile infrastructure. The network design envisions seven regional rings connecting the six geopolitical zones including Lagos, extending connectivity to all 774 Local Government Areas.

The proposal is that the SPV will also provide wholesale open-access services to downstream Internet Service Providers and Mobile Network Operators. These operators will deploy last-mile connections to households, businesses, and public institutions. While the project does not directly finance household-level connections, it lowers entry barriers through backbone availability and may support strategic connections to selected public facilities.

Targets include connecting approximately 38,800 public schools, 16,900 health facilities, and 3,400 local government offices. Results indicators track broadband users (with disaggregation for women and youth), private capital mobilized, kilometers of climate-resilient fiber deployed, wholesale price reductions, and contracts signed between the SPV and service off-takers. Climate resilience is embedded through weather-resistant materials, redundancy measures, and integration with renewable energy where needed.

4. Evolution

Although implementation has not yet begun, BRIDGE has evolved conceptually through several preparatory phases:

- Conceptualization (2022–2024): Technical workshops and policy consultations identified the backbone deficit and explored SPV-based delivery models. Preparatory studies assessed demand, governance structures, and regulatory conditions.

[43] "*Stakeholder Engagement Plan (SEP) – BRIDGE*," 2025, Federal Ministry of Communication, Innovation and Digital Economy of Nigeria
[44] "Report No. PADHI01185 – Project Appraisal to the Federal Republic of Nigeria for a Building Resilient Digital Infrastructure for Growth – Bridge Project," 2025, the World Bank.
[45] "Report No. PADHI01185 – Project Appraisal to the Federal Republic of Nigeria for a Building Resilient Digital Infrastructure for Growth – Bridge Project," 2025, the World Bank.

- Structuring and Financing (2024–2025): A Project Preparatory Advance financed transaction advisory and legal design for SPV incorporation. Market soundings confirmed private-sector interest in participation.
- Planned Implementation (2026–2030): Equity disbursements from IDA are tied to milestones, including SPV incorporation, adoption of fiduciary procedures, and phased deployment of at least 5,000 km, 20,000 km, and subsequently 40,000 km of network infrastructure before successive tranches are released. Project closing is expected in September 2030.

5. Public and Private Sector Stakeholders

BRIDGE is structured through a deep interrelationship between public and private sectors. Below is a list of the most critical stakeholders.

- Federal Government of Nigeria: Through the Federal Ministry of Communication, Innovation and Digital Economy (policy oversight) and Ministry of Finance (equity participation), the government will hold up to 49 percent of SPV shares.
- Regulatory Authorities: The Nigerian Communications Commission will regulate wholesale market conduct and licensing.
- International Development Association (IDA, World Bank Group): IDA provides US$500 million in credit financing and technical oversight.
- Private Sector Investors: Expected to mobilize approximately US$1.1 billion in private capital. Selected through a competitive PPP process, private investors will hold majority ownership (at least 51 percent) in the SPV. They will co-finance and manage infrastructure rollout. Downstream ISPs and MNOs will purchase wholesale capacity and deploy last-mile networks.
- Other Multilateral Development Banks have expressed interest in parallel or complementary financing.

6. Outcomes

As of September 2025, BRIDGE remains in the pre-implementation stage. SPV incorporation and private partner selection are underway, and disbursement is conditional on governance and deployment benchmarks.

Looking forward, the project aims to expand broadband use to 150 million users by 2030, including women and youth, while deploying nationwide climate-resilient backbone infrastructure. If implemented as designed, BRIDGE is expected to reduce wholesale costs, improve median speeds, and expand connectivity to priority public institutions. Its performance will depend on effective SPV governance, regulatory alignment, and sustained private-sector participation.

The initiative represents an attempt to address Nigeria's structural broadband deficit through a market-shaping public–private partnership model, with implementation and performance outcomes to be assessed over the coming five-year horizon.

6.1 Outcomes

Project type	Industry-focus	Time-frame	Funding
Planned PPP deploying nationwide fiber backbone via special purpose vehicle	Broadband infrastructure (backbone)	2022–2030 (planned)	500M International Development Association plus 1.1B private capital

Role of the government	Role of private firms	Outcomes	Success factors
Sets policy, co-invests minority equity, oversees implementation	Private investors own majority SPV and deploy infrastructure	Pre-implementation; aims 150M users, 90,000 km fiber	--

Geneva Research Lab for Digital Impact

May-2026

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Mini-Case

Telecom Liberalization and the Entry of Safaricom Ethiopia

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Telecom Liberalization and the Entry of Safaricom Ethiopia [46]

1. Background

Until June 2019, Ethiopia's telecommunications sector operated as a vertically integrated state monopoly under Ethio Telecom. Despite sustained macroeconomic growth, digital connectivity remained limited—for instance, UNESCO reported that internet penetration in Ethiopia was of 12% in 2017, rising to 15% in 2018 and 16% in 2019—and that school connectivity was particularly low (around 3.6% of schools had access to the internet in 2017). [47]

High-speed mobile broadband coverage was similarly constrained. As late as 2021, only 6% of the population was covered by 4G services, placing Ethiopia among the least digitally connected countries in Sub-Saharan Africa. The World Bank later characterized the sector as marked by limited competition, uneven coverage, and insufficient private investment under the monopoly structure. [48]

By 2018, policymakers increasingly framed limited connectivity as a structural market issue. The absence of competition and private capital was seen as inhibiting expansion, service innovation, and affordability improvements. Telecom liberalization was therefore advanced as a mechanism to mobilize foreign direct investment, introduce competition, and accelerate nationwide rollout.[49]

2. Establishment of the Global Partnership for Ethiopia

In January 2020, the Ministry of Finance appointed the International Finance Corporation (IFC) as lead transaction advisor to structure a competitive international tender for new full-service telecommunications licenses. The process sought to generate fiscal revenues, catalyze large-scale private investment, and embed population coverage, affordability, and service-quality obligations within the license design.[50]

In May 2021, the Ethiopian Communications Authority awarded a 15-year unified telecommunications license to the Global Partnership for Ethiopia (GPE) consortium, which subsequently incorporated Safaricom Telecommunications Ethiopia PLC as the local entity to hold and operate the license. The

[46] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[47] "Assessing Internet Development in Ethiopia," 2025, UNESCO. Available in: https://doi.org/10.58338/DMFP2740
[48] "Ethiopia Telecom Market Assessment," 2025, The World Bank. Available in: https://openknowledge.worldbank.org/entities/publication/ca0ed446-5a41-4c29-9b05-e33a7b16705c
[49] "PPP Project Briefs – Ethiopia: Telecom Liberalization," 2020, The International Finance Corporation. Available in: www.ifc.org/ppp
[50] "PPP Project Briefs – Ethiopia: Telecom Liberalization," 2020, The International Finance Corporation. Available in: www.ifc.org/ppp

consortium paid an upfront fee of USD 850 million and announced planned investments of approximately USD 8 billion over ten years.[51]

The consortium comprised Safaricom plc (operational lead), Vodacom Group, Vodafone Group, Sumitomo Corporation, and CDC Group (now British International Investment). Under the license, Safaricom Telecommunications Ethiopia (STE) was authorized to build and operate nationwide 2G, 3G, and 4G networks, with 5G in selected areas, subject to coverage and universal service targets.[52]

3. Infrastructure Investment and Service Provision

Safaricom Ethiopia entered as a greenfield mobile network operator, focusing on access-network rollout and retail service delivery. Its investment strategy prioritized rapid 4G deployment in urban and peri-urban areas and competition on pricing, quality, and customer experience.[53]

By contrast, backbone fiber networks and legacy national infrastructure remain largely under the control of state-owned Ethio Telecom and public utilities. Even after liberalization, much of the broader infrastructure footprint and expansion momentum continued to be shaped by the incumbent.[54]

4. Evolution

Following license award in 2021, STE launched services in 2022 through a phased city-by-city rollout. In 2023, IFC and the Multilateral Investment Guarantee Agency (MIGA) strengthened financial backing through equity, loans, and guarantees, supporting continued expansion.[55]

Sector-wide indicators improved substantially. Mobile subscriptions increased from 44.2 million in 2018 to 87.6 million in 2024. Unique mobile broadband subscriptions reached 54.1 million (41% of the population), while 4G coverage expanded from 6% in 2021 to over 40% by early 2025.[56]

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[51] "Global consortium wins Ethiopia's telecom license for $850M," 2021, Anadolu Agency. Available in: https://www.aa.com.tr/en/africa/global-consortium-wins-ethiopias-telecom-license-for-850m/2251286

[52] "IFC Project Information & Data Portal, Global Partners, Project Number 44591," 2026, International Finance Corporation. Available in: https://disclosures.ifc.org/project-detail/SII/44591/global-partners

[53] "Safaricom Launches Operations in Ethiopia," 2022, Africa Telecom Review. Available in: https://www.telecomreviewafrica.com/articles/telecom-operators/3033-safaricom-launches-operations-in-ethiopia/

[54] "Ethiopia Telecom Market Assessment," 2025, The World Bank. Available in: https://openknowledge.worldbank.org/entities/publication/ca0ed446-5a41-4c29-9b05-e33a7b16705c

[55] "Safaricom Ethiopia closes $275M IFC Deal," 2023, Connecting Africa. Available in: https://www.connectingafrica.com/investment/safaricom-ethiopia-closes-257m-ifc-deal

[56] "Ethiopia Telecom Market Assessment," 2025, The World Bank. Available in: https://openknowledge.worldbank.org/entities/publication/ca0ed446-5a41-4c29-9b05-e33a7b16705c

5. Public and Private Sector Stakeholders

The Ministry of Finance led liberalization, while the Ethiopian Communications Authority administers licensing and regulation. The government retains ownership of Ethio Telecom, which remains the dominant incumbent and direct competitor.

Safaricom Ethiopia depends on interconnection and infrastructure-sharing arrangements with state-owned entities. The World Bank report highlights that Ethio Telecom retains significant market power in multiple segments and controls substantial backbone and international gateway infrastructure. Safaricom must lease backbone capacity, access fiber routes, and rely on negotiated interconnection agreements.

6. Outcomes

By 2025, Ethiopia's telecom market reflects measurable growth but persistent structural asymmetries. Mobile broadband penetration reached 41% of the population, and 4G coverage exceeded 40%. Data prices declined relative to income levels, placing Ethiopia among the more affordable markets in Eastern and Southern Africa in 2025.

However, while Safaricom accelerated 4G rollout and intensified competition, rural coverage gaps remain significant, and fixed broadband penetration remains low (approximately 3.5%). Furthermore, continued concerns regarding significant market power of Ethio Telecom remain, particularly concerning the pricing of mobile termination rates, and infrastructure access. Ethio Telecom is dominant in several segments, and Safaricom's ability to compete is partly shaped by its dependence on leasing backbone and interconnection infrastructure from state-owned entities. [57]

Project type	Industry-focus	Time-frame	Funding
Telecom liberalization introducing private operator to compete with state monopoly	Telecom infrastructure and services	2020–present	Private FDI around 8B plus license fee

Role of the government	Role of private firms	Outcomes	Success factors
Liberalizes market, regulates, retains state-owned incumbent	Consortium builds networks, competes in retail services	4G coverage above 40%, increased subscriptions, lower prices	Competition introduction, large-scale investment, regulatory reform

[57] "Assessing Internet Development in Ethiopia," 2025, UNESCO. Available in: https://doi.org/10.58338/DMFP2740 & "Ethiopia Telecom Market Assessment," 2025, The World Bank. Available in: https://openknowledge.worldbank.org/entities/publication/ca0ed446-5a41-4c29-9b05-e33a7b16705c

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Uganda Communications Universal Service and Access Fund (UCUSAF)

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Uganda Communications Universal Service and Access Fund (Uganda)[58]

1. Background

At the time of telecommunications liberalization in the late 1990s and early 2000s, Uganda's connectivity levels were extremely low. In 2002, the country had approximately 260 telecommunications towers and only about 330,000 mobile subscriptions.[59] Internet access was marginal: in 2008, total internet subscriptions were 58,648, and penetration stood at 0.2%.[60]

Although market liberalization stimulated growth, expansion followed commercial logic, leaving rural and low-income areas underserved. Universal access policy emerged to address this gap. Universal access seeks to ensure affordable and convenient access to basic communications services for all citizens, often through shared facilities, while universal service refers to individual household connectivity as a longer-term objective. [61]

In 2011, the Uganda Communications Act established the Rural Communications Development Fund (RCDF), later renamed the Uganda Communications Universal Service and Access Fund (UCUSAF), to support projects in commercially unviable areas.[62]

2. Establishment of the Uganda Communications Universal Service and Access Fund (UCUSAF)

The RCDF was formally established in 2001 by the Uganda Communications Commission (UCC) under the Uganda Communications Act of 1997. The Act mandated the UCC to create and manage a fund dedicated to rural communications development. With the Uganda Communications Act 2013, the Fund's legal basis was reaffirmed, and it was renamed to UCUSAF.

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[58] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[59] "20 years progress report on WSIS Actions Lines – Uganda," 2025, World Summit on the Information Society Forum - The International Telecommunication Union. Available in: https://www.itu.int/net/wsis/review/reports/twenty-year.html
[60] "ICT Sector at a Glance 2023 - The Communication Sector Journey," 2023, Uganda Communications Commission. Available in: https://www.ucc.co.ug/wp-content/uploads/2023/11/ICT-SECTOR-at-a-Glance-insert-2023.pdf
[61] "Funding and Implementing Universal Access: Innovation and Experience from Uganda," 2005, Uganda Communications Commission. Available in: https://idrc-crdi.ca/sites/default/files/openebooks/188-4/index.html
[62] "Uganda Communications Universal Service and Access Fund – Overview," 2025, Webpage. Available in: https://www.ucc.co.ug/ucusaf/

Under Section 3(g) of the 2013 Act, UCC is responsible for establishing and administering the Fund to promote universal access to and use of communications services, including in rural areas.[63] Institutionally, UCUSAF operates as a semi-autonomous entity but functions as a department within UCC.

Consistent with international Universal Access Fund (UAF) models, Uganda's Fund uses targeted subsidies and competitive mechanisms to mobilize private sector participation in rural infrastructure deployment.[64] Rather than relying solely on cross-subsidies by incumbents, UCUSAF provides structured financial support to reduce investment risk in high-cost, underserved areas. Over time, the Fund's mandate expanded from basic voice access toward broadband-enabled digital inclusion, reflecting technological advancements and policy shifts.

3. Infrastructure Investment and Service Provision

UCUSAF combines supply-side and demand-side interventions. On the supply side, the Access Infrastructure Program subsidizes the construction of GSM telecom towers, upgrades of 2G to 3G sites, deployment of 3G/4G greenfield sites, installation of Internet Points of Presence at local government headquarters, and public payphones.[65]

On the demand side, UCUSAF supports ICT in Education (school ICT labs and teacher training), ICT for Agriculture (ICT4Farmers app, call centers, and e-academy), Digital Skilling initiatives for SMEs, youth, women, and PWDs, Internet Connectivity for schools and libraries, and Devices for Underserved Communities.[66] These initiatives have aimed at reaching consumers directly to facilitate their initial access to digital tools. For instance, the Rural Household Devices Project initiative distributed grid- and solar-powered tablets with six months of subsidized data bundles to low-income households. By December 2023, the project had reached 10,706 households across 54 districts.[67] Importantly, several of these initiatives are time-bound and do not guarantee continuation without consumers'/communities' own actions.

[63] "2013 Uganda Communications Act," Available in: https://ulii.org/en/akn/ug/act/2013/1/eng@2013-01-18
[64] "Funding and Implementing Universal Access: Innovation and Experience from Uganda," 2005, Uganda Communications Commission. Available in: https://idrc-crdi.ca/sites/default/files/openebooks/188-4/index.html
[65] "UCUSAF Access Infrastructure Program – FAQ," 2025, UCC, Available in: https://www.ucc.co.ug/ucusaf/access-infrastructure-program/
[66] "Uganda Communications Universal Service and Access Fund – Overview," 2025, Webpage. Available in: https://www.ucc.co.ug/ucusaf/
[67] "Impact Assessment: Rural Household Devices Project," 2024, Global Digital Inclusion Partnership.

4. Evolution

Up until the end of 2023, the UCUSAF had evolved across three strategic cycles:[68]

1. *RCDF I (2001–2009): Voice Access Expansion*. The initial phase prioritized extending basic voice access through GSM mast deployment and public payphones.

2. *RCDF II (2010–2016): Introduction of Internet Access*. The second phase expanded to ICT school labs and digital terrestrial television transmission sites.

3. *UCUSAF III (2017–2023)*: Broadband Usage and Sectoral Integration. The third phase emphasized broadband adoption, public Wi-Fi hotspots, digital skilling for marginalized groups, and sectoral ICT integration.

Currently, UCUSAF is engaged with its 4th strategy cycle: "Digital Inclusivity through sustainable interventions and impactful collaborations." This cycle has 5 broad themes: (a) increased broadband access; (b) enhanced usage of digital devices and services; (c) promotion of ICT applications and services; (d) facilitating knowledge informative decision-making, and (e) enhanced multi-sector collaboration.

5. Public and Private Sector Stakeholders

The governance model is thus a hybrid public–private arrangement, where public funds leverage private deployment and service delivery.

- The UCC established the fund and serves as both regulator and administrator of UCUSAF.
- The Ministry of ICT and National Guidance provides overarching policy direction.
- Telecommunication companies both contribute to the firm and act as licensed telecommunications operators, infrastructure providers, and vendors that implement subsidized projects.
- Development partners have contributed to program co-financing and impact assessment, including in the Rural Household Devices Project.
- Other organizational stakeholders are the National Union of Disabled Persons of Uganda (NUDIPU) - which collaborates on digital skills training for persons with disabilities – and the Research and Education Network for Uganda (RENU) – which works with UCC to advance access to research and education resources.

[68] "20 years progress report on WSIS Actions Lines – Uganda," 2025, World Summit on the Information Society Forum - The International Telecommunication Union. Available in: https://www.itu.int/net/wsis/review/reports/twenty-year.html

6. Outcomes

Over the past two decades, connectivity indicators in Uganda improved significantly. UCUSAF's targeted investments contributed to rural tower deployment, school connectivity, digital skills training, and first-time household internet usage. By 2013, internet penetration reached 12%, and by 2023, it reached 59%. Total internet subscriptions rose to 26.9 million by 2023, while mobile subscriptions surpassed 34 million. Fiber infrastructure expanded from 5,700 km in 2013 to over 30,000 km in 2023, and towers increased from 3,208 to 4,907 over the same period. Mobile penetration increased from 31% in 2008 to 75% in 2023. Internet penetration rose from 0.2% in 2008 to 59% in 2023. 3G coverage expanded from 86% in 2014 to 97% in 2023, and 4G coverage from 31% to 61%.[69]

While disparities persist across regions and income groups, Uganda's trajectory demonstrates how a legally anchored universal access fund, administered by the regulator and aligned with market growth and private actors, can support advances in connectivity.

Project type	Industry-focus	Time-frame	Funding
Universal access fund subsidizing rural telecom infrastructure and digital inclusion	Telecom infrastructure, digital inclusion	2001–present	Sector levies, public funds, donor support

Role of the government	Role of private firms	Outcomes	Success factors
Regulates, administers fund, allocates subsidies to underserved areas	Telecom operators deploy infrastructure and deliver services	Internet penetration reached 59%, major infrastructure expansion	Targeted subsidies, phased strategy, public-private coordination

[69] "ICT Sector at a Glance 2023 - The Communication Sector Journey," 2023, Uganda Communications Commission. Available in: https://www.ucc.co.ug/wp-content/uploads/2023/11/ICT-SECTOR-at-a-Glance-insert-2023.pdf

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New Jersey Internet Cooperative Purchasing Initiative (USA)[70]

1. Background

In the United States, most K–12 schools rely on the federal E-rate program to subsidize telecommunications and internet connectivity. Established under the Telecommunications Act of 1996 and administered by the Federal Communications Commission (FCC) through the Universal Service Administrative Company (USAC), E-rate provides discounts ranging from 20% to 90% of eligible connectivity expenditures, depending on school poverty levels and rural status.[71]

To receive subsidies, schools must conduct a competitive bidding process. Each school (or district) files an FCC Form 470 to solicit bids, evaluates proposals based primarily on cost-effectiveness, selects a provider, and then files Form 471 to request reimbursement. Historically, this process has been decentralized: individual schools or districts organized their own procurements and contracted independently with internet service providers (ISPs). While compliant with federal rules, this fragmented approach limited schools' bargaining power and often resulted in uneven pricing and bandwidth across districts. [72]

By the early 2010s, increasing demand for digital learning, online assessments, and cloud-based tools exposed the limitations of decentralized procurement. Against this backdrop, the state of New Jersey sought to redesign how schools procured connectivity.

2. Establishment of the Internet Cooperative Purchasing Initiative

In 2014, as part of the state's Digital Readiness for Learning and Assessment Project (DRLAP), the New Jersey Department of Education launched the Internet Cooperative Purchasing Initiative (ICPI). The initiative shifted broadband procurement from individual school contracts to a coordinated, statewide structure.

The ICPI was organized as a consortium purchasing model. Under this approach, multiple public entities – in this case, school districts – joined together to aggregate demand and conduct a single competitive procurement process.[73] The ICPI also functioned as a bundled service agreement, combining multiple buyers into regional contracts to achieve economies of scale and streamline administration. In New Jersey's case, schools were grouped into four geographic regions (Northwest, Northeast, Central, and South), and ISPs were required to bid to serve all participating schools within

[70] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[71] "Internet Cooperative Purchasing Initiative (ICPI) Summary Document," 2025, UNESCO.
[72] "The Benefits from Bundling Demand in K-12 Broadband Procurement," 2025, Gaurab Aryal, Carles Murry, Pallavi Pal, and Arnab Palit. Available in: http://www.nber.org/papers/w33498
[73] "Bundled service agreement: digital transformation collaborative financing toolkit factsheet," 2025, UNESCO. Available in: https://www.unesco.org/en/dtc-financing-toolkit

a region rather than bidding school by school. Specifically, the Middlesex Regional Educational Services Commission (MRESC) issued a consolidated Request for Proposals (RFP) on behalf of participating schools.[74]

Funding continued to rely on school budgets supplemented by E-rate reimbursements. However, procurement design shifted from decentralized contracting to coordinated regional demand aggregation.

3. Infrastructure Investment and Service Provision

Operationally, the ICPI involved schools contracting for broadband and related wide area network services through the regional bundles under two primary service types. Category A provided basic broadband connections suited to smaller schools, typically through asymmetrical services. Category D provided dedicated enterprise-level internet service, often delivered in bulk to regional hubs and distributed through WAN connections.[75]

Under both categories, ISPs were responsible for delivering connectivity, maintaining equipment, and meeting performance standards. This project did not entail investments in backbone infrastructure.

4. Evolution

Before 2014, schools independently conducted E-rate compliant procurements. Each district negotiated separately with ISPs, resulting in fragmented contracts. In 2014–2015, New Jersey implemented regional bundled contracts, replacing school-level auctions with coordinated procurement while maintaining compliance with E-rate rules.[76] By 2022, schools in the sate of new Jersey continued to purchase internet access via a bundled approach through the New Jersey Digital Readiness for Learning and Assessment Project, reaching 730,000 students in the state, and 427 educational institutions.[77]

5. Public and Private Sector Stakeholders

The initiative involved the New Jersey Department of Education (policy leadership), the MRESC and regional educational service agencies (procurement coordination), and the FCC and USAC as the E-rate administrators. For the private sector, there was not direct change, with private ISPs bidding for the bundled contracts.

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[74] "Bundled service agreement: digital transformation collaborative financing toolkit factsheet," 2025, UNESCO. Available in: https://www.unesco.org/en/dtc-financing-toolkit

[75] "New Jersey Digital Readiness for Learning & Assessment- Broadband Component Wide Area Network and Internet Cooperative Purchasing Initiative – Request for Proposals." 2014. Available in: https://charliemurry.github.io/ESCNJ_RFP_2014.pdf

[76] "Internet Cooperative Purchasing Initiative (ICPI) Summary Document," 2025, UNESCO.

[77] "Educational Services Commission of New Jersey: More than Half of New Jersey School Districts Saving Millions Through Cooperative Purchasing of High-Speed Internet Access," 2022, INSIDER NJ. Available in: https://www.insidernj.com/press-release/educational-services-commission-new-jersey-half-new-jersey-school-districts-saving-millions-cooperative-purchasing-high-speed-internet-access/

In this form, the ICPI could enable significant cost savings, increased broadband speeds, economies of scale, reduced administrative burden, and complementarity with the federal E-rate program. However, potential drawbacks could be increased market concentration risks on the side of ISPs, and inability of schools that had previously agreed on long-term contracts with ISPs to participate.[78]

This arrangement positions the state as an aggregator, while private firms deliver connectivity services under a contract that covers several schools simultaneously. In this arrangement, schools are not directly responsible negotiating connectivity contracts and potentially benefit from lower contracted service costs and superior quality.

6. Outcomes

Empirical analysis of the ICPI documented substantial effects on price and bandwidth. Using a difference-in-differences approach comparing participating and non-participating schools, researchers estimated that bundling reduced internet prices by approximately 37% per Mbps per month and increased bandwidth by roughly 500%.[79] In absolute terms, participating schools experienced an estimated price decrease of about $10 per Mbps per month and an increase of nearly 1 Gbps in contracted bandwidth. Total annual cost savings for participating schools were estimated in the millions of dollars, depending on bandwidth assumptions.

The evidence suggests that the regional bundling model contributed to lower prices and higher capacity relative to the pre-2014 decentralized system. The ICPI has since been cited as an example of how consortium purchasing and bundled service agreements can reshape public procurement outcomes in connectivity markets.

Project type	Industry-focus	Time-frame	Funding
State-led consortium bundling school broadband procurement to reduce costs	Education connectivity procurement	2014–present	School budgets plus government subsidies

Role of the government	Role of private firms	Outcomes	Success factors
Aggregates demand, coordinates procurement, ensures compliance	ISPs provide broadband services under bundled contracts	37% price reduction, 500% bandwidth increase	Demand bundling, economies of scale, procurement redesign

[78] "Internet Cooperative Purchasing Initiative (ICPI) Summary Document," 2025, UNESCO.
[79] "The Benefits from Bundling Demand in K-12 Broadband Procurement," 2025, Gaurab Aryal, Carles Murry, Pallavi Pal, and Arnab Palit. Available in: http://www.nber.org/papers/w33498

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Conectividad para la Educación 2030 (Chile)[80]

1. Background

Chile has pursued digital inclusion in education since the early 1990, such as via the *Enlaces* program in 1992 and the 2011 *Conectividad para la Educación* initiative to provide free internet to educational establishments. These efforts significantly expanded digital infrastructure and internet access in schools. By the late 2010s, progress was substantial: approximately 74.2% of schools had internet connectivity, and nearly all schools had at least some level of computer access for educational use.[81]

However, these figures also revealed structural limitations. If roughly three-quarters of schools were connected, nearly one in four still lacked stable internet access. Moreover, even among connected schools, bandwidth levels and internal infrastructure varied widely. Chile remained below the OECD average in key indicators such as device availability per student,[82] and service speeds were often insufficient to support cloud-based platforms, multimedia content, or hybrid instruction models. Connectivity coverage, therefore, still required additional advances to translate into school-level digital readiness.

The COVID-19 pandemic further exposed these constraints as, despite schools having internet access, its quality was not sufficient for enabling teachers to provide sustained remote education to students – whose access to education suddenly shift to digital channels that had to be access from home. The policy challenge thus shifted from ensuring basic connectivity presence to guaranteeing accessible high-speed, scalable broadband capable of reliably supporting digital learning environments.

The context above motivated the Chilean national government to design the program *Conectivdad para la Educación* 2030 (CPE, Connectivity for Education 2030) as an initiative to upgrade connectivity standard nationwide.

2. Establishing the CPE 2030 Initiative

CPE 2030 was launched in 2020 through coordination between the Ministry of Education (MINEDUC) and the Ministry of Transport and Telecommunications (MTT), implemented by the government agency SUBTEL via the Fondo de Desarrollo de las Telecomunicaciones (FDT).[83]

The program divided the country into 70 geographic zones, encompassing approximately 11,000 subsidized educational establishments, pre-identified by the MINEDUC. Telecom operators competed

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[80] The information reported in this document originates from publicly available reports, websites, and documents. Any errors and omissions are attributable to the authors.
[81] "Políticas Digitales en Educación en Chile: Tendencia emergentes y perspectives de futuro," 2022, report sponsored by UNESCO and UNICEF; "*Futuro de La Educación en Chile: Innovación, tecnología y habilidades del siglo XXI*," 2023, report sponsored by Fundación País Digital and Accenture.
[82] "*Futuro de La Educación en Chile: Innovación, tecnología y habilidades del siglo XXI*," 2023, report sponsored by Fundación País Digital and Accenture.
[83] "*Requisitos y Procedimentos para la Convocatoria 'Conectividad para la Educación 2030,"* 2020, Ministério de Educación de Chile.

for zone-level concessions through a public tender process. Contracts extend through December 2029, providing medium-term service stability and regulatory predictability. [84] [85]

The institutional design reflects a solution of aggregating demand, centralizing tenders, and relying on private operators to deliver upgraded broadband services under uniform national standards. The funding model relies on annual public budget allocations to the MINEDUC, with defined subsidy ceilings. Educational establishments themselves did not have to pay for internet access, as the costs were borne by the MINEDUC. Private operators receive monthly payments, and services are subject to several technical standards, some of which are described below.

3. Infrastructure Investment and Service Provision

CPE 2030 provides each participating school with a dedicated broadband service point and the required terminal equipment.[86] Service delivery may rely on fiber optics, radiofrequency links, or other technically feasible technologies depending on geographic conditions.

A distinguishing feature of the program is the incorporation of explicit performance standards. Operators must guarantee minimum bandwidth calculated on a per-student basis (e.g., 100 Kbps downlink per student, and a total minimum of 1 megabit per second), along with defined upload ratios and international bandwidth parameters. The internet service must also be available for at least 98% of the time of school operations, and the private operator must implement information security and parental control software. [87]

Service conditions and contracts also include scheduled upgrade commitments, such as bandwidth multipliers in later years of operation, ensuring that connectivity capacity evolves over time, alongside formalized reporting obligations. [88] Responsibilities are clearly divided: telecom operators deploy and maintain external connectivity infrastructure, while school authorities are responsible for internal network distribution within school facilities.

4. Brief Overview of Connectivity Policies in Chile

CPE 2030 represents the latest stage in Chile's progressive connectivity policy trajectory, which has evolved significantly since the early 1990s.

Digital connectivity initiatives in Chile targeting schools date back to 1992, when the *Enlaces* program started providing primary and secondary schools with digital infrastructure in computer laboratories,

[84] '*Resolución Número 02, 20-04-2020 – Bases Específicas para El Concurso Público 'Conectividad para la Educación 2030'*,' 2020, Subsecretaria de Telecomunicaciones, Ministerio de Hacienda de Chile.
[85] "Continuidad y Consolidación de CpE 2030 (2020-2029)," website accessed in March, 2026, Link: https://www.innovacion.mineduc.cl/iniciativas/cpe2030
[86] "Ficha de Proyecto Conectividad para la Educación 2030," 2025, Centro de Innovación – Ministério de Educación de Chile.
[87] "*Requisitos y Procedimentos para la Convocatoria 'Conectividad para la Educación 2030,"* 2020, Ministério de Educación de Chile.
[88] "*Requisitos y Procedimentos para la Convocatoria 'Conectividad para la Educación 2030,"* 2020, Ministério de Educación de Chile.

technical and pedagogical support for Chilean instructors, and the introduction of digital skills in the curriculum. [89]

Building on the Enlaces program, the 2011 *Conectividad para la Educación* initiative sought to ensure that subsidized schools had internet access free of charge, with costs paid for by the government instead of educational establishments. Furthermore, the 2018 *Aulas Conectadas* program extended digital infrastructure beyond laboratories, adding a more explicit focus on classroom-level access – aligning, for instance, with the *Enlaces* program which included digital skills within the school curriculum. These initiatives collectively marked a transition from expanding coverage to improving usability and pedagogical integration.

CPE 2030 consolidated and restructured prior efforts under a competitive subsidy model. Unlike earlier programs, it embedded explicit performance standards and upgrade obligations into contracts with service providers. The policy shift entailed an alteration of goals, moving from guaranteeing connectivity presence to ensuring high-speed, scalable broadband nationwide, including schools in isolated and rural areas.

5. Public and Private Sector Stakeholders

Public sector: The MINEDUC identifies eligible schools and defines educational objectives; SUBTEL and the FDT design and administer tenders, supervise compliance, and manage subsidy payments; the *Consejo de Desarrollo de las Telecomunicaciones* authorizes subsidy allocations and oversees implementation.

Private sector: Telecom operators – including firms such as GTD, Entel, Claro, and others – compete for geographic zones and assume responsibility for infrastructure deployment and service operation.[90]

This arrangement positions the state as regulator and financier, while private firms deliver standardized high-speed connectivity under contracts with strict technical requirements. In this arrangement, schools are not directly responsible for the costs of connectivity.

6. Outcomes

By 2024, the program had reached close to 10,000 schools nationwide, benefiting approximately 3 million students, and a total of 68 of 70 zones had been successfully awarded.[91] Although schools in isolated and rural areas are included, the program's defining characteristic is the standardization and upgrading of broadband quality across the entire subsidized education system, and not only in remote areas.

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[89] "*Futuro de La Educación en Chile: Innovación, tecnología y habilidades del siglo XXI*," 2023, joint report by Fundación País Digital and Accenture.

[90] "Más de ocho mil colegios que reciben aportes del estado tendrán gratis internet de alta velocidad," 2021, Subsecretaria de Telecomunicaciones de Chile. Link: https://www.subtel.gob.cl/mas-de-ocho-mil-colegios-que-reciben-aportes-del-estado-tendran-gratis-internet-de-alta-velocidad/

[91] "Preguntas Frecuentes – Zonas no Adjudicadas," website accessed in March, 2026, Link: https://www.innovacion.mineduc.cl/iniciativas/cpe2030

Compared to baseline conditions under earlier programs – which focused on creating conditions for school connectivity – this initiative has contributed to the availability of high-speed, quality-controlled broadband in subsidized schools. Its contractual horizon through 2029 and built-in upgrade mechanisms represent a shift toward a focus on broadband quality.

Project type	Industry-focus	Time-frame	Funding
National program upgrading school broadband via centralized tenders and subsidies	Education connectivity, broadband services	2020–2029	Public budget subsidies

Role of the government	Role of private firms	Outcomes	Success factors
Designs program, aggregates demand, funds and regulates service provision	Telecom operators deliver broadband under contracts and performance standards	~10,000 schools, 3 million students, standardized high-speed connectivity	Demand aggregation, performance standards, long-term contracts