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Leveraging Private Sector Investment in Digital Communications Infrastructure in Eastern Africa

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Acknowledgments

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The report was prepared for the purpose of undertaking a study on leveraging private sector investment in Digital Communications Infrastructure (DCI) in Eastern Africa. Specifically, the study focuses on leveraging private sector investment in the Eastern African countries of: Djibouti, Ethiopia, Kenya, Madagascar, Somalia and South Sudan. An advanced draft of the report was discussed during consultations with Government officials in Kenya on February 29, 2024 and with the other countries on March 21, 2024. The final report was subject to a World Bank review, conducted virtually in June 2024, in a decision meeting chaired by Isabel Neto, Practice Manager, Digital Development, Eastern and Southern Africa.

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Abbreviations and Acronyms

2G, 3G, 4G, 5G	Second, Third, Fourth, Fifth Generation mobile telephony service
AfDB	African Development Bank
ARRA	American Recovery and Reinvestment Act of 2009
BAFO	Best and Final Offer
BCG	Boston Consulting Group
BOT	Build-Operate-Transfer
BTO	Build-Transfer-Operate
CA	Communication Authority (Kenya)
CAI	Community Anchor Institutions
CAPEX	Capital Expenditure, and OPEX – Operational Expenditure.
CTM	Commercial Transaction Manual
DARE	Djibouti Africa Regional Express
DCI	Digital Communications Infrastructure
DE4A	Digital Economy for Africa Initiative
DECIM	Digital and Energy Connectivity for Inclusion in Madagascar Project
DeFi	Decentralized Finance
DPI	Digital Public Infrastructure
EAP	Electronic Auction Platform
EARDIP	Eastern Africa Regional Digital Integration Project
ECA	United Nations Economic Commission for Africa
E-Commerce	Electronic Commerce
EPC	Engineering, Procurement, Construction
FCC	Federal Communications Commission (United States)
FDI	Foreign Direct Investment
FGS	Federal Government of Somalia
GDP	Gross Domestic Product
GSMA	Global System for Mobile Communications Association
ICA	The Infrastructure Consortium of Africa
ICT	Information and Communication Technology
IDA	International Development Association
IFIs	International Financial Institutions
IFC	International Finance Corporation
IGAD	Intergovernmental Authority on Development
IP	Internet Protocol
IRU	Indefeasible Right of Use
ITU	International Telecommunication Union
KDEAP	Kenya Digital Economy Acceleration Project

LICs	Low Income Countries
MAS	Maximum Allowable Subsidy
Mbit/s	Megabits per second
MDBs	Multilateral Development Banks
MIGA	Multilateral Investment Guarantee Agency
MNO	Mobile Network Operator
MoU	Memorandum of Understanding
MPPRA	Madagascar Public Procurement Regulatory Authority
MRRA	Multi-Round Reverse Auction
MVNO	Mobile Virtual Network Operator
NCA	National Communications Authority of Somalia
NICTBB	National ICT Broadband Backbone
NPCI	National Payments Corporation of India
PCE	Private Capital Enabling
PCM	Private Capital Mobilisation
PPA	Public Procurement Act, 2011
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Public-Private Partnership
PPPC	Public-Private Partnership Commission (Malawi)
PPRA	Public Procurement Regulatory Authority (Kenya)
PRI	Political Risk Insurance
RAG	Red Amber Green
RCIP	Regional Communications Infrastructure Programme
RFQ	Request For Quotation
SDGs	Sustainable Development Goals
SIM	Subscriber Identity Module
SOE	State Owned Enterprise
SSA	Sub-Saharan Africa
TAPAS	Transparency and Accountability in Public Administration and Services Project (UK)
TTL	Team Task Leader
UAT	User Acceptance Testing
UCF	Unguaranteed Commercial Financing
UCSAF	Universal Communications Service Access Fund (Tanzania)
UN	United Nations
UPI	Unified Payments Interface
USAFs	Universal Service and Access Funds
USD	United States Dollar
USF	Universal Service Fund
WB	World Bank

CHAPTERS

Introduction

1

This study provides guidance on World Bank involvement in Digital Communications Infrastructure (DCI)[1] projects in which finance has been extended to support build-out.[2] In particular, the study provides guidance to three World Bank projects:

- The Kenya Digital Economy Acceleration Project (KDEAP; P170941), which aims to expand access to high-speed internet, improve the quality and delivery of education and selected government services, and build skills for the regional digital economy.[3]
- The Eastern Africa Regional Digital Integration Project (EARDIP Series of Project 1; P176181, and Series of Projects 2; P180931), which has the objective of promoting the expansion of an integrated digital market across Eastern Africa by increasing cross-border broadband connectivity, data flows and digital trade in the region.[4] The first phase covers Somalia and South Sudan and grants to the East African Community (EAC) and the Intergovernmental Authority on Development (IGAD); while the second phase covers Djibouti and Ethiopia.[5]
- The Digital and Energy Connectivity for Inclusion in Madagascar Project (DECIM; P178701), which aims to expand access to renewable energy and digital services in Madagascar.[6]

The study has been conducted under the supervision of the World Bank (WB) co-Task-Team Leaders for the projects listed in the acknowledgements. The report provides a list of policy recommendations with regard to leveraging private sector investment in DCI in the six Eastern African countries analysed: Djibouti, Ethiopia, Kenya, Madagascar, Somalia and South Sudan. The content of the report covers, among other things:

- A summary of selected World Bank funded DCI projects in Eastern Africa.
- An overview of the role of the private sector, Multilateral Development Banks (MDBs) and governments in facilitating private sector investment in DCI.
- A discussion of various approaches that can be used to incentivise and facilitate Private Capital Mobilisation (PCM) in DCI. In particular, we look at the potential for governments and their agencies to aggregate demand for DCI services and functions and act as anchor tenants.
- The potential for using novel procurement methods, such as Multiple Round Reverse Auctions (MRRA), to promote value for money and an assessment of the "readiness" of the six Eastern African countries in adopting such an approach.

The report also provides a roadmap on what should be included in a Commercial Transaction Manual (CTM) in the case where we recommend that a borrower government pilots a MRRA. The preparation of the CTM is a disbursement condition covering infrastructure investments in each of the three projects and this report is intended to reform the preparation of the CTMs in each of the six countries.

The rest of this chapter is as follows. Section 1.1 introduces the concept of DCI and discusses policy within the context of digital gaps. Section 1.2 discusses the roles of the private sector, government and multilateral banks in Eastern Africa. Section 1.3 looks at the role expected to be played by PCM. Section 1.4 discusses in brief the role of Public-Private Partnerships (PPPs), procurement and DCI. Section 1.5 discusses risks in DCI projects and their mitigation, focusing in particular on the role of government agencies as anchor tenants and in overseeing MRRAs. Our conclusions and Section 1.6 highlights the remainder of this report.

1 The phrase Digital Communications Infrastructure is used here to denote digital technologies used for connectivity, such as fiber optic cables, cellular mobile services, microwave systems, satellites, etc. They are used by the public to communicate by voice, video, data, etc. Digital Communications Infrastructure may be regarded as a subset of the term "Digital Public Infrastructure" which encompasses also data exchange platforms, digital ID systems, digital financial payment systems etc, as well as connectivity. A more detailed explanation is provided in Appendix C

2 Throughout this study we use the convention that the financing of infrastructure is how governments, private companies and others that own infrastructure find the money to meet the upfront costs of building it. In contrast, the funding of infrastructure is how consumers, taxpayers and others pay for the infrastructure, including paying back the finance from whichever source government or private owners choose. In some instances, private firms may face a funding gap. In this case government, and in the case of Eastern African countries multilateral development banks, can intervene and provide finance to cover the funding gap. Our report is concerned with achieving value for money in funding gap situations.

3 See https://projects.worldbank.org/en/projects-operations/project-detail/P170941

4 See https://projects.worldbank.org/en/projects-operations/project-detail/P176181

5 See https://projects.worldbank.org/en/projects-operations/project-detail/P180931

6 This project is interesting as it combines initiatives in both electricity and power supply markets and broadband communications. The two are interrelated, as new mobile services and mobile broadband require reliable power supplies. In the project, it is envisaged that an Engineering, Procurement and Construction (EPC) model may be deployed. This may involve system integrators designing, building, operating and handing over assets such as solar panels and battery packs to schools and health centres. See https://projects.worldbank.org/en/projects-operations/project-detail/P178701

1.1 Digital communications infrastructure and digital gaps

As more citizens across the globe use the internet, governments and their agencies can deliver better public services, improve accountability and promote inclusivity.[7] DCI forms a crucial part of this and includes the solutions and systems that facilitate essential society-wide functions and services such as: identity verification, payments and data exchange (we explore DCI in further detail in Appendix C). To achieve these benefits, many governments in low- and middle-income countries, including in Eastern Africa, are currently promoting investments in building out the physical infrastructure and virtual architectures that underpin DCI functions and services.

Most citizens in Eastern Africa gain access to the internet through mobile devices. However, the proportion of people connected to mobile broadband in Sub-Saharan Africa (SSA), at around 25 per cent in 2022, was less than half the global average of 57 per cent.[8] Table 1-1 shows that as recent as 2021 only Djibouti exceeded the global average of the percentage of the population using the internet, for the other five counties in this study the majority of the population did not use the internet.

The figures in Table 1.1 reflect gaps formally described by Navas-Sabater, Dymond and Juntunen (2002) in their study on universal access.[10] The authors proposed a 'Gaps Model', shown in Figure 1-1, where the y-axis is the demand side for a service (households ordered by income from high to low) and the x-axis is the supply side (geography). The top border represents 100% of communities (i.e., geographic population centres) within the region or country and the right border represents 100% of the population, typically expressed as households.

The model proposes two main gaps in service provision: (i) a market efficiency gap and (ii) an access gap, explained further below. In Figure 1-1 current penetration is shown as relatively low, as for most of the countries in this study, and typically reflects that demand is mainly coming from higher income households (vertical axis) and supply is focused mainly in lower cost service areas (horizontal axis). Notwithstanding, since the Gaps Model was originally proposed, industry has proved adept at extending networks and services to low-income households in high-cost service areas, often working with development agencies and government, as the penetration rates for mobile service in all the countries of this study underscore.[11]

Table 1-1 Percentage of population using the internet

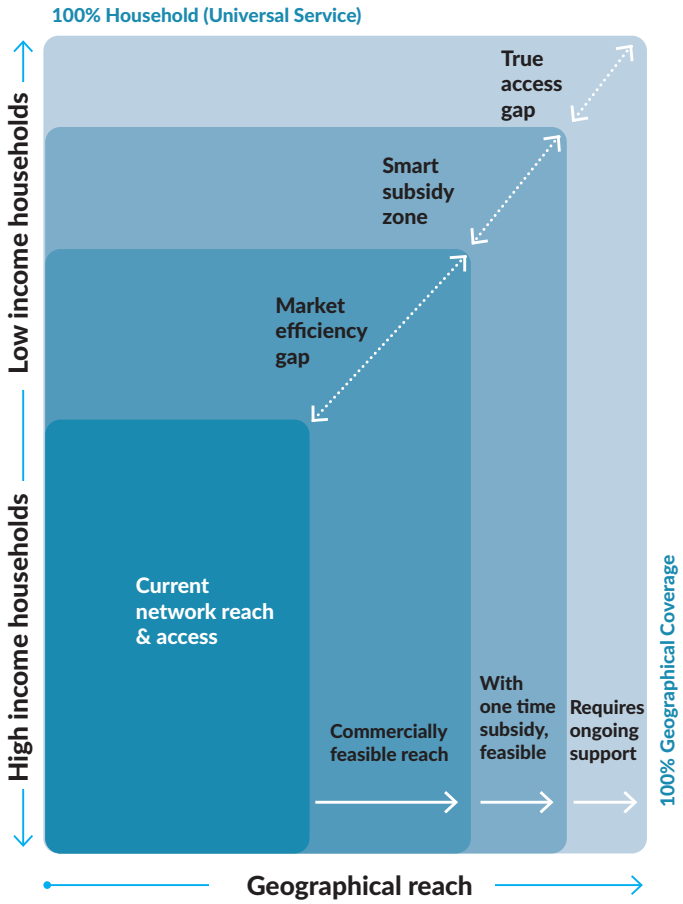
Year	2021	2021	2021	2021	2021	2021 est	2020
Country	Global	Djibouti	Ethiopia	Kenya	Madagascar	Somalia	South Sudan
Percentage of population using the internet	63%	69%	17%	29%	20%	6%	7%

Source: ITU[9]

7 Milakovich, Michael. (2021). Digital Governance: Applying Advanced Technologies to Improve Public Service. 10.4324/9781003215875
8 GSMA (2023) "The State of Mobile Internet Connectivity: Key Findings 2023".
9 Internet users are individuals who have used the internet (from any location) in the last 3 months. The internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. Source: International Telecommunication Union (ITU) World Telecommunication/ICT Indicators Database at https://data.worldbank.org/indicator/IT.NET.USER.ZS
10 Juan Navas-Sabater, Andrew Dymond and Niina Juntunen (2002) "Telecommunications and Information Services for the Poor: Toward a Strategy for Universal Access" World Bank.
11 According to the GSMA, the penetration rate of mobile services in Sub-Saharan Africa for 2023 was 43%, see GSMA (2023) "The Mobile Economy Sub-Saharan Africa 2023".

The market efficiency gap is shown as representing the geographic reach and coverage that is commercially feasible in a fully-functioning market setting. The gap reflects various obstacles in the market that have not enabled this gap to be fully closed. The 'smart subsidy zone' shows how both coverage and reach can be extended beyond the market frontier after the application of one-time subsidies to assist start-up and cover initial network investment.[12] Finally, the figure shows what is termed the 'true access gap' which refers to areas and users that require ongoing support.

Figure 1-1 The Gaps Model



Source: Reproduced from World Bank and ITU. 2011. Telecommunications Regulation Handbook, Tenth *Anniversary Edition p.157*[13]

Although there are substantial DCI gaps, most of the large cities in SSA have good communications connectivity and access to the internet has improved as a result of increased submarine cable connectivity to the African continent, deployment of new fibre backbone networks and competition.[14] However, there remain significant gaps, particularly outside the larger cities where private operators are less incentivised to rollout communication networks due to the higher cost of network build and lower demand. It is these areas where there are access funding gaps and considerable disparities in coverage, as evidenced in GSMA (2023) and by a World Bank (2023) report (see Figure 1-2 below).[15,16]

Key findings from the World Bank (2023) report include:

- **Internet access remains low.** On average, only 28.5 percent of individuals live in households with access to internet. Among the countries surveyed, Gabon has the highest rate of internet access, with an estimated access rate of 64.9 percent of the population, while Zambia has the lowest rate of internet access, with only an estimated 6.9 percent share of the population having access.

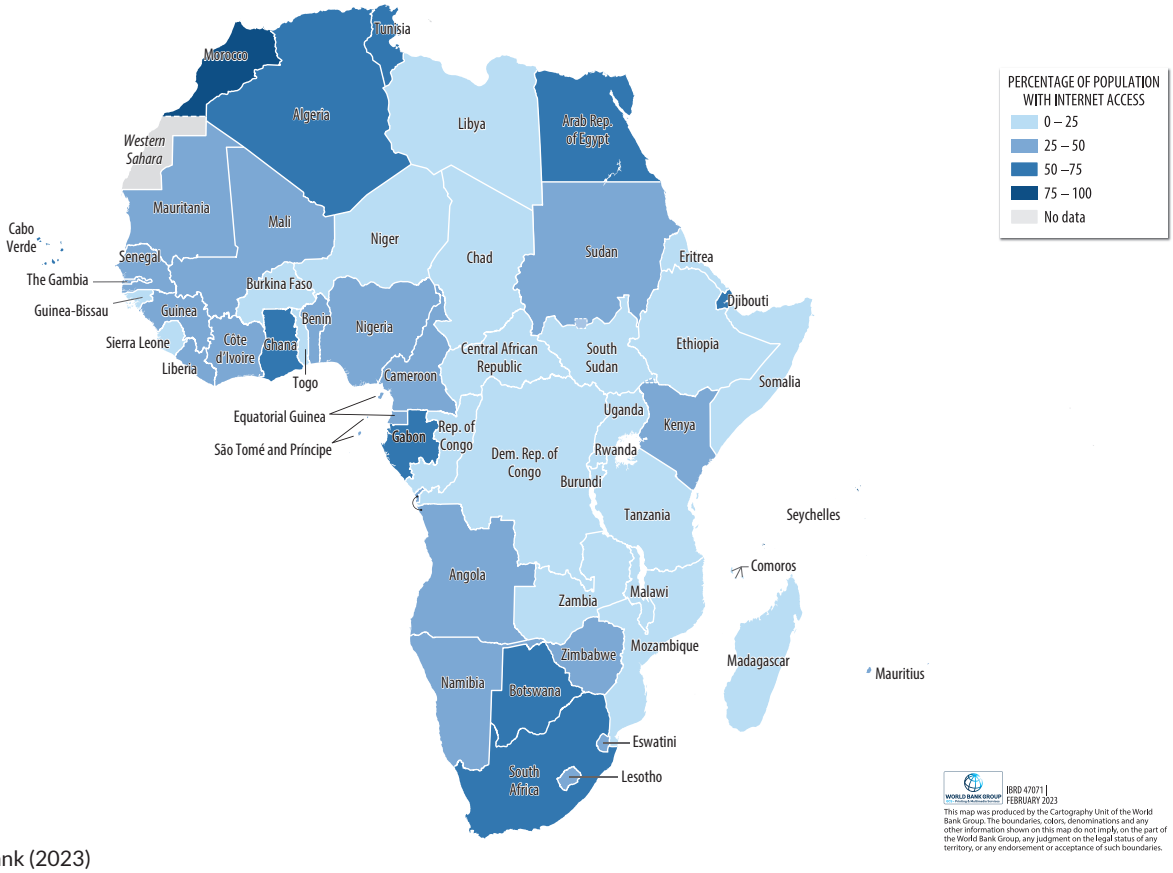
- **Access to computers and tablets is very low.** On average, only around 11 percent of individuals live in households with access to a computer. Mauritius and Cabo Verde have the highest rates of computer or tablet access, with 58 percent and 45 percent respectively. Meanwhile, the Central African Republic and the Democratic Republic of Congo have the lowest rates of computer or tablet access, at 0.6 percent and 1.4 percent respectively. On average, only 11.2 percent of the population lives in a household with access to a computer or tablet.

- **Access to mobile phones is relatively high compared to other internet-capable devices.** On average 76 percent of individuals have access to a phone. Senegal and the Arab Republic of Egypt have the highest rates of phone access, with 99.1 percent and 97.9 percent respectively.

- **Electricity access varies significantly.** On average, 58.8 percent of individuals surveyed have access to electricity. However, this hides large differences between countries. The Central African Republic has the lowest electricity access rate (9.1 percent); the Seychelles has the highest electricity access rate (100 percent).

13 World Bank and ITU. 2011. Telecommunications Regulation Handbook, Tenth Anniversary Edition (2011) edited by Colin Blackman and Lara Srivastava,.
14 Simione and Li. 2021. "The Macroeconomic Impacts of Digitization in Sub-Saharan Africa: Evidence from Submarine Cables" IMF Working Paper, WP/21/110. Available at: https://www.imf.org/-/media/Files/Publications/WP/2021/English/wpiea2021110-print-pdf.ashX. Figures 1 & 2 in their paper show a dramatic increase in cable connectivity, especially since 2010, and it is estimated that this has resulted in a statistically significant effect on productivity and growth.
15 See, https://www.gsma.com/r/wp-content/uploads/2023/10/The-State-of-Mobile-Internet-Connectivity-Report-2023.pdf
16 World Bank. 2023. "The Size and Distribution of Digital Connectivity Gaps in Sub-Saharan Africa." Available at: https://documents1.worldbank.org/curated/en/099241003142325200/pdf/IDU0cb2e42f3050260484d0b8370b84eee303ecf.pdf

Figure 1-2 Digital connectivity in Africa



Source: World Bank (2023)

To facilitate wider adoption of DCI in Eastern Africa, policies focus on both the demand and supply sides of the market. On the demand-side, government interventions can include digital literacy training, favourable taxation and subsidies to end-users. Government interventions on the supply-side include market liberalisation, favourable corporate tax policies and import duties, and subsidies. Further, as DCI enables new digital government services, this provides higher demand for digital communication services and facilitates scale economies, which lowers unit costs. Aggregating government agency demand for DCI services can help close the usage gap by making services more affordable.

DCI investments may involve, for instance, the rolling out of more datacentres, land-based fibre-optic broadband cables and telecom towers, which help to close digital gaps and confer benefits on consumers and producers. For example, DCI investments can promote inclusive economic growth (for example Kouladoum (2023)) and strengthen the economic resilience of households (for example Chetty (2023)).[17] Studies also show that increasing internet availability increases jobs and reduces poverty.[18,19] Finally, additional DCI investments can also help bridge the digital gender divide.[20] More generally, DCI is recognised as having substantial potential to promote many positive externalities such as improvements in health care (e.g. through disseminating knowledge), education (e.g. access to resources), etc..[21]

While the many benefits justify public expenditures on DCI, there is a need to ensure that policies deliver value for money. In this study we emphasise the importance of designing policy interventions that ensure value for money is achieved.

17 Jean-Claude Kouladoum (2023) "Digital infrastructural development and inclusive growth in Sub-Saharan Africa" Journal of Social and Economic Development 25: 403–427. Krish Chetty (2023) "Strengthening Africa's Digital Infrastructure for Greater Economic Resilience" South African Institute of International Affairs, Policy Briefing number 277, August. See also https://www.undp.org/digital/blog/human-and-economic-impact-digital-public-infrastructure#:~:text=Using%20a%20DCI%20approach%20can,the%20economic%20resilience%20of%20households

18 Begazo, Blimpo and Dutz (2023) "Digital Africa: Technological Transformation for Jobs" World Bank Group.

19 Ndubuisi, G., Otioma, C. and Tetteh, G. K. (2021). "Digital infrastructure and employment in services: Evidence from Sub-Saharan African countries." Telecommunications Policy, 45(8): 102153.

20 A study conducted in Nigeria shows that after a year or more of mobile broadband coverage the total consumption in households increased by more 6 percent and that two or three years of 3G/4G coverage increased labour force participation for women (See Bahia, K., Castells, P., Cruz, G., Masaki, T., Pedros, X., Pfutze, T., Winkler, H. (2020)). The Welfare Effects of Mobile Broadband Internet. Evidence from Nigeria. Washington DC: World Bank Group. See also OECD (2018) "Bridging the Digital Gender Divide: Include, Upskill, Innovate".

21 DCI is an important enabler of accelerating sustainable development goals, see UNDP (2023) "Accelerating the SDGs through Digital Public Infrastructure: A Compendium of the potential of digital public infrastructure".

1.2 The roles of the private sector, government and multilateral development banks

The bridging of digital gaps and the promotion of DCI in Eastern Africa involve all major stakeholders: the private sector (especially communication service and network companies and equipment manufacturers), government (national, regional and local) and MDBs. To date, the majority of investment in DCI in SSA has been undertaken by the private sector, with governments and MDBs typically extending some gap financing and in many cases overseeing structural reforms and capacity building that have facilitated much needed new competition.[22]

According to Lee and Gonzalez (2022), between 2007 and 2020 investment in telecoms SSA by the private sector was US$25.3 billion versus US$4.6 billion by the public sector.[23] The private sector accounted for 85 per cent of all investment in SSA over 2007-20, whereas in the energy sector private sector investment was lower at 43 per cent and in the transport sector lower still at 32 per cent. Much of the private investment in telecoms occurred in the earlier part of the period when new costly mobile networks were being built. According to ICA Africa "*The most notable distinguishing feature of investment in ICT infrastructure in Africa is that…it requires little support, financial or otherwise, from national governments or IFIs [International Financial Institutions]. Almost all ICT infrastructure is financed by the private sector. Within the ICT sector there is government support for offshore cables (notably in the form of guarantees) as well as fiber-optic data backbones. The amounts involved are overshadowed by the mobile telecommunications expenditure by the private sector.*"[24]

Whilst private sector investment has led to marked improvements in telecommunications and DCI coverage and usage in Eastern Africa, there remain substantial gaps. It is estimated by the World Bank that countries in SSA would need to invest between 2 and 8 per cent of GDP annually until 2030 to help close these gaps.[25]

To stimulate further investment and reap the benefits of new DCI in SSA, there is a need for intervention by government, MDBs and international financial institutions (IFIs) to address both institutional and market failures.

The World Bank, in particular, has played a leading role in this regard, having invested a total of US$582 million in ICT projects in Eastern and Southern Africa in 2022, which amounted to 3 per cent of its total lending in the region.[26] In 2024, the World Bank has committed a further US$2.5 billion in lending in the region up to 2032 under the Inclusive Digitalization in Eastern and Southern Africa Multiphase Programmatic Approach Project (IDEA MPA). Such investments include: mobile infrastructure in unserved and underserved areas, building out and extending capacity in fibre-optic backbone networks and programmes aimed at enhancing digital literacy. In promoting broadband investments, programmes have included loans to facilitate government subsidy of rural rollout and supply of internet connectivity to schools, hospitals and other public resources.[27]

Increasingly the intervention by MDBs is seeking to leverage more effectively funding or matching investments made by the private sector through PCM. Additionally, reforms and public investments part-funded by the Bank perform an important role in Private Capital Enabling (PCE).[28]

1.3 Private capital mobilisation

Projects that seek to improve the digital economy and DCI in Eastern Africa involve a considerable amount of private finance and in some instances has involved public funding. Although to date much investment has been led by the private sector, it seems that further progress in extending of DCI coverage into high-cost service areas and low-income demand areas will require more public funding. A key focus of this report is to examine how best to achieve value for money new public funding investments and how such interventions can best leverage PCM.

The relative immaturity of capital markets, low saving rates in SSA, and constrained fiscal positions of many governments mean that, to achieve marked reductions in DCI gaps, a considerable fraction of new investment will be required from external sources, including from MDBs. Njenga et al (2022) remark "*As most SSA countries do not have well-established and liquid capital markets, external debt has become the only source of capital. External debt is driven by low revenues and high expenditure needs, particularly in infrastructure development.*"[29]

22 Emmanauelle Auriol (2005) "Telecommunication Reforms in Developing Countries" Communications & Strategies, November.
23 Nancy Lee and Mauricio Cardenas Gonzalez. 2022. "Stuck Near Ten Billion: Public Private Infrastructure Finance in Sub-Saharan Africa." CGD Policy Paper 251. Washington, DC: Center for Global Development. https://www.cgdev.org/publication/stuck-near-ten-billion-public-private-infrastructure-finance-sub-saharan-africa
24 ICA. 2018 The Infrastructure Consortium for Africa "Infrastructure Financing Trends in Africa – 2018" page 66.
25 Rozenberg, Julie and Marianne Fay. 2019. "Beyond the Gap: How Countries Can Afford the Infrastructure They Need while Protecting the Planet" World Bank.
26 Begazo, Blimpo and Dutz. 2023. "Digital Africa: Technological Transformation for Jobs" World Bank Group.
27 For example, on 5 April 2023 the World Bank announced it was lending $390m to the Government of Kenya for the first phase of a program that aims to expand access to high-speed internet, improve the quality and delivery of education and selected government services, and build skills for the regional digital economy. This forms part of the KDEAP. See https://www.worldbank.org/en/news/press-release/2023/04/05/kenya-afe-and-the-world-bank-group-provide-a-390-million-boost-the-digital-economy#:~:text=NAIROBI%2C%20April%205%2C%202023%20%E2%80%94,for%20the%20regional%20digital%20economy.
28 See World Bank. 2022. "Evolving the World Bank Group's Mission, Operations, and Resources: A Roadmap" 18 December especially para. 19.
29 Njenga, Githinji, Josphat Machagua, and Samwel Gachanja. 2022. "Capital markets in sub-Saharan Africa" WIDER Working Paper 2022/112.

This situation is likely to prevail in the near term and the International Development Association (IDA) credit and grant[30] facilities will continue to feature in many new DCI investment projects.[31]

An example of a project which is anticipated to involve a considerable amount of PCM is KDEAP in Kenya. This project involves the IDA extending credit of US$390 million to the Government of Kenya over the first phase of the project, 2023-28, with a planned additional US$100 million to be leveraged in PCM, or unguaranteed commercial financing (UCF), for projects targeting improvements in digital infrastructure and access through expansion of broadband coverage.[32] The financing under KDEAP is highlighted in Table 1-2.

Table 1-2: Financing digital infrastructure and access in KDEAP

KDEAP Investment, Component 1	IDA credit (US$, million)	Potential PCM (US$, million)
1.1 Extending the reach of the backbone network (middle mile)	60	60
1.2 Increasing last mile connectivity for education	90	30
1.3 Enhancing government connectivity	35	0
1.4 Strengthening the digital enabling environment	5	0
R1.5 Enhancing regional digital infrastructure	30	10

Source: Para. 28, Table 1 Project Information Document, KDEAP op cit Note : This table covers KDEAP Component 1 only. Adding funding for Components 2, 3 and 4 brings the total to US$390m plus US$100m in Private Capital Mobilization (PCM).

The WB anticipates that potential PCM will be leveraged through credit facilities supplied by IDA. Ideally the PCM induced by the WB gap funding (sometimes referred to as matching investments) is expected to yield a ratio of roughly 2:3 (i.e., US$2 of commercial investment for every US$3 of public funds). Achieving this ratio of private and public funding is anticipated to be achieved by leveraging government agencies demand for digital services and by promoting greater competition for subsidies and public sector contracts through the use of novel procurement models, including MRRAs.

The KDEAP PAD states "*Among the many possible models for combining public and private funds for network roll-out, one of the models, for both the extension of the backbone and last mile connectivity, would involve matching investments from network operators in return for project contracts awarded through a reverse auction model.*"[33] This approach is also advocated for PCM in the DECIM project in Madagascar, which "*may potentially include, for instance, the use of an interactive electronic auction platform to optimize the best value in competitive, multi-round bidding processes.*"[34]

1.4 Public-private partnerships, procurement and digital communications infrastructure

The mobilisation of private capital in projects in receipt of gap financing for DCI brings together the public and private sectors. Public sector gap financing incentivises participation by the private sector in projects that may involve small scale local initiatives (e.g. installing connectivity at a village school in Kenya in the KDEAP project, and installing mobile base-stations in rural areas in Madagascar in the DECIM project) through to large scale national and regional initiatives (e.g. investing in additional national middle-mile backbone fibre capacity in Ethiopia, Somalia and South Sudan and connections to bordering countries in the EARDIP project).

In some cases, arrangements between the public and private sectors in infrastructure projects fall within the scope of PPPs which are broadly defined as a "long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance".[35] Typically a PPP involves the delivery of project finance through a project-specific company established to deliver infrastructure. It is the company that borrows the money and contracts transfer responsibility for matters such as design, build, operation and maintenance to the company in which the investors have managerial responsibilities. There are a number of PPPs in telecoms in Africa, an example is the high capacity backbone network part funded by the WB in the Democratic Republic of Congo.[36]

30 The IDA extend assistance to low-income countries via grants, which offer funds in return for results, or through loans (credit) that result in debt and require servicing and eventual redemption. Subsidy funding to support DCI can be provided through either channel, and for some projects it may involve a mix of grants and loans.

31 See the Digital Moonshot Report (2019) for how the World Bank Group will mobilize finance through the IDA under a Mobilizing Finance for Development approach to distribute $25 billion earmarked for the DE4A Initiative.

32 See Project Information Document – Kenya Digital Economy Acceleration Project – P170941 26 February 2023, at https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099094702272313420/p17094109fabfa0508c6204a93160f0598

33 Para. 31 in Project Information Document KDEAP.

34 Para. 48 in Project Information Document DECIM. Under DECIM, a similar model of "matching grants" is also proposed for power sector infrastructure in rural areas, such as mini-grids.

35 World Bank. 2014. "Public-Private Partnership Reference Guide Version 2.0". There are many variants of PPPs, but the typical PPP arrangements used by the WB include BOO: Build, Own, Operate; BOT: Build, Operate, Transfer; BOOT: Build, Own, Operate, Transfer. PPPs can be structured in many different ways and one recent interesting example promoting DCI in Indonesia and the Philippines involves in-kind payments by private sector telcos expanding into negative net present value areas in return for access and use of national fiber backbone facilities – the Palapa ring model, see https://baktikominfo.id/layanan/palapa-ring.

36 See World Bank. 2012. "Public-Private Partnership in Telecommunications Infrastructure Projects: Case of the Republic of Congo." Available at: https://documents1.worldbank.org/curated/en/677871468244179240/pdf/687020ESW0P1220cover0PO1223950Congo.pdf

PPPs have been researched extensively and continue to be created but are not the primary focus of this study. Our concern involves PCM in projects that have many sub-projects in which private sector parties may compete to supply matching investments. It is widely recognised (for example, Bhattacharya et al. (2022)) that for Eastern Africa to boost economic growth and achieve the United Nations (UN) Sustainable Development Goals (SDGs) there is a need for greater leverage to be placed on the private sector.[37]

Where PCM is anticipated in projects in receipt of financing from the IDA, the public and private sectors will be subject to any applicable national PPP and procurement legislation. For example, the projects specified in KDEAP are subject to both national procurement legislation in Kenya.[38] To ensure PCM is leveraged by public financing to greatest effect, it is necessary to understand the constraints arising from the applicable legislative frameworks.

1.5 Risks, anchor tenants and price discovery

Infrastructure projects are risky because of their often long term, large scale characteristics. Demand side revenue streams and supply side infrastructure construction costs are not known for certain. Market risks can be managed by contracts that allocate risks to incentivise participants to choose actions that result in desirable outcomes. Many PPPs are structured in ways that allocate risks to help mitigate the costs associated with uncertainty.

However, while contracts can target risks presented in market situations, behavioural risks can arise due to asymmetric information within the contractual setting, such as moral hazard.[39] For example, where the private sector co-finances infrastructure in conjunction with a public subsidy, a well-designed contract will likely encourage the private party to deliver services efficiently at lowest cost. By contrast, where the private sector operates infrastructure services financed entirely by the public sector, it might be less incentivised to minimise costs if it perceives losses will be made up by the public sector.

One way to mitigate some moral hazard risk in DCI projects is through the aggregation of demand for digital services by government agencies in the form of anchor tenants.[40] For example, government agencies could commit to purchasing substantial broadband capacity over the lifetime of a broadband connectivity project. In such a scenario, demand side risk faced by a private party would be lowered and private firms would be more willing to share more of the upfront costs of infrastructure investment as the funding gap would be lower. In projects involving last mile connectivity for education, as forms part of KDEAP, the aggregation of demand for broadband capacity by public educational institutions would help in this regard, particularly for regional projects.

When seeking PCM through public sector gap financing, public agencies are exposed to the risk of adverse selection. Prospective private partners seeking public finance may overstate deliverables and offer terms in responses to tender that are unrealistic, in efforts to win the initial public finance. This risk can be problematic if private bidders know they have the possibility to hold-up the public party and renegotiate down the line.[41] To help mitigate this risk, a project needs to be well-specified to ensure that sufficient bids are made by private entities and bids received are meaningfully comparable (i.e., different bids are not based on varying underlying assumptions).

Some of the risks public finance faces when seeking PCM in DCI projects arise because of asymmetric information about the funding gap. For example, government is not usually in a good position to know how much gap funding is required. An important challenge for the public sector entities providing finance is how best to mitigate paying too much (i.e. the adverse selection risk) and achieve value for money.

37 The authors state that "there is significant potential to leverage official finance with double the amount of private finance. Use of such instruments could lead to a doubling of private finance compared with 2019 – an additional $395 billion", see p. 46 in : Bhattacharya A et al. 2022. Financing a big investment push in emerging markets and developing economies for sustainable, resilient and inclusive recovery and growth. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science, and Washington, DC: Brookings Institution.

38 In Kenya the relevant PPP legislation is The Public Private Partnerships Act, 2021. Part V of the Act specifies the types of procurement that are feasible. The Government of Kenya issued a policy on procurement "National Public Procurement and Asset Disposal Policy", in November 2020 which is in accordance with The Public Procurement and Asset Disposal Act, 2015 (revised 2022).

39 Moral hazard is a situation where an economic entity has an incentive to increase its exposure to risk because it does not bear the full costs of that risk. In practice PPPs are prone to moral hazard risks, often exemplified by post-bid negotiations. For example, see Gifford et al. (2014) who discuss PPPs in the United States where contract renegotiation may dampen the market and adversely affect national infrastructure investment efforts. See https://ppp.worldbank.org/public-private-partnership/library/renegotiation-transportation-public-private-partnerships. In the United Kingdom a government review found that negotiations at the preferred bidder stage led to price increases in many projects, see HM Treasury (2014). "Investing in UK Infrastructure." Available at: https://assets.publishing.service.gov.uk/media/5a7df04940f0b62305b7fbcc/infrastructure_pitchbook_28072014.pdf. A WB study has also found that the nature of the long-term contracts between participants that constitute PPPs are at risk of re-negotiation and cited four causes behind this: (i) unexpected exogenous changes, (ii) complexity of the contractual relationship, (iii) winner's curse and (iv) rent seeking behaviour. See World Bank (2014) "Renegotiation of Transportation Public-Private Partnerships",

40 The aggregation of demand is also known as demand pooling. This has been studied recently in the context of pooling demand by schools in Africa for Internet related services, see Deloitte (2024) "Market assessment: Connectivity solutions for schools in Eastern, Western and Southern Africa", Project Giga, ITU and UNICEF, April.

41 This risk of opportunism can be reversed in telecoms, as private investors seeking to partner with government agencies to roll-out next generation networks (NGNs) might limit their investment fearing opportunism by a future different government, see : Howell, Bronwyn and Sadowski, Bert. 2014. "Anatomy of a Public-Private Partnership: Hold-up and regulatory risk in an NGN PPP", 20th Biennial Conference of the International Telecommunications Society (ITS): "The Net and the Internet – Emerging Markets and Policies" , Rio de Janeiro, Brazil, 30th-03rd December, 2014, International Telecommunications Society (ITS), Calgary.

One way to mitigate the adverse selection risk is via the application of procurement methods that facilitate 'price discovery'. Price discovery is desirable because it leads to resources being allocated more efficiently – at the margin $1 of public funds should yield a marginal benefit of $1 – and the public sector should obtain value for money. Competitive markets operate via the "invisible hand" to discover prices – rivalry among suppliers drives down prices to reflect underlying costs. Procurement methods that promote competition among private suppliers seeking government subsidies for investments in DCI can bring about enhanced value for money by enabling price discovery.

Over the years, a limited form of price discovery has been facilitated through many MDB loans used to contribute to funding gaps. These have relied on a procurement method known as 'Best and Final Offer' or BAFO. According to World Bank (2018) "BAFO is appropriate when the procurement process may benefit from Bidders/Proposers having a final opportunity to improve their Bid/Proposal, including by reducing prices, clarifying or modifying their Bid/Proposal, or providing additional information. It is normally particularly effective when markets are known to be highly competitive and there is strong competitive tension between Bidders/Proposers."[42]

While BAFO provides an opportunity for Bidders/Proposers to reduce prices and improve terms, its application often takes place against a backdrop of negotiation that lacks market discipline. Further, competing bidders and proposers may have little visibility about other offers. An improvement, and in many ways an extension of the principles enshrined in BAFO, are methods that allocate subsidy finance by allowing bidders to change prices (and terms) more than once and in response to sight of some summary of bid information made by competitors. This can be achieved using a MRRA framework.

Where a MRRA framework has been used to allocate public subsidies, as in India[43] and the United States,[44] savings have been identified and consequently the public enjoys better value for money. In World Bank and CEPA (2023) it was argued that application of MRRAs in Tanzania, where millions of dollars of subsidy have been awarded by way of single round auctions, the authorities could have achieved better value for money had MRRAs been used.[45] In this report we analyse how a MRRA is likely to be beneficial within the context of DCI investments seeking PCM.[46]

1.6 Structure of the report

The remainder of our study is structured as follows. In chapter 2 we look at the specific challenge of funding DCI in Eastern Africa. This looks at the economic characteristics that affect DCI funding and the options available to government in funding gaps and financing connectivity infrastructure. This is followed in chapter 3 with a look facilitating private capital mobilisation in DCI, assessing risks and probing into the role that can be played by national governments and development institutions.

In chapter 4 of the report we take a deep dive into the ways private sector investment can be incentivised by public funding. We describe direct subsidy methods and look closely at the opportunity for government agencies to act as anchor tenants and enable scale economies. This is followed in chapter 5 by looking at how the provision of funding can be best structured to achieve value for money. In this chapter our main recommendation of piloting multi-round reverse auctions is described.

The final chapter 6 sets out our policy lessons and recommendations. We also set out a road map for commercial transaction manuals in regard of deploying multi-round reverse auctions. This is followed by a number of appendices that look at a range of related and relevant issues, including procurement rules. We also provide some interview summaries conducted with a number of World Bank Task Team Leaders.

42 World Bank. 2018. Procurement Guidance "Negotiations and Best and Final Offer (BAFO). Use of Negotiations and BAFO in procurement of Goods, Works, and Nonconsulting Services".

43 The application of multi-round reverse auctions in India is discussed in Wu, Irene S. 2010. "Maximum Impact for Minimum Subsidy: Reverse Auctions for Universal Access in Chile and India" FCC Staff Working Paper 2. More recently, Shivam Bajpai and A.K Malviya. 2023. "Efficacy of Electronic Reverse Auction (eRA) in the Public Procurement System in India" International Journal of Creative Research Thoughts, Volume 11, Issue 7 July, illustrates the benefits enjoyed in practice by MRRA schemes in public procurement in India.

44 World Bank and CEPA. 2023. "Allocating universal service subsidies using electronic multi-round reverse auctions: Telecommunications in Tanzania" discusses multi-round auctions that have taken place in the United States. The benefit of MRRA public procurement schemes in the United States are quantified in David C. Wyld. 2011. "Reverse Auctioning: Saving Money and Increasing Transparency" IBM Center for the Business of Government.

45 World Bank and CEPA. 2023. op cit

46 Examples of the use of MRRAs in the energy sector include: a) Brazil's electricity auction in descending clock format (Box 5.1 IRENA Report); b) The UK's Capacity Market Auction in descending clock format to award capacity market agreements.

Funding Digital Communications Infrastructure in Eastern Africa

2

2.1 Economic characteristics of digital communications infrastructure

To build the foundations needed to help countries in Eastern Africa connect to, and benefit from, the digital economy, as discussed in chapter 1, significant investment finance is required. [47] DCI projects are often large-scale, capital-intensive, long-term and involve considerable planning and construction. Within the scope of this study, the extension to the backbone national fibre network and last-mile connectivity in the KDEAP project in Kenya is a prime example.

The economic characteristics of these DCI investments include:

- **Large scale assets, irreversible investments and long-lasting.** The KDEAP project includes extending the national fiber backbone network (the long distance and high capacity routes between interconnected networks and core routers in the internet) into the middle mile bringing services closer to users in the last mile. Investments involve substantial capital outlays and construction costs which are estimated to lie between US$15,000 to US$30,000 per kilometer, depending on the topography. In the KDEAP, as shown in Table 1-2, the World Bank has allocated US$60 million to extending the backbone to the middle mile and a further US$90 million to last mile connectivity, along with US$35 million on connecting government agencies and services (e.g. hospitals, educational institutions, etc.) and US$30m for investments in cross-border connectivity. This is estimated to be sufficient to leverage a further US$100m in unguaranteed commercial financing through "matching investment" by the private sector.

- **Uncertainty.** DCI projects are typically long-term in outlook and in the near term they involve considerable outlays with revenues appearing further down the line. Returns for investors are therefore influenced by future growth and future regulatory and governance environments, presenting risks that affect the cost of capital and the amount of finance needed. There is a role for government and MDBs to help manage these risks, including aggregating demand for services through government agencies and offering guarantees, as well as establishing clear and credible regulatory rules.

- **Network effects.** DCI services are delivered on platforms that may feature network effects in the form of externalities across different participants – different types of users avail of and provide services over the platforms on different sides of the market (some as buyers, others as suppliers).[48] For example, services may be accessed by end-users as consumers and supplied over DCI platforms by firms and government agencies. Network externalities within and across user groups on these platforms may lead to market failure in the form of under provision of DCI. This is likely to arise when investors are unable to monetise externalities.[49] As many DCI projects have wider social benefits that are not monetised through usage fees, this can provide a rationale for public support to correct this form of market failure.

The level of DCI in a country is affected by both demand and supply-side forces, as discussed in the context of the gaps model above. On the demand side, income is the key driver and as income increases, demand for more data and better-quality services increases which in turn increases the use of digital infrastructure. For example, faster broadband speeds will become more affordable as income increases. Higher demand for high-speed broadband makes it more profitable to invest in expanding fibre and wireless networks.

47 See For example, Bandwidth & Cloud Services Group (BCS) expansion of fibre infrastructure in DRC, Malawi, Zambia, Mozambique and Zimbabwe involves an estimated total project cost of US$185m where 70% of the capex is concentrated in DRC. The IFC recently committed a debt package structured as an unsecured covenant-lite ("UCL") loan of up to US$200m (US$[165]m A-loan and up to US$[35]m in mobilization from the Managed Co-Lending Portfolio Program (MCPP)) for Airtel Africa. The proceeds will support capex financing which will contribute to expanding and upgrading Airtel Africa network and also refinance part of its debt. e https://empowerafrica.com/internet-infrastructure-in-africa/

48 A platform is an intermediary connecting two or more different sides of a market. For example, a two-sided market has (1) two sets of agents interact through an intermediary or platform [in this study the intermediary or platform is viewed as the physical and virtual networks enabling DCI services], and (2) the decisions of each set of agents affects the outcomes of the other set of agents, typically through an externality. Externalities can be positive (e.g. a consumer values services more when there are more suppliers on the other side to choose from) and negative (e.g. too many consumers on a platform may lead to congestion such as too many adverts, etc.). See Rysman, Marc. 2009. "The Economics of Two-Sided Markets." Journal of Economic Perspectives, 23 (3): 125-43. DOI: 10.1257/jep.23.3.125

49 Jacobides, M. G., Cennamo, C., & Gawer, A. .2024. Externalities and Complementarities in Platforms and Ecosystems: From Structural Solutions to Endogenous Failures. Research Policy, 53(1), Article 104906. https://doi.org/10.1016/j.respol.2023.104906 notes platform operators may have the scope to internalise the problem of monetising externalities by setting appropriate discriminatory tariffs.

Investments in DCI by government can stimulate future fiscal benefits and improve government efficiency which together enable funds to support additional DCI related projects. In the Project Appraisal Document for the KDEAP it is noted "The public sector would enjoy cost savings stemming from digitization and automation of core administrative functions and services to relieve strain on public finances…".[50]

Businesses will demand more and better quality DCI, so that they can further improve productivity and access wider markets. Some countries in Eastern Africa have strong growth potential, so demand for more and better DCI is likely to be high over the foreseeable future. Government policy often seeks to facilitate demand for DCI, for example Ethiopia's Digital 2025 Policy set the objective of becoming a lower-middle income country by 2025 and involves various programmes.[51]

Public sector participation in Digital Communications Infrastructure

If a DCI project is commercially viable from a risk-return perspective, then the private sector can be left alone to finance investments. In middle- and high-income countries, the majority of investments in DCI are privately financed and public and private interests are fully aligned. Further, in middle- and high income countries access gaps are relatively small.

However, even in middle- and high-income countries there is widespread public funding of DCI programmes.[52] These interventions arise for both efficiency and fairness reasons. For example, the social benefits arising from investments in DCI are not fully accounted for by private investors and public funding becomes a means to unleashing greater gains. There is also pressure on many governments to deliver equality of access to DCI for inclusivity reasons.[53]

In low- and low-to-middle income countries, and especially in Eastern Africa, immature private capital markets combined with governments having weak fiscal positions and inadequate or under-resourced capacities mean there is a greater need for public support of DCI projects to help promote growth and achieve the UN's SDGs. The source of public funding will often rely to some extent on loans from MDBs and IFIs.

A further risk arises in Eastern Africa in respect of currency risk, where some operators manage exposure to currency risk by charging customers in US dollars. For example, BCS, a wholesale fiber provider, charges all its wholesale customers, except Airtel Uganda, in USD.

However, with DCI projects there is the potential for considerable private sector funding and operational involvement and the key issue is how best to leverage this.

2.2 Government options and funding gaps

For many DCI projects in Eastern Africa there is a funding gap and the private sector alone is unlikely to deliver the socially optimal levels of investment. There is scope for public finance interventions and public funding to help make up gaps in investment. A key problem, however, is imperfect information about the magnitude of the funding gaps. This asymmetry in information raises a question about the best approach to the funding of gaps.[54]

Traditionally telecoms funding gaps have been managed by one or more the following approaches:[55]

- **Regulation:** setting licence obligations that require universal service and other objectives to be met and/or the application of controls on prices and the nature of competition.
- **Universal service and access funds (USAFs)[56]:** using a mix of industry levies and general taxation to disburse subsidies.[57] For example, a mobile operator in Tanzania is subject to a universal service levy of up to 1.5% applied to gross operating revenue.[58]

50 Para. 70 in Project Appraisal Document for KDEAP, Report No. PAD4616, March 14, 2023.
51 On Digital Ethiopia 2025 see https://dfp.gov.et/. In a recent paper by Adam L, E Alemneh, Omar N and Partridge A (2024) African After Access 2023 Ethiopia, Post the Pandemic Policy Paper Series, Policy Paper 3, Research ICT Africa, Cape Town, the authors argue that Ethiopia's ambitions will fall short of the targets set.
52 For example, the EU's Connecting Europe Broadband Fund invests in underserved areas where there are strong opportunities for profitability. By 2021 it had raised €555 million for broadband investment and is expected to unlock total investments of €1-1.7 billion. See https://digital-strategy.ec.europa.eu/en/library/connecting-europe-broadband-fund.
53 For example, see BEAD in US, Project Gigabit in UK, Broadband Europe in EU.
54 For related reports identifying digital infrastructure gaps and various financing options and partnership opportunities to address those gaps in Kenya and the Horn of Africa respectively see (a) World Bank and Salience Consulting. 2022. "Kenya Public Digital Infrastructure Options Assessment and Pre-Feasibility Study" and (b) World Bank and TMG. 2022. "Identification of Missing Broadband Links in the Horn of Africa Region".
55 Many of the issues in this chapter were addressed in detail by Arturo Muente-Kunigami and Juan Navas-Sabater. 2010. "Options to Increase Access to Telecommunications Services in Rural and Low-Income Areas", World Bank: Washington DC.
56 GSMA. 2014. "Sub-Saharan Africa – Universal Service Fund study" September is a good, though slightly dated, overview of universal service policies in most SSA countries. In Table 3.2.3 of the report it can be seen that most countries apply a levy of 1% or higher on some measure of revenues. In a more recent report GSMA. 2023. "Mobile Tax Policy and Digital Development: A study of markets in Sub-Saharan Africa" October "Mobile consumers and operators in SSA are subject to a substantial tax burden, increasingly driven by sector-specific taxes and fees, which exacerbates affordability and coverage barriers. The multitude of taxes and frequent tax changes negatively impacts the business environment and hinders operators' capacity to invest in network expansion and coverage."
57 For example, see : Thakur, D. and Potter, L. 2018. Universal Service and Access Funds: An Untapped Resource to Close the Gender Digital Divide. Washington DC: Web Foundation.
58 See https://www.tcra.go.tz/download/sw-1619084421-The%20Universal%20Communications%20Service%20Access%20Act%20of%202006.pdf

- **PPPs:** co-financing arrangements between the private and public parties in an infrastructure project. In telecommunications projects often involve foreign capital and this presents currency risks.

- **Guarantees:** underwriting commercial investments by offering insurance against losses.

- **Anchor tenants:** facilitating and channelling public sector demand for DCI enabled services to promote scale economies and lower unit costs of service delivery.

In this study we are interested in how funds are disbursed and/or provided by the public sector. The approach taken towards funding gap investments can have a material bearing on how much the private sector contributes towards investment. For example, a USAF manager could choose to disburse subsidies using a single-round, sealed-bid auction. This approach has to date been taken by the UCSAF in Tanzania. Once World Bank funds had been disbursed, UCSAF itself stepped in to offer a higher level of subsidy to operators for those sites that had missed out on bids through the initial rounds of bids.

Arguably if the UCSAF had instead used MRRAs it would likely result in better value for money by promoting more investment and high private sector funding (see World Bank and CEPA, 2023).

This section gives a brief introduction to the various options available to mobilise private funding.

Regulation

Regulation of private undertakings that supply networks and services is commonplace and is a way for governments to achieve desirable policy objectives that would otherwise not arise absent regulation. One method used to regulate entities is through obligations in regard of geographic and population coverage attached to licences assigned to operators and service providers. Such obligations can also act as a means of channelling private investments in lower profitability areas.

This could be done in respect of DCI. However, it requires government to know what services should be delivered as part of DCI, who the recipients are and the implications for end user prices.

Enforcement of coverage licence obligations is usually one of the duties of the communications regulator, and in many instances this process is supported by the courts. Obligations may define outputs and quality of service, and may also determine the type of service supplied. For example, it is often a requirement that licensees achieve at least pre-defined coverage levels within a period of time after the grant of licence. For example, Safaricom Ethiopia, surpassed a 25 percent nationwide population coverage it was required to hit as part of its licence, acquiring over 5 million customers since launching commercial services in October 2022.[59]

Inserting obligations within licences can help promote investment but carries a risk that licensees will seek concessions in other areas – such as higher prices. Further, the insertion of obligations may be misjudged and lead to inefficient outcomes. Obligations may also lead to less market interest and diminished competition – something which has been a feature at times in various Africa countries.[60]

Universal service access funds, subsidies and guarantees

In addition to directly decreeing objectives through licence obligations, government can also provide subsidies to help fund and steer investments in DCI. Subsidy finance can derive from levies on the telecoms industry, general taxation and borrowing. Where the telecoms industry faces levies, these raise costs[61] and result in cross-subsidy: users with a high willingness to pay help to subsidise services provided to consumers with a lower willingness to pay. The impact on efficiency depends on the type of levies applied.[62] According to Matheson and Petit (2017) "*Universal service fund charges also reduce profitability by reducing output and/or operator margins*".[63]

On the demand side, government can subsidise products and services to help bridge the gap between the returns an investor would require and the current willingness to pay of households and businesses. For example, the UK government operates a voucher scheme to connect unserved addresses to gigabit broadband services.[64] In Africa the government of Rwanda applied a subsidy scheme to purchasers in rural areas of mobile handsets. Analysis of this scheme by Björkegren and Karaca (2022) showed that "*welfare impacts are positive, with a social rate of return of at least 44%. A substantial portion of impact arises from spillovers*".[65] However, schemes of this kind appear to be the exception rather than the norm in Sub-Saharan Africa, possibly because of concerns about corruption and a lack of capacity in public administration.[66]

59 See Capacity. 2023. "A brief guide to Ethiopia's attempts to licence a third operator"
60 Ethiopia suspended the award of a third national telecoms licence in December 2021 (partly as a result of conflict in the north of the country) following the failure of bids to materialise after expressions of interest were received. According to the regulatory authority, the process is currently "parked".
61 See Gregoire Rota-Graziosi and Fayçal Sawadogo. 2022. "The tax burden on mobile network operators in Africa", Telecommunications Policy, Volume 46, Issue 5 who find that telecommunications faces a very high tax burden in many African countries.
62 Sector specific taxes that target excess profit can be efficient. See Thornton Matheson and Petit. 2017. "Taxing Telecommunications in Developing Countries" IMF Working Paper, Fiscal Affairs Department, WP/17/247.
63 Matheson and Petit. 2017. page 16, op cit
64 For example, see "Gigabit Broadband Voucher Scheme information", February 2024.
65 Daniel Björkegren and Burak Ceyhun Karaca. 2022. "Network adoption subsidies: A digital evaluation of a rural mobile phone program in Rwanda", Journal of Development Economics, Volume 154, 102762, ISSN 0304-3878.
66 For example, see Lamin Cessay (2019) "Corruption in Sub-Saharan Africa - An Impediment to Economic Growth" European Scientific Journal, April, vol.15, no.10.

A demand side measure that can stimulate PCM is through packaging public sector demand for digital services and providing guaranteed payments for services. This is considered below in section 2.2.4 within the context of anchor tenants . On the supply side, government can give subsidies to the private sector to build infrastructure, as occurs in Tanzania. By lowering the funding gap, private sector interests are incentivised to build out more infrastructure. As an example, see Appendix F.1 for a discussion of supply-side subsidies to allocate funds for investment in mobile broadband digital infrastructure in Tanzania.

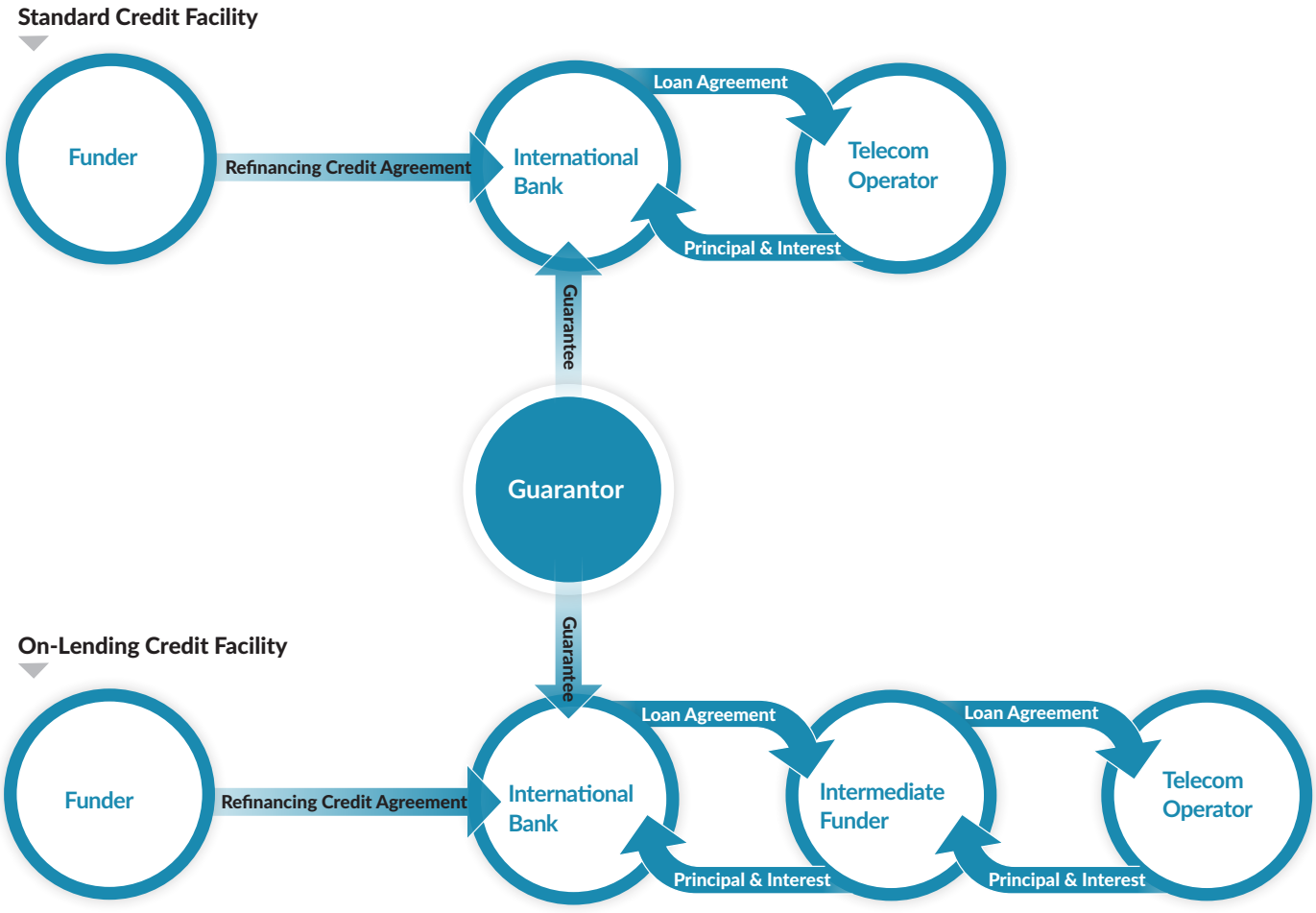
On the supply side, government and MDBs could offer a capital market 'subsidy' by offering guarantees in collaboration with commercial banks.[67] This would provide a guarantee that money loaned to projects will be repaid, which can be an important stimulant of PCM. The guarantors charge borrowers a fee for taking on this risk.

In some instances local guarantee companies could be established, with advocates claiming such schemes can unlock lending from local pension funds, insurance companies, and the like, for projects that commercial banks are reluctant to finance. An illustration of directing financing in this way is shown in Figure 2-1 below:

As guarantees are defined in local currency, exchange rate risk is decreased and transferred from the telecom operator or supplier of DCI services, which is a significant source of risk in many African countries. Local currency solutions are appealing, especially as in recent years currencies in many Africa countries have lost value or been highly volatile.

An example of a guarantee company in Kenya is InfraCo Africa, a finance vehicle backed by the UK, the Netherlands, and Switzerland, which has made some local currency investments supporting guarantees, mainly in Kenya.[69] However, while this option is a positive step forward in PCM, the investment amounts involved to date have been relatively small.

Figure 2-1 Intermediate funder carries foreign exchange risk



Source: European Investment Bank (2021)[68]

67 Guarantees enable financing partners to transfer certain risks that they cannot easily absorb or manage on their own to other parties such as the WB or government. For example, partial risk guarantees cover lenders against nonpayment by the borrower caused by political risk events. See World Bank Group Guarantee Products (2016), Guidance Note.
68 European Investment Bank. 2021. "Unlocking digital connectivity in Africa" page 40
69 FSD Africa. 2022. Guarantee companies unlock African infrastructure finance

Public-private partnerships

As we have already set out, PPPs may act as vehicles for government to provide funding in collaboration with private sector interests to deliver public services. Over the term of a contract revenues are drawn from taxpayers and/or users for profit. Thus, a PPP is one way to fund DCI gaps by blending users' revenues, taxation and government borrowing. PPPs, which are championed by development institutions such as the African Development Bank (AfDB), are becoming more and more common in Africa.[70] As alluded to in section 1.4, there are many potential benefits to PPPs and, when designed carefully, they can foster efficiency gains. However, because PPPs often involve very complex contracts and, over time, these are often imperfectly implemented and subject to renegotiation.

PPPs can appeal as they relieve government funding problems with projects relying more on private sector funding. However, government fiscal commitments to PPPs can be unclear, and treating PPPs as off-balance sheet can lead to governments accepting higher fiscal commitments and risk than prudent financial management would suggest.[71] Furthermore, many African countries lack the capacity to implement and monitor the delivery of PPPs, and private sector participation may be limited, especially as they involve considerable bureaucracy. This can result in a lack of competition for PPP contracts and the potential for contract renegotiation following award of contracts. Strong governance is key to ensuring PPPs are implemented effectively. Governments can also decide to reverse PPP arrangements, as happened in the case of the Burundi Backbone System where the Government decided to nationalise a PPP that had originally been set up under a World Bank lending program, chilling the environment for private sector investment.

In any case, for many telecom DCI projects PPPs may not be appropriate because relative to other infrastructure sectors there is often considerable private sector involvement and investor appetite. Instead, subsidies and PCM are more effective mechanisms to bridge the funding gap. However, caution is needed to ensure that investment appetite does not translate into entrenchment of market power.

Anchor tenants

We discussed benefits that could derive from anchor tenants in section 1.5. In the commercial world of real estate, an anchor tenant is a store whose presence increases footfall for nearby stores in a shopping mall. The shopping mall as a platform typically offers generous and possibly below cost rents to an anchor tenant and recovers costs by charging higher rents to smaller stores willing to pay more because of the higher demand (footfall) due to the anchor tenant.[72]

In a DCI setting, anchor tenants are potential large buyers of data services such as universities, hospitals, schools, etc. The presence of government agencies as anchor tenants can be structured through funding to provide guaranteed income for infrastructure investors and thereby lower project risks. For example, a government agency may agree to a long-term contract to pay a fixed amount upfront for the rights to using say 50% of fibre capacity at no usage charge over ten years.[73]

Scale economies afforded by anchor tenants lead to lower incremental costs for access by other users of DCI. Thus, government funding via long-term contracts for services supplied to anchor tenants can result in higher coverage and welfare. Unlike in the commercial world of real estate, where smaller stores pay more, a government anchor tenant acts to transfer benefits to smaller users and helps increase overall welfare. We revisit this idea of anchor tenants in chapter 4.2.

70 See the African Development Bank "PPP STRATEGIC FRAMEWORK 2021-2031".

71 See World Bank. 2022. "Fiscal Accounting and Reporting for PPPs." Available at: Fiscal Accounting and Reporting for PPPs Public Private Partnership (worldbank.org). Since PPPs transfer risks (such as construction or demand risk) to a private party, under accounting rules most PPPs are not recognised in debt statistics. Most accounting and reporting standards do not require governments to recognise contingent liabilities, including those arising from accepting risk under PPP contracts.

72 An anchor tenant would usually bargain with the mall owner over the division of rents arising from its presence. Konishi, H., and M. T. Sandfort. 2003. "Anchor Stores." Journal of Urban Economics 53 (3): 413–435. https://doi.org/10.1016/S0094-1190(03)00002-0.

73 For example, BCS's fibre construction in DRC has involved laying 1,200km of backbone (no metro yet), and a plan to build an additional 6,000km of backbone and 3,000km of metro. BCS has built backbone and metro fibre with 96 cores plus a submarine cable of 24 cores. Out of the 96 cores, 24 are owned by the Government (forming an anchor tenant) with remaining owned by 48 BCS plus 24 Vodacom (operator). The total capacity of the 96 cores is 1.6Tbps.

2.3 **Financing connectivity infrastructure**

Securing financing is critical for DCI projects to make it past the planning stage. There are a range of financial instruments that can be used, outlined in Table 2-1.

Table 2-1: Financial instruments for DCI

Financial Instrument	Merits	Challenges
Public budgets are sums of money allocated for public expenditure by a state entity	■ Backed by state policy ■ Steady flow and stable value ■ Subject to public scrutiny	■ Influenced by changes in national priorities ■ Dependent on political buy-in
Grants are sums of money that are commitment-based or philanthropic in nature	■ Aligns DCI with welfare goals ■ Ideal for funding the R&D aspects of DCI ■ Often large amounts of money, with limited control over usage	■ Unreliable for long-term financing as most grants are provided for a fixed period of time with uncertain terms of renewal ■ Limited public accountability
Private capital is a sum of money invested in an entity or infrastructure in exchange for ownership rights	■ Possibility to raise more capital ■ Forges strategic partnerships with investors ■ Ideal for funding the R&D aspects of DCI	■ Typically focused on short-term goals ■ Could create the micro-economic issue of principal-agent conflict
Debt is a sum of money borrowed for a fixed period of time, with accompanying interest payments	■ Lowest risk for funder ■ Ownership rights remain with the entity/country	■ Interest payments can cause fiscal burden ■ Restrictive terms of operation

There are numerous examples around the world of how these financial instruments have been used to develop DCI.

- **Public budgets** – for example, India's National Health Authority was allocated US$41 million from the national budget in 2023-24 for the Ayushman Bharat Digital Mission which aims to support the integrated digital health infrastructure of the country. It will bridge the existing gap amongst different stakeholders of healthcare ecosystem through digital highways. Within ten months of its nationwide launch, 20 government platforms and 32 private health applications were integrated and contributing to scaling the network.[75]

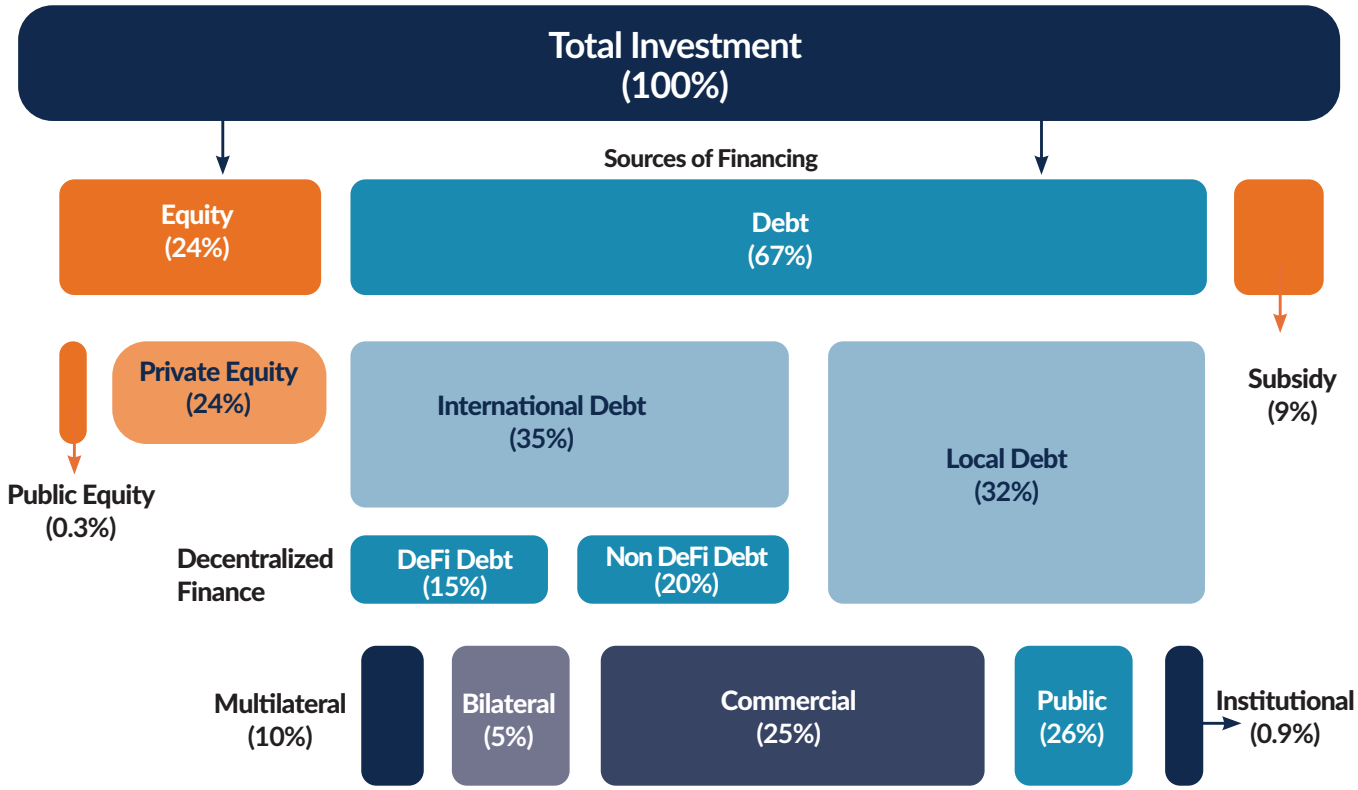
- **Grants** in response to a shift in geopolitical conditions in 2022, USAID contributed US$25 million to further develop Ukraine's e-governance app Diia. With support from the UK Transparency and Accountability in Public Administration and Services (TAPAS) project, Diia has been in development since 2019. The first version was developed by EPAM Systems, a private software firm. It has also seen varying contributions from UNDP, Sweden, Swiss-funded E-Governance for Accountability and Participation Program (EGAP),[76] EU4Digital, and others over the years. The app provides online access to more government services to all Ukrainians with digital documents such as ID-cards, student ID, driver's licenses, vehicle registration certificates, vehicle insurance policy, tax numbers, birth certificates and resettlement certificates and foreign biometric passports.

- **Private capital** - As of June 2023, 65 banks were shareholders of the National Payments Corporation of India (NPCI), an umbrella organization that operates the Unified Payments Interface in India. There are currently 22 third-party applications developed by private sector firms for end-users to avail UPI for digital payments.[77]

- **Debt** – MDBs such as the WB provide debt finance for DCI projects. For example, a US$250 million loan to strengthen population and civil registration while increasing the usage of digital identification for service delivery in Indonesia.[78]

74 See https://www.undp.org/sites/g/files/zskgke326/files/2023-08/undp-the-DCI-approach-a-playbook.pdf
75 See https://abdm.gov.in/
76 See https://eef.org.ua/en/program/programa-egap/
77 See https://www.npci.org.in/
78 See https://projects.worldbank.org/en/projects-operations/project-detail/P175218

Figure 2-2 Sources of finance for infrastructure projects with private participation in emerging and developing economies



Source: PPI Database (2022)[79]

*All figures as a percentage of total investment

2.4 Conclusions

Funding the build out of DCI in Eastern Africa will face the challenge of funding gaps over the coming years. In this chapter we have set out how funding can be structured given the economic characteristics of DCI. Measures such as regulation can be applied to achieve desirable outcomes, but other approaches that may utilise competitive tendering, such as the allocation of subsidies, might yield better value for money. These themes will be examined further in the next few chapters

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79 Source https://ppi.worldbank.org/en/ppidata

Facilitating Private Capital Mobilisation in Digital Communications Infrastructure

3

3.1 Current constraints and risks

The development of DCI in Eastern African needs to ensure that funds invested by the public sector deliver the best value for money and PCM is maximised. This is all the more important as macroeconomic indicators for the region have generally declined in recent years, partly as a result of the COVID-19 pandemic and other overlapping crises, placing a greater strain on government accounts. According to the World Bank Africa's Pulse October 2023 report, rising instability, weak growth in the region's largest economies, and lingering uncertainty in the global economy are dragging down growth prospects in the region.[80]

Further, debt distress remains widespread, with 21 countries at high risk of external debt distress or in debt distress as of June 2023. In 2022, the median debt-to-GDP ratio for low-income-countries (LICs) in Sub-Saharan Africa reached 55 percent, while it reached 58 percent for middle-income-countries in the region—in both cases, there was an increase in the debt ratio of around 27 percentage points since 2012.[81] Rising interest rates have increased the cost of borrowing to fund infrastructure investments and budgets are constrained by rising interest payments on existing debt. There are four key risks which act to constrain private investment in DCI in Africa:

1. **Project risk.** Although there is a vast array of business opportunities, the pipeline of projects that are 'investment ready' is limited. Investors are cautious of investing in unfamiliar markets or early-stage concepts which have not been implemented before. Particularly for last-mile digital infrastructure, these projects are unprofitable and costly to deliver with unpredictable revenues. Governance and regulatory ambiguity can also deter investors. For example, the US Department of State finds that foreign investment in Madagascar is limited by the government's reported lack of fair and consistent implementation of existing laws.[82] Other rules and restrictions, such as foreign ownership in the Malagasy telecommunications sector being restricted to 66 percent, means that foreign investors might look elsewhere.[83]
2. **Currency risk.** For international investors a key concern is currency volatility and depreciation, as revenues are defined in domestic currency. This can be caused by a lack of prudential macroeconomic policy and poor foreign exchange reserve management in addition to other economic factors. Djibouti is an example of a country with relatively low currency risk since the Djibouti Franc is pegged to the dollar and is fully covered by foreign exchange reserves. Ethiopia has a high currency risk, as the Birr is not freely convertible and the country lacks sufficient foreign reserves.[84]
3. **Political risk.** Political instability is a major concern for private sector investors, particularly in parts of Eastern Africa. Unstable governments may suddenly cut funding and short political cycles may challenge commitments to long-term infrastructure projects. The possibility of regional violence or conflict can completely halt local infrastructure investment. Limited competition in the telecommunications sector makes foreign investors fearful of unfair treatment due to government preference for state owned firms, particularly if it is a market structure in which the fibre backbone is dominated by a state-owned incumbent. Ethiopia, Somalia, and South Sudan are classified by the World Bank as Fragile and Conflict-Afflicted Situations (FCS).
4. **Exit risk.** Underdeveloped financial markets can prevent investors from exiting by issuing shares and capital controls can slow down or increase the cost of exiting. Legal frameworks are often weak and investors have limited protections available. If investors are unable to recoup their gains from investment, they will be unlikely to invest in the first place. Apart from Kenya, the project countries all have relatively weak and under-developed capital markets.

80 Africa's Pulse: Delivering Growth to People through Better Jobs, October 2023, World Bank
81 Africa's Pulse, October 2023 pp. 44-45 op cit.
82 See https://www.state.gov/reports/2023-investment-climate-statements/madagascar/
83 The recent licensing of Starlink in Madagascar suggests the government's willingness to waive this foreign ownership limitation.
84 The credit rating of Ethiopia was downgraded on several occasions toward the end of 2023. The rising cost of external finance is resulting in government seeking more domestic finance to fund government deficits. This environment is putting increasing pressure on the funding of large infrastructure projects. See Addis Standard "Ethiopia's credit rating downgraded by Fitch, amplifying high default risk", 3 November 2023.

Table 3-1: Perceived investment risks in the six countries in this study, CEPA estimates

Country	Project Risk	Currency Risk	Political Risk	Exit Risk	Description
Djibouti	⚠	⊕	⚠	⚠	Seen as a relative safe haven in the region and currency pegged to the dollar. Some political risk from Chinese investment and spillovers from conflict in Middle East and the Red Sea. Weak financial sector and opaque business practices.
Ethiopia	⚠	⊗	⊗	⊗	Ethiopian birr not freely convertible and lack of foreign reserves. Areas of conflict and violence. Lack of developed capital market but reform minded government. No functioning stock market.
Kenya	⊕	⚠	⚠	⚠	Positive investment climate with relatively sophisticated capital markets. Recent currency appreciation relative to US$. Some political risks.
Somalia	⚠	⊗	⊗	⊗	Lack of comprehensive legal and regulatory framework and presence of al-Shabaab terrorist group. Government welcomes FDI and has maintained macroeconomic stability. Weak financial system.
South Sudan	⊗	⚠	⊗	⊗	Reported unfair practices such as expropriation of assets and unpredictable tax policies, years of conflict and internal displacement. No functioning stock market.
Madagascar	⊗	⚠	⚠	⊕	Government publicly welcomes FDI but in practice has challenging business environment. No stock market, but developing one, and foreigners cannot participate in the bond market.

Legend: ⊗ is high risk; ⚠ is medium risk; and ⊕ is benign or normal risk.

Mitigating risks is complex and various institutions have a vital role to play to facilitate private sector investment in DCI in Africa. Sections 3.2 and 3.3 below focus on specific actions that local governments and development institutions can enact. While local governments and development institutions are key to creating a conducive environment for DCI, collaboration between the public and private sectors will help catalyse implementation and effectiveness.

3.2 Role of national governments

Governments play a key role in facilitating private sector investment in DCI. We have identified three broad areas for reform.

1. Improving the business climate

a **Macroeconomic stability:** prudential macroeconomic policy and sound foreign exchange reserve management can limit currency risk which will attract foreign investors and can make projects more profitable.

b **Transparent regulations and protections:** Transparent regulations, adequate legal protection for investors – especially foreign investors, and easy permitting and land acquisition can reduce legal and operational risks and enhance the commercial viability of projects. A good investment climate provides opportunities and incentives for firms to compete and innovate.

2. Providing financial incentives

a **Subsidies:** particularly for projects that are not seen as profitable but still provide a wider social benefit, such as developing last-mile digital infrastructure, the government can provide subsidies to make projects viable. This is already done extensively in other parts of the world. In East Asia, 90 percent of infrastructure projects with private participation receive government support.[85] The private sector will only get involved in projects with adequate risk returns, so government backing can provide both higher potential returns and lower risk.

b **Reallocating funding:** given budget constraints and limited availability of public funds, governments may consider reallocating resources used for public investment towards financing public incentives for private projects. The private sector is typically more effective in allocating resources and suffers less from external influences, such as trying to appease voters or the status quo bias, which may affect project feasibility. The McKinsey Center for Government analysis finds that governments across most countries and at all levels are less effective in allocating resources than the private sector, being slower to reallocate resources where needed and delivering little change in spending allocations from year to year.[86] To avoid crowding out the private sector, public finance can be reallocated from the most commercially viable asset classes to those that provide lower returns which are more suitable for government investment.

3. Promoting effective governance and security

a **Good governance:** promoting transparency, checks on corruption, improving regulatory quality, and political stability all help to incentivise private sector investment. Good governance improves other areas which affect the investment climate, such as policy uncertainty, macro instability, cost of access to finance, insecurity and crime.[87] In particular, promoting voice and accountability and improving regulatory quality are especially important, see Saha et al. (2022).[88]

3.3 Role of development institutions

The involvement of development institutions such as the World Bank is important to incentivise greater private sector involvement in DCI projects in Africa, effectively PCE. The role of development banks is leveraged through a wide range of mechanisms.

- **Laying the foundations.** The presence of past projects (e.g., in digital infrastructure) makes it easier to implement similar projects in the future. Lessons can be learnt from failures and successful strategies can be replicated. It also acts as a signal that the government is committed to investment in infrastructure projects so there might be less perceived political risk surrounding questions over ongoing support. However, direct involvement by the World Bank ends once a project formally closes.

- **Multiplier effect.** Investment by MDBs such as the World Bank, often working in collaboration with regional economic commissions such as IGAD and ECA, can have a multiplier effect, where the total investment created is a multiple of the initial investment provided. Private investors will have increased confidence in the country and projects and will be more likely to invest if MDBs have previously invested.

- **Improved local governance.** Development institutions can help local governments improve governance by making funding contingent on meeting specific criteria or by providing support and expertise. An example of success is the World Bank's ICT Sector Support Program for Somalia,[89] which ran from 2014 to 2020, and had a focus on promoting good governance and ICT sector regulation. The government was helped to develop telecommunications legislation and encouraged private sector investment in ICT infrastructure, such as the development of mobile money and improving connectivity.

85 See https://www.adb.org/news/features/how-much-should-asia-spend-infrastructure-0
86 See https://www.mckinsey.com/industries/public-sector/our-insights/how-governments-can-be-more-effective-by-reallocating-their-resources
87 World Development Report (2005), World Bank.
88 Saha, S., Sadekin, M. and Saha, S. K. 2022. "Effects of institutional quality on foreign direct investment inflow in lower-middle income countries." Heliyon, 8(10): e10828.
89 See https://www.worldbank.org/en/news/feature/2021/09/27/supporting-information-and-communications-technology-advances-in-somalia

Data from the International Telecommunication Union shows that the cost of a low-user package of mobile services fell by 76 percent between 2015 and 2019, when the project was in operation.[90]

- **Funding and expertise.** Many governments and developers lack the capabilities and capacity, as well as the budgets, to design and implement infrastructure projects with commercial potential. Very few projects reach financial close, with 80 percent of African infrastructure projects failing at the feasibility and business-plan stage[91]. MDBs can provide the funding and expertise necessary to develop profitable projects.

- **Trust.** MDBs can help build trust between the public and private sectors and facilitate cooperation. Trust is defined by the expectation that the other party will take the trusting party's interests into account and will not behave opportunistically.[92] Trust is necessary for the private sector to enter investments with the public sector due to the perceived risks involved. For example, there is the risk that an actor will abuse power in the project or abandon the cooperation, which forces the other actor to bear the costs. Involvement of a trusted third party without vested interests, such as the World Bank, can encourage the private sector to enter contracts as they trust that they will be treated fairly and not left with any unexpected costs.

- **Risk Sharing.** MDBs can leverage the private sector by making investments less risky. For example, the Multilateral Investment Guarantee Agency (MIGA) provided an initial US$1 billion guarantee for political risk insurance (PRI) cover against the equity investment in the first privately owned telecommunications network in Ethiopia, a consortium led by Safaricom of Kenya, and IFC has taken an equity share in the consortium.[93]

3.4 Conclusions

In this chapter we have set out the risks that surround DCI investments in Eastern Africa and considered ways governments and MDBs can mitigate them. Policies to manage and mitigate risks play an important role in affecting the environment for private sector interests and the extent to which PCM occurs. In the next chapter we look in more depth at how approaches to incentivising private sector investment in DCI.

90 See https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/IPB.aspx
91 See https://www.mckinsey.com/capabilities/operations/our-insights/solving-africas-infrastructure-paradox
92 Warsen, R., Nederhand, J., Klijn, E., Grotenbreg, S. and Koppenjan, J. 2018. "What makes public-private partnerships work? Survey research into the outcomes and the quality of cooperation in PPPs." Public Management Review, 20(8): 1165-1185.
93 See https://www.worldbank.org/en/results/2023/12/01/mobilizing-the-private-sector-to-drive-development-in-africa

Approaches to Incentivize Private Sector Investment in Digital communications Infrastructure

4

As already stated, the private sector has played a crucial role in developing telecoms infrastructure in SSA.[94] Notwithstanding, the private sector is not in a position to deliver within a timescale preferred the scale of investment required to achieve ambitious government policy goals associated with DCI. Policy ambitions, along with market failures and institutional shortcomings, necessitate intervention by governments and MDBs. As discussed in Chapter 10, substantial funding gaps in both connectivity and access justify public finance intervention. The focus of this chapter is to look more closely at how governments can leverage private sector finance and investments in DCI.

There are a range of approaches governments could use to incentivise private sector investment in connectivity infrastructure and DCI. These range from traditional fiscal approaches, such as tax incentives, to long term contracts with the private sector through PPPs. Table 4-1 summarises these two direct approaches. Other methods outside of the scope of this report, such as policies to improve governance and the investment environment, can be effective alongside these more direct approaches.

In the case of last mile connectivity infrastructure investment, methods such as tax allowances are likely to be ineffective due to the political risk involved and the fact that the burden is still placed on the private sector to raise capital. Contracts with the private sector, such as the provision of direct subsidies, will be more effective due in this case due to the sharing of risk between public and private sector and the ability for the government to state what investment needs to occur as part of the contractual conditions.

The key policy question is how public and private funds can be best used in combination to maximise DCI investments. The remainder of this chapter outlines different approaches to leveraging the private sector. First, we consider subsidies – outlining both the traditional methods used to allocate subsidies in telecoms and in particular direct subsidies, which we believe are most likely to be appropriate to maximise the benefit derived from the funding. We also develop the anchor tenant model further, which can be used in conjunction with some form of subsidy rather than simply as a direct alternative.

Table 4-1 Approaches to incentivise private sector investment in DCI

Approach	Advantages	Disadvantages
Altering taxes e.g., lower corporation tax	Reducing the tax burden for companies who invest in connectivity infrastructure can make projects more profitable. Can be targeted at high-cost rural areas.	Political risk – tax often altered so no guarantee the favourable tax policy would last. Burden on private sector to raise capital, which would be expensive due to risk of last mile infrastructure. Often not a strong enough incentive for investment in risky and unknown projects. Fiscal pressures, though these can be mitigated to some extent by MDB lending.
Contracts involving private sector e.g., PPPs, subsidy	Share risks between public and private sector. Contract can specify quality targets and give government more control over output.	Political risk – government can break commitment e.g., nationalise PPP, but more difficult to do than altering tax policy. Potential to distort market competition if PPP project given protections.

Source: CEPA analysis

94 See the discussion paper from the International Telecommunication Union, available at: https://www.itu.int/ITU-D/ict/papers/bmi/bmi98.pdf

4.1 Subsidy methods

We considered subsidy approaches through USAFs in chapter 2.2.2 and noted subsidies can be provided to either service providers (supply-side subsidy) or to customers of communications services (demand-side subsidy). Both aim to improve the commercial viability of a project, but on different sides of the market.

A supply-side subsidy is where the government or other public body such as an MDB provides funds to a private company in return for delivery of certain obligations, such as building and operating DCI in areas that might not otherwise be served. The subsidy would typically be funded through fiscal measures (general taxation or government borrowing) and enable the private party to obtain privately funded capital to fund the development. The subsidy payment being made to the private party upon competition of the contractually agreed obligations is a form of commitment device: it ensures the private sector delivers on its agreements otherwise it will not receive the subsidy, see Box 1 below for a discussion in the context of Niger. This protects the government or MDB from providing funds for a project that is subsequently not delivered as promised.

Such an agreement relies on a strong legal framework in the particular country where the investment is aimed for; however, such arrangements are now standard practice in most countries including those in Africa. Supply-side subsides are well suited for DCI projects in Eastern Africa, such as rollout of last- and middle-mile fiber, because it helps to provide gap funding for projects that might otherwise be uncommercial. Box 1 describes a supply-side subsidy implemented by the WB in Niger to speed up construction of cell towers in 2,000 plus underserved villages.[95]

An alternative to subsidising infrastructure cost and build is to stimulate demand by providing users with a subsidy – this can be focused on both consumer related infrastructure build and/or devices needed by consumers to avail of services. Demand-side subsidies have occurred in Eastern Africa, an example is shown from Rwanda in Box 2. In 2023, Airtel in Rwanda partnered with Reed Hastings (founder of Netflix) to provide subsidized 4G smartphones for around USD$20 coupled with 4G daily data and unlimited calls and texts at USD$3/month.[96] Subsidisation of last-mile fibre rollout in rural areas occurs in many high-income countries and an example is provided in Box 3 from the United Kingdom.[97]

Box 1:

Niger Smart Villages Project (P167543) – subsidies for CAPEX

Background: Niger is a large, landlocked, country in the Sahel region of West Africa and is one of the least developed countries in the world. Niger's digital infrastructures are significantly under-developed, rated last out of 176 countries in the 2017 ICT Development Index of the ITU. At least 10 percent of the population has no mobile phone telephone coverage and around half the population is not covered by mobile broadband. The Niger Smart Villages Project was launched in 2020 with the aim of increasing access to cell phone and broadband services in rural areas and bringing digital financial services to selected underserved areas. Component 2 of the project aims to develop connectivity for approximately 2,111 "smart villages" out of a total of 6,092 rural villages lacking connectivity.

Subsidies: Supply-side subsidies for capex of around US$60,000 per village are provided for underserved villages with a population between 250 to 2,500. This population range was chosen because larger villages would likely be served even without a subsidy if enabling polices and an appropriate regulatory environment were in place. Smaller villages would likely be uneconomical to serve using today's technology without also subsidising operating expenditures.

Subsidies were most commonly used for construction of additional cell towers in areas with limited or no cellular coverage. Capital subsides were provided to the private sector through a reverse auction subsidy tender process where the winning bidders request the lowest levels of subsidy. Additional funding to promote connectivity is expected to be supplied by winning bidders, among others.

The payment of subsidies, however, is made contingent on winning bidders in the process undertaking the investments promised. This illustrates the importance of post-auction audit in ensuring commitment.

95 See https://projects.worldbank.org/en/projects-operations/project-detail/P167543 and https://documents1.worldbank.org/curated/en/315991594519247904/pdf/Niger-Smart-Villages-for-Rural-Growth-and-Financial-Inclusion-Project.pdf

96 See https://taarifa.rw/airtel-unveils-rwandas-most-affordable-lte-smartphone-with-an-exclusive-offer/

97 See https://www.topafricanews.com/2024/01/22/rwanda-pushes-africa-towards-universal-smartphone-access/ and the #connectrwanda programme at https://www.minict.gov.rw/

Box 2:

Smartphone subsidies in Rwanda

Rwanda recently-announced a three-year target for smartphone ownership and is one of the most ambitious in Africa. As part of the innovative funding scheme, citizens can obtain handsets at a subsidised price of US$16, complemented by a data plan costing just US$1 for 1GB, valid for 30 days and inclusive of unlimited text messaging. "We are optimistic that in the next three years, at least every citizen will have this level of access that allows them to benefit directly," Communications Minister Paula Ingabire told reporters in Davos in early 2024.

Box 3:

Demand-side subsidies - Gigabit Broadband Voucher Scheme (UK)

The United Kingdom government has introduced a policy called Project Gigabit to promote faster broadband in areas of the country that lie in the access gap. As part of the £5 billion (US$6.4 bn) Project Gigabit, the UK Government is providing up to £210 million (US$268 m) worth of voucher funding for people experiencing slow broadband speeds in rural areas. Vouchers help to cover the costs of installing gigabit broadband. In effect, the voucher bridges the gap between the required returns for a fiber network investor and the current willingness to pay of households and businesses to pay for these services. Only suppliers can request vouchers on behalf of their customers. The value of the voucher contributes to the build cost of installing a gigabit-capable connection at the customer's premises.

Testimonies state how broadband upgrades resulting from the scheme have greatly increased the utility of those who live in rural areas. Users can download large documents quickly and engage in video-conferencing calls that support business development. Residents of supported areas are now able to work from home when they would have had to drive for hours to reach a quality signal.

This case study highlights the success of demand-side subsidies in a UK context. However, this does not mean that it would be successful in Eastern Africa since construction costs might be so high that it is impossible for the company to finance and build the infrastructure without a supply-side subsidy. In addition, the sufficient level of demand-side subsidy required per individual in the East Africa context may be significantly higher than the level required to achieve the desired outcomes in the UK.

Below we consider the advantages and limitations of using subsidies against other interventions such as direct regulation, public ownership models or government or public supply.

Advantages

- Supply-side subsidies compatible with competitive allocation mechanisms to achieve value for money: If service providers are competing solely on the level of subsidy required, government can establish a procurement process that is compatible with an auction format to promote better value for money. These are known as reverse auctions and are discussed further in chapter 5.

- Broad experience: Subsidies are used around the world to support the rollout of DCI, such as the construction of last mile infrastructure to bring broadband to rural areas. Subsidies have also been widely used in WB programs such as Niger Smart Villages (P167543),

  Digital Malawi Foundations Project (P160533), and the Digital Tanzania Project (P160766).

- Efficiency: Following the award of a subsidy, recipient private companies have an incentive to build the required infrastructure for as low a cost as possible so as to receive all the subsidy funds.

- Greater transparency and accountability when combined with auction allocations: A direct subsidy when allocated through use of a reverse auction, can be associated with a process that has greater transparency and accountability. It is clear who is allocated what subsidy, and whether there are any unallocated funds, following competition in an auction process. This is in contrast to where subsidy funds are allocated by negotiation or application, as features in in many USAFs, where outcomes often lack transparency and accountability.

Limitations

- Effective procurement mechanism requires competition: Subsidies may not provide value for money if the method of allocation does not involve competition. However, in most subsidy allocation areas there is likely to be some competition, though policy makers need to take care when it is very limited.

- Challenging to determine appropriate level of subsidy: For many DCI projects in Eastern Africa, such as last mile fiber, expected costs vary significantly to the areas in which networks have already been developed. It makes it more difficult for private companies to bid for a subsidy if they are very unsure about costs and demand. There is a risk of winning bidders receiving a subsidy award that is less than the amount required to complete the project without making a loss. This phenomenon is analogous to the concept of the winner's curse – the idea that, if you are the winning bidder, it is because you have bid too low (or too high, in the case of an ascending auction).98 Given bidders are aware of the winner's curse, they will tend to include a relatively large risk premium within their bid prices to avoid winning an insufficient subsidy. With imperfect information it will be rational for all bidders to do so, risking an inefficient outcome and the procurement not delivering value for money. A multiple round auction for subsidy finance can help mitigate the winner's curse.

- Difficulty in deciding where to allocate the subsidy: The government or public body in charge of allocating the subsidy funds needs to decide carefully what geographic regions the funding should be assigned to. This is particularly important when funds are scarce. Many factors, including the current areas of coverage, need to be determined to assess which areas require subsidy and which do not. This is a challenging and lengthy process. It is also potentially susceptible to lobbying by vested interests and risk the result of an inefficient allocation.

- Red tape: Subsidies and grants are conditional on numerous requirements which may be quite stringent on the private party in terms of security, open access, social and environment safeguards requirements and other obligations. This may lead to concerns of either undue government control or an unjustified burden placed on the private sector which would be inefficient.

- Buyer determined award rule: Rather than award the subsidy funds to the lowest bidder via an auction, it is possible for governments to allocate funds using an arbitrary scoring system. Bureaucrats usually score applications using a degree of discretion, which can lead to corrupt influences, especially in countries where oversight and court resources are limited. This is a commonly used approach in public sector procurement and also widely used in the private sector.

4.2 Government agencies as anchor tenants

The idea of using government agencies as anchor tenants as part of communications policy has developed traction over the last fifteen years. Above, we mentioned that BCS hosts a number of anchor tenants on its fibre network in Eastern Africa.[99] Stenberg (2010) described the merits of anchor tenants in helping to improve broadband coverage in the United States.[100] He showed that over 32,000 anchor institutions received subsidy funding under the American Recovery and Reinvestment Act of 2009 (ARRA) to help improve broadband connectivity. Also in the United States, the Benton Foundation (2016) published an action plan on behalf of schools, health providers and libraries to promote broadband connectivity using Community Anchor Institutions (CAI).[101] Part 7 of the ten-part plan recommended:[102]

98 The winner's curse that may arise in an auction setting requires the value of items to have a common value component. Common value is where the intrinsic value of an item is the same for everyone. The bidders in an auction form their own expectations about the common value of the item, informed by research and information. This typically results in a distribution of value estimates, with each bidders' estimate known only by that bidder. In theory the average of these estimates is likely to be close to or equal to the true 'hidden' common value. Therefore, bidders' possessing estimates above the average are likely to overbid (or in a reverse auction, ask for less) and win – as a result there is a higher chance of winning and paying too much (or receiving too little) – the winner's curse. Rational calculating bidders are aware of this and in a single round setting would adjust bids upwards in a reverse auction, to reduce the possibility of receiving too little.

99 BCS Group owns one of the biggest terrestrial fiber networks in Africa. Its network spans from the East Coast of Africa connecting to multiple submarine cables through Mombasa in Kenya and extends to the West Coast of Africa through Muanda in the Democratic Republic of Congo and Luanda in Angola, providing capacity to land locked countries in the continent as well as ensuring network redundancy to our customers in the event of unplanned network outage. BCS is connecting up to 5,660 institutions inclusive of 3,125 schools, 1,533 hospitals and 1,002 government office as anchor tenants. See https://www.bcs-ea.com/about.html

100 Peter L. Stenberg. 2010. "American Policy and the Evolving broadband Internet Network", Choices, 25(4).

101 CAIs are Schools, Health & Libraries Broadband (SHLB) Coalition. "Connecting Anchor Institutions: A Broadband Action Plan." Evanston, IL: Benton Foundation, July 2016.

102 Page vi op cit.

"*Studies show that CAIs often cannot afford to purchase the broadband capacity they need to serve their communities. Policymakers can address CAIs' financial constraints with direct subsidies to CAIs, encouraging them to work together in planning joint procurement of broadband services, and expediting review of consortium applications for funding that can yield cost savings.*"

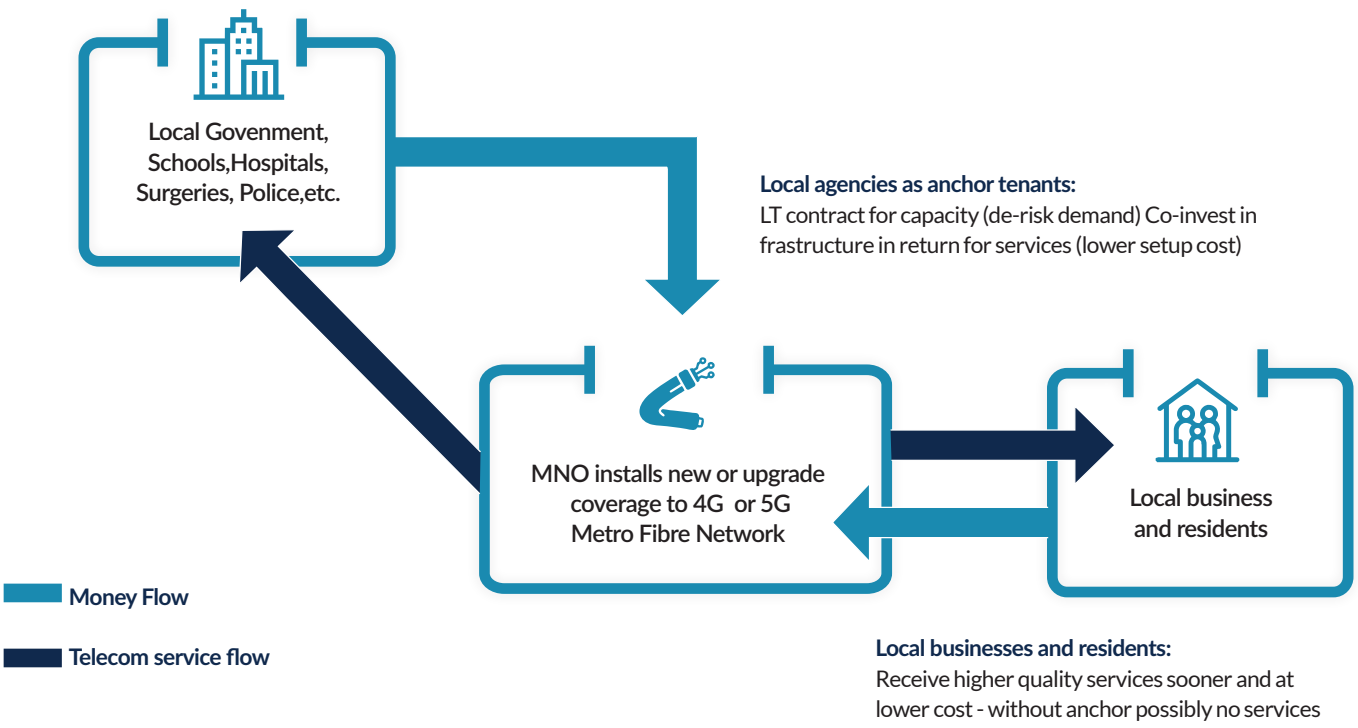
The World Bank has also recommended policies around the anchor tenant concept. Kim, Kelly and Raja (2010) stated that the "*Government's main pump-priming function on the demand side is to serve as an anchor tenant for broadband services.*"[103] In the influential Moonshot for Africa plan of 2019, anchor tenants were recognised to form an important part of connectivity policy:[104]

"*Procurements of telecommunications network infrastructure and service, establishing broadband connectivity at government offices, including wide area networks and extensions to town and village centers, which can also serve as "anchor tenants" that can support costs of commercial operators' overall network infrastructure deployment.*"

In 2018 the ITU, UNICEF and the private sector established an initiative 'Giga'[105]—having the goal of connecting every school to the internet. Analysis for Giga shows that schools can be anchor tenants and facilitate access and digital skills training across the neighbouring communities.[106] In a wide-ranging report for Giga on connecting schools by the Boston Consulting Group (BCG) (2021), three primary forms of funding connectivity are identified: (1) Private sector; (2) Government and (3) Community from which numerous funding models can be derived. BCG state that a combination of funding models is needed in most countries, as single solutions cannot bridge the funding gap in isolation and note that "*anchor clients stand as a good option to provide stable revenues and thus decrease risk*".[107]

An illustration of the anchor tenant model is provided in Figure 4-1 below.

Figure 4-1 Public sector anchor tenant model



Source: CEPA analysis

103 Yongsoo Kim, Tim Kelly, and Siddhartha Raja. 2010. Building broadband: strategies and policies for the developing world. World Bank.
104 Broadband Commission Working Group on Broadband for All: A "Digital Infrastructure Moonshot" for Africa, October (2019) "Connecting Africa Through Broadband: A strategy for doubling connectivity by 2021 and reaching universal access by 2030" Broadband Commission for Sustainable Development. ITU, UNESCO.
105 See https://giga.global/
106 The State of Broadband 2022: Accelerating broadband for new realities. ITU/UNESCO Broadband Commission for Sustainable Development, September 2022, page 48.
107 BCG for Giga. 2021. "Meaningful school connectivity: An assessment of sustainable business models" Giga in collaboration with Boston Consulting Group (BCG).

The possibility for government agencies to act as anchor tenants within the development of communications infrastructure and services continues to grow as DCI policies on the digitalisation of taxation, education, health and identity services expand.[108]

Box 4:

Anchor tenants and direct subsidy diagrams

Figure 4-2 Demand and cost for communication services

DCI communications infrastructure exhibits high fixed and sunk costs (high capex) and relatively low marginal costs (low opex), giving declining average cost. In areas where demand (willingness to pay) is low, service may require substantial subsidy. In Figure 4-2 the subsidy required to incentivise service quantity Q* is the area ABCD which exceeds consumer surplus shown as triangle KDC.

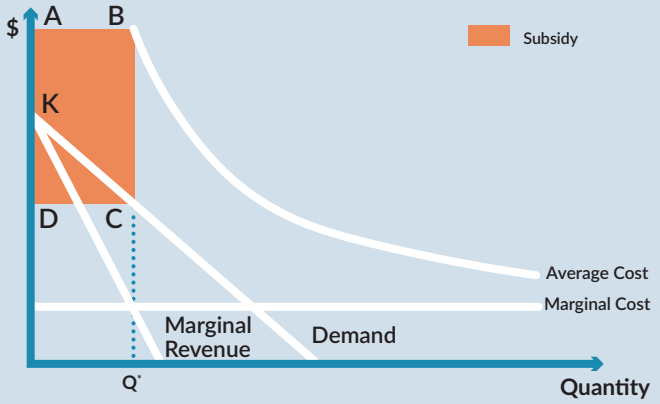


Figure 4-3 Anchor tenant effect

DCI service demand by local government agencies increases demand. In Figure 4-3, local government agencies demand QT (anchor tenant effect) and have a higher willingness to pay, reflecting social gains (externalities). With higher demand, scale economies result in lower unit costs and a lower subsidy EFGH is required. The subsidy is less than the consumer surplus measured by the triangle KHG.

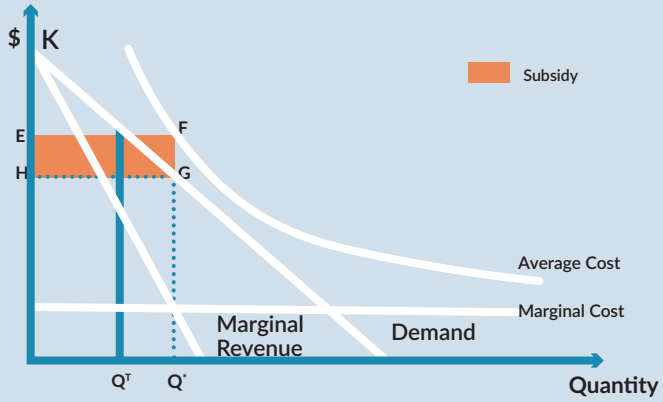
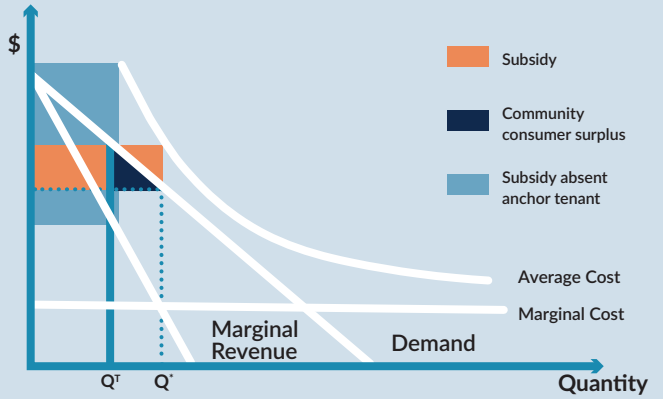


Figure 4-4 Benefits of an anchor tenant

QT of DCI services are purchased by the anchor tenant. By increasing demand for connectivity, average costs are lowered and this enables the community to enjoy a consumer surplus directly. The subsidy EFGH is shown in orange in Figure 4-4. The subsidy without an anchor tenant exceeds the subsidy applied with an anchor tenant.



108 Digital identities issued by government are also a person's legal identity – such as passports, birth certificates, and national identity cards. These identities are usually required to access services offered by government and private providers; for example, travel, bank accounts, and educational opportunities. The main driver for digital ID globally is the aspiration to account for every person in line with the sustainable development goals (SDGs). An indicator for SDG 16.9 is to issue a legal identity to every person by 2030. The World Bank is helping to fund a national digital ID programme being piloted in Madagascar. The system is expected to facilitate access to public services and the technology procured for the national ID project will form part of the upgrade the country's digital infrastructure – enabling government agencies to become anchor tenants. See https://www.biometricupdate.com/202211/madagascar-signs-with-mosip-for-national-digital-id-pilot-plans-1k-enrollments

Box 5:

Digital Malawi Program Phase 1 "Digital Foundations Project" use of anchor tenants

Background: Malawi ranks poorly compared to its peers in the development of its telecommunications market, being ranked 168 out of 175 countries in the 2016 International Telecommunication Union's Global ICT Development Index. It has extremely low mobile and internet penetration, high cost and low-quality ICT services, and a large digital divide between rural and urban areas. Lack of knowledge of how to use the internet and affordability issues act as the main barriers to internet access.

Approach: The project (2017 to 2024) aimed to build the digital foundations needed to help Malawi connect to the global digital economy. Access to the internet will be expanded by making internet connections more affordable, reliable and higher quality in all parts of the country. Importantly, the project aimed to leverage significant private sector infrastructure investment and support regulatory and policy measures aimed at increasing competition in the ICT sector. Government procurement was moved online which improved transparency and efficiency.

The project was implemented by the Public-Private Partnership Commission (PPPC), with other key players including the Ministry of Information and Digitalization (MID), the Malawi Research and Education Network (MAREN) and the Malawi Communications Regulatory Authority. Funding came from the World Bank with a US$72.4 million International Development Association (IDA) credit. The tender process was usually a single stage process. Bidders were evaluated (e.g., see contract for design, installation, and commissioning of a data centre) to identify a preferred supplier.

The main model used was a pre-purchase of international connectivity for government, under a 10-year Indefeasible Rights of Use (IRU) contract, where the government acts as an anchor tenant to encourage investment from the private sector. Through a competitive tender process, SimbaNet of Kenya was selected to invest in a fibre backbone network under the earlier RCIP project (2009-2016) and three companies were selected for different lots to provide international bandwidth, BengolNet umentto provide last mile-connectivity in the South and North of the country, and Datacon/Luna to serve the Central region.

Lessons: The anchor tenant model was effective because it engaged and benefitted both the public and private sectors. Public funds are used to benefit the public sector, which itself can have positive spillover effects for society (e.g., improved educational outcomes), but also later benefits the private sector by enabling their use of the fibre backbone. This can promote local economic growth and productivity and drive innovation.

A key feature of the project design is open access, which reduced the price of access to the network for the government and also to private operators. The wholesale price fell from over US$10,000 per Mbit/s to US$481 Mbit/s under RCIP, and has subsequently fallen to below US$10 per Mbit/s under Digital Malawi. The contracts were won by private sector firms which helped with efficient network planning and operation, and achieved 'matching investments' where firms invested their own funds alongside the government contracts.

The competitive tender for contracts could be improved. For contracts we examined, the bid price range was very large (often millions of USD for bigger contracts). A multi-round process, by enabling price discovery, would make it more likely winning bids reflected the true value of the contract, ensuring better value for money. This is proposed for use in the new Digital Malawi Acceleration Program (P505095), approved in June 2024.

This model has been adapted to DCI to leverage private sector investment and can be used as part of direct subsidy arrangement. Anchor tenancy involves a government agency being tied into a long-term agreement, with guaranteed revenue for an ICT provider acting as a commercial incentive for investment. For example, a number of local councils in the UK have used the anchor tenant model to improve broadband access.

West Sussex County Council signed a 30-year Indefeasible Right of Use (IRU) with CityFibre agreeing to build fibre network access to 152 public buildings.[109] The argument for the use of the anchor tenant model in conjunction with a direct subsidy is demonstrated diagrammatically in Box 4 below. Malawi and South Africa provide two examples of how the government can act as an anchor tenant for the private sector for DCI projects in Africa.

109 See https://static1.squarespace.com/static/5ef3391483c1fe1e25c1e871/t/5fa2df58b3960047e82eead4/1604509539068/C0094+-+TF+Connectivity+Investment+and+Use+Cases.pdf

- Digital Malawi Foundations Program (World Bank): provides a good example of the anchor tenant model and how it can be successful in attracting private investment in DCI (see Box 5 and Appendix F.2). Part of the project involved developing high-speed connectivity for priority public institutions, which acted as anchor tenants to incentivise private network investment. These included schools, community centers, post offices, health centers, airports, etc. For the private operator, expanding to nearby households becomes commercially viable, as the incremental cost of expanding from the nearby public institution is far lower than the incremental cost of expanding the network from zero. The government as a client provides some financial stability for networks and makes revenues from improving their networks more certain.

- South African Government's "Connected Government" plan: provincial treasuries would act as anchor tenants to provide a degree of financial stability for start-up networks to incentivise private investment in DCI.[110] In addition, the government wanted to aggregate local council demand to become an anchor tenant and stimulate other government agencies to join the broadband services rollout.

Below we consider the advantages and limitations of promoting investments in DCI using anchor tenants, where the latter can be used with subsidies and other interventions such as direct regulation, public ownership models or government or public supply.

Advantages

- **May reduce level of subsidy:** Where the anchor tenant model is used in conjunction with direct subsidies, the level of subsidy required to be provided by the government may be lower. This is because the anchor tenant provides an assured higher level of demand and through exploiting scale economies, unit costs are lower helping to stimulate take up of services in the wider community. The subsidy may be lower because the funding behind the public sector anchor tenant takes account of productivity gains in the future. This assumes that the operator that wins the bid continues to own and operate the network infrastructure and not transfer it to the Government or local client (such as a school).

- **Improves commercial viability of projects:** The government reduces project risk by providing a more assured revenue for the private operator. This guarantee provides the security needed to receive to obtain private capital, either at a lower rate or financing that the service provider would be unable to obtain entirely.

- **Positive externalities for the public:** Public funds are used to benefit the public sector, which can have positive spillover effects on society, such as better internet access directly improving educational and health outcomes. For example, Project Giga, the ITU-UNICEF initiative for schools connectivity, has achieved a 57 percent reduction in the average price per Mbit/s for schools. More generally, where the anchor tenant model results in deployment of DCI that would otherwise not have occurred absent the anchor client, a consumer surplus is generated.

- **Benefits to the economy:** The prices for communications services also benefit businesses as well as household and public institutions, as they too benefit from cheaper and better-quality services. Given the need to be digitally connected for most business activities in the 21st Century, this is an important benefit.

Limitations

- Requires substantial oversight and governance: Successful anchor tenant projects have also required a focus on technical assistance, procurement services, capital deployment and contract management. Monitoring is essential to ensure connectivity is deployed efficiently and maintained over time.

- **Clashes between public and private sectors:** Public bodies may have different needs and ideas for how the infrastructure should be used compared to the private sector. There may be instances where the immediate most efficient network expansion might not be near a school or other public institution, but the anchor tenant model often requires such institutions to generate demand and lower unit costs.

- **Expansion limited to areas near public institution:** although relatively rare, in instances where there are rural areas far away from public buildings such as a school or hospital, the anchor tenant model is not feasible and direct supply-side subsidies must be used either in isolation or in conjunction with some other form of support, such as demand-side subsidies.

- **Less common model:** Using an anchor tenant to attract private sector investment in DCI has been used relatively infrequently. There could be unknown issues with deploying direct subsidies alongside anchor tenants, so it would be advisable to initially test this approach using a small-scale pilot to assess the effectiveness of the model.

110 https://www.westerncape.gov.za/sites/www.westerncape.gov.za/files/connected_government_-western_cape_broadband_implementation_plan.pdf

- **Operational costs.** Although operations and maintenance costs usually costs only a few percentage points of the up-front capacity costs, they can become proportionally more significant towards the end of a long IRU period, especially if donor funding has expired. An emerging practice here is to require operators to factor in future O&M costs in their bid price.

4.3 Key considerations

Whether it is appropriate to use direct subsidies, either with or without the use of anchor tenants, to leverage private sector involvement in the rollout of DCI depends on the specific characteristics of the particular country and the nature of the project(s) involved. When making this decision, there are three key issues which the government and MDBs should consider:

- **Involvement of foreign firms** – in the case that the domestic private sector does not have the relevant knowledge or expertise, technology, or management best-practices, for delivering a DCI project, then foreign firms should be sought to provide what is lacking domestically and allow for some capacity building and transfer of know-how. However, some African countries still retain minimum local equity investment requirements for telecom operators.
- **Government preferences** – if the government wants to use its own funds for DCI projects that directly benefit the public sector, such as digitising government services or providing broadband connection to rural schools, then an anchor tenant could be used to leverage private sector investment on top of it e.g., nearby households using the school's fibre network.

  Such an arrangement can bring significant efficiencies and benefits for society. If the government wants to be heavily involved in the project, in terms of management (e.g., joint venture) or ownership (e.g., BTO) then a PPP could meet their requirements whilst still providing efficiency by involving the private sector.
- **Development of the telecoms market** – where a market is less developed and there is limited competition, especially in the case of a single monopoly provider, it will be difficult or impossible to implement a competitive subsidy allocation process. In this instance, awarding subsidies to promote DCI projects will necessitate regulatory measures to protect against the abuse of market power and inefficiency. This could, for example, lead to infrastructure sharing and open access regulations, as well as cost-based pricing regulations.[111]

111 For further information on regulatory options, see chapter 5 in https://broadbandcommission.org/wp-content/uploads/2021/09/WGDigitalMoonshotforAfrica_Report2020-1.pdf

Achieving value for money

5

5.1 Procurement and competition

It is well understood that, when procuring goods or services, competition among suppliers helps to deliver better value for money. For example, Istache and Iimi (2008) demonstrated that the competition effect was underutilized in many infrastructure projects funded by development partners, arguing "*auction design, especially lot division, is crucial for reducing unit costs of infrastructure*" and "*competition [in] the developing world might be able to save at most 8.2 percent of total infrastructure development costs*".[112]

More recently the National Audit Office (2023) in the United Kingdom has published a report on the efficiency of public procurement models in which it states "*competition can help support efficiency, innovation and quality in public services, by allowing buyers to select the bid that can supply the optimal balance of benefits and cost. When competition is lacking or ineffective, other safeguards are required, or value for money can be reduced through higher prices, inefficiencies and poorer outcomes*".[113]

Competition is recognised to be an effective way of selecting the lowest cost suppliers. Absent competition, well-designed regulatory oversight can help mitigate problems, but this requires well-resourced and experienced government administration. In the countries that form the focus of our study, competition is not always apparent and well-resourced and experienced government administration is an exception rather than the norm.

E-procurement is often advocated as one way to improve and make more accountable procurement, especially in developing economy contexts (see Komakech, 2016).[114] The World Bank has published a number of benchmarking studies on procurement.[115] Their reports suggest that e-portals for procurement can reduce information asymmetries between parties in the procurement process which can curb opportunistic behaviour and unfair advantages.

E-procurement systems are also advantageous because they can facilitate transparent complaint procedures and produce a digital trail which helps with accountability.

The models described in chapter 4 for facilitating private sector investment in DCI require a procurement mechanism to allocate funds to the private sector. For a subsidy, the procurer needs to decide how much to allocate and who should receive funds. Strong public procurement systems, with rules that encourage competitive bidding, are essential for efficient procurement. This includes:

- Transparent tender documents so that all eligible firms can be involved with no discrimination, and with no charge, or only minimal administrative charges, to acquire bidding documents.
- An independent procurement agency that is held to account including in its role of setting standards and monitoring their enforcement.[116]
- E-procurement systems to reduce transaction costs and thus increase efficiency and value for money.

Today, the typical procurement method in Eastern African telecommunications markets is largely an administrative process. This is evident for the majority of procurements managed through USAFs in SSA.[117] Administrative processes typically involve detailed application forms and scoring schemes that serve as a proxy for social objectives. In practice these administrative processes often lack transparency, and many countries in Africa lack the bureaucratic capacity or legal frameworks to oversee such a process and ensure sufficient accountability.[118] This can mean that, in the projects of interest in Eastern Africa, a largely administrative process for allocating subsidy funds may not provide the best value for money and other more competitive market-based processes, such as reverse auctions, might better deliver value.

112 Antonio Estache and Atsushi Limi. 2008 "Procurement Efficiency for Infrastructure Development and Financial Needs Reassessed", World Bank Policy Research Working Paper 4662.
113 Cabinet Office & National Audit Office. 2023. "Lessons learned: competition in public procurement" Session 2022-23, 19 July 2023, HC 1664.
114 Robert Agwot Komakech. 2016. "Public Procurement in Developing Countries: Objectives, Principles and Required Professional Skills", Public Policy and Administration Research, vol, 6, no. 8, pp. 20-29.
115 See https://documents1.worldbank.org/curated/en/121001523554026106/pdf/Benchmarking-Public-Procurement-2017-Assessing-Public-Procurement-Regulatory-Systems-in-180-Economies.pdf
116 See https://blogs.worldbank.org/voices/value-money-public-procurement-beyond-rules-measurement
117 See GSMA (2023) "Universal service funds in Africa: Policy reforms to enhance effectiveness" October, by Kenechi Okeleke, Kalvin Bahia and Sayali Borole.
118 Jones M. 1990. "Efficiency and Effectiveness in an African Public Administration Context." International Journal of Public Sector Management, 3(1). More recently AfDB (2014) "Summary of Literature on Fraud & Corruption in Public Procurement".

However, while competitive multi-round reverse auctions have the potential to deliver value for money, we are mindful that in Eastern Africa there is limited experience of applying them and governments face budgetary constraints. These present challenges and raise the costs of applying multi-round reverse auctions, so policy makers need to consider carefully trade-offs involved. Notwithstanding, where a competitive multi-round reverse auction is considered appropriate, we feel it would deliver better value for money. This is likely because administrative processes for allocating funds are impacted by the following.

- **Misappropriation of funds or rent extraction** Public officials might divert funds towards areas that suit them best or to their own pockets, and applicants for funding might extend gifts to sway decisions in their favour. Administrative processes require robust mechanisms in place to stop agents from abusing the process. Well-designed reverse auctions can limit opportunistic behaviour and result in more transparent and accountable procurement processes.

- **Complexity** Allocating a small number of subsidy payments administratively may make sense, but in situations where there are many micro-projects involved (e.g. thousands of new base stations have featured in the Tanzania subsidisation programme for rural connectivity) it becomes extremely complex and challenging to process who should be awarded what subsidy. Carefully designed e-procurement auctions can help overcome these problems resulting in a faster and more efficient allocation of funds. However, a multi-round reverse auction with many lots can also be challenging to implement and should, at this time, be executed by countries in eastern Africa only if they have the support of experienced delivery partners.

- **Relies on administrative judgement** Administrative judgement is susceptible to unconscious or even conscious bias which can result in distorted outcomes. The difficulty of making administrative procedures credibly transparent undermines trust and confidence, leading to inefficient outcomes. A reverse auction procedure is less exposed to such biases, as participants focus on monetary implications.

To achieve DCI policy goals and the SDGs, and the possible allocation of many subsidies across numerous localities, suggests that flexible and more effective decentralised procurement models than those currently deployed are needed. In situations where thousands of potential subsidy payments may be involved, procurement should be streamlined and agile rather than bureaucratic.

To achieve value for money, governments in Eastern Africa should focus on using methods that facilitate competition and price discovery.

5.2 Reverse auctions

Auctions are a recognised way to elicit valuations (discover prices) from buyers (in forward auctions) and sellers (in reverse auctions) in circumstances when such valuations are hidden and market prices not readily available as guides.[119] In a reverse auction, there are many sellers who bid for the prices at which they are willing to sell their goods or services to a single buyer. The winner is the seller who offers the lowest price. For example, in the case of allocating a subsidy for building last-mile fiber infrastructure, the winner of the reverse auction would be the firm who asks for the lowest subsidy amount. This contrasts with a regular forward auction in which multiple buyers bid as high as they can for an item from a single seller.

Reverse auctions, if designed well, are superior to administrative processes in terms of achieving value for money.[120] This is due to the price discovery characteristic of reverse auctions, where bidders have the incentive to compete against each other to offer the lowest bid possible. This means that the winning bid price should reflect the true value of the object. To leverage the benefits of reverse auctions, it is important to follow best practice. In general, successful auction design relies on two factors:

- **Attracting, or allowing, entry** – an auction will not be competitive if there are limited bidders in the auction, making it less likely for price discovery to occur.

- **Preventing collusion** – explicit or tacit collusion removes the competitive element of an auction which results in limited price discovery and an inefficient allocation.

To highlight the importance of auction design, consider the European 3G mobile-phone licence auctions that were held in the early 2000s. Auction design in some countries may have facilitated tacit collusion and high prices in early auctions acted to deter entrants in later auctions, apart from existing 2G operators. Furthermore, the sequential nature of the 3G auctions in Europe (occurring in different countries at different times) enabled some firms (European wide incumbents) to benefit from gaming. This and other factors, see below, resulted in large differences by country in the revenues per pop per MHz from the auctions. These ranged from 20 Euros per capita in Switzerland to 650 Euros per capita in the UK, though the values of the licences sold were similar in terms of spectrum availability.[121]

119 For example, radio spectrum is often sold by auction, as the seller usually cannot appeal to the market and determine the value of the spectrum. Companies seeking service providers often do not know what the market price is as the bespoke characteristics of their requirements are not easy to value. In both scenarios auctions provide a way to elicit the hidden values of the buyer (in the case of spectrum) or seller (in the case of the service provider). Paul Milgrom (2017) "Discovering Prices: Auction Design in Markets with Complex Constraints (Kenneth J. Arrow Lecture Series)" Columbia University Press provides an excellent account of the issues involved.

120 See documents1.worldbank.org/curated/en/099651211282373597/pdf/IDU0dbf327200338f04d3e0baf708920f13a346c.pdf

121 Klemperer, P. 2002. "How (not) to run auctions: The European 3G telecom auctions." European Economic Review, 46(4-5): 829-845.

Despite similar auction designs, country specific factors and timing can result in significant differences in auction results, for example between the very high values paid in the UK 3G spectrum auction which was held at the peak of the dotcom bubble in March 2000 and lower competition in the Italian 3G spectrum auction held later in 2000 after a downward market correction in tech stock valuations. It is important to be mindful of such variations and effects when considering the practical challenges for implementing reverse auctions in the Eastern African countries considered in this study.
The key characteristics in any reverse auction are:

- **Lot category** – A key component of designing an auction is the areas in which the subsidy is to be offered. For example, one can choose areas that align with political administration areas to ease the administrative process, though a trade-off with service operational areas should also be considered.

- **Lot size** - How lots are dimensioned can influence the way bidders approach bid strategy and impact on auction outcomes. The level of granularity needs to be selected to best suit the needs of the country in question. The simplest case would be having one subsidy that covers all the desired areas which eases auction logistics. Disaggregating lots allows bidders to assemble their preferred packages.[122]

- **Maximum Allowable Subsidy (MAS)** – The MAS should be sufficiently high to attract credible interest and not deter participation, but not too high to avoid poor value for money. A higher MAS should attract more interest but may result in successful applicants receiving funds far above what is needed.

- **Pricing rule** – Determines what the winning bidders receive in terms of the subsidy. Rules can be first-price, where bidders receive as bid, or second-price, where the winner receives the amount equal to the nearest unsuccessful bidder.[123]

There are a few important trade-offs in auction design that policymakers should consider. Firstly, auctions with greater levels of price discovery, such as MRRA, are typically more complex to execute. Even if the format may theoretically be optimal, in practice capacity and experience may not support its implementation. For example, a complex format will be more expensive to implement, and agents involved in the auction might not fully understand the rules or best strategy which could result in irrational strategies.

In the context of Eastern Africa, where experience with multi-round reverse auctions is limited and budgets are tight, this trade-off should be carefully considered.

Secondly, there is a trade-off between promoting competition in the market and minimising subsidy allocation in the auction. Minimising subsidy allocation could result in larger incumbents receiving the bulk of the funding due to economies of scale. However, from a dynamic efficiency perspective, it might be better to allow smaller entrants to win so as to promote competition in the future. The procurer must make clear what their main intentions are for the auction to be able to properly tailor the design to achieve potentially conflicting aims.

Single round reverse auction

A single round reverse auction is the simplest reverse auction to organise. In Tanzania, the Universal Communications Service Access Fund (UCSAF) has used this format using a first-price rule for allocating subsidies under the Digital Tanzania Project to extend rural mobile and broadband coverage over the last decade. In eleven funding rounds, on average 61 per cent of areas received subsidy funding, with the rate of success declining to roughly 45 per cent in the last four rounds. It is estimated that competitive bidding saved the Government US$3.3 million (see Appendix F.1 for further discussion on these auctions) and there was further scope for saving where government selection was used, in a second round to the auction.

122 Increasing the number of lots in an auction offers more discretion for bidders but comes at a risk of additional computational complexity, especially in regard of bid strategy, winner determination (depending on how bids are expressed) and valuation. In some circumstances this can result in inefficiency. In an econometric analysis of the US 'C Block' spectrum auctions of 1995-96, in which the FCC offered 480 distinct licence areas, Fox and Bajari (2013) argued that had the FCC chosen fewer licensed areas the outcome would have been more efficient.

123 Where the winning subsidy is calculated with reference to the second lowest subsidy requested, this is known as a Vickrey auction or sealed-bid second-price auction. In a Vickrey sealed-bid reverse auction bidders' submit written bids without knowing the bid of the other participants in the auction. The lowest bidder wins, but the subsidy received by the winner is the second-lowest requested subsidy. In a Vickrey auction, bidders' are incentivised to bid at their willingness to accept (i.e., the lowest subsidy each bidder needs to cover its cost of capital) and are not influenced by views on other bidder's bid amounts. In other words, bidders' request subsidies according to their true requirements and this leads to an efficient outcome – the bidder requesting the lowest subsidy wins.

Box 6 discusses the Kosovo Digital Economy (KODE) project and its use of single-round reverse auctions for procuring contracts.[124] Also see Appendix F.3 for the TTL interview for the project.

Box 6:

Kosovo Digital Economy (KODE) project

Background: Kosovo is a mountainous European country with a low population density which means that telecom network operators were unable to provide good connectivity on a profitable basis. Rural populations had particularly poor connections with around 200 villages totally unconnected. This means that there was a large geographical divide in the access to social and economic opportunities. Remote areas were losing young families to cities due to the inability to work or study online and school and health centres struggled with poor or no internet connection. The population also had low trust in institutions which limited collaboration between the public and private sector to close the digital divide.

Approach: The KODE project began in 2018 and aimed to improve access to high-speed broadband services in project areas. The Ministry of Economic Development provided strategic direction and technical oversight to the project and partnered with the Kosovo Telecommunication Regulatory Authority, University of Prizren, and the pan-European network of universities GÉANT. For component 1, a "matching grants" model was used, where private sector operators compete for a grant of up to 80% of capital expenditure for a project and the rest is provided by the operator. The rural broadband program effectively leveraged private capital and the World Bank was able to use its convening power to build trust between public and private parties. However, the ratio of private sector investment to public sector investment fell over time, from nearly a 1:1 ratio in 2019 to a ratio of 1:4 in 2021, in part due to the fact that more commercially viable projects were chosen first and the more challenging higher cost projects were left. Overall, the success of the project, in terms of building digital infrastructure, has made it a blueprint for similar World Bank projects in other parts of the world. Contracts were procured with a variety of methods. For example, request for quotations (RFQ) was used to procure the purchasing and installation of internal network equipment for schools in Prizren municipality (September 2023). 10 private firms bid in the single round sealed-bid auction competed to provide the lowest quote. All but one of the companies were based in Kosovo. The range of bid prices was large, at more than EUR 100,000 (US$108k) between highest and lowest.

Lessons: The strengths of the single round process are simplicity and the fact that it is commonly used, meaning it is less costly to implement both in terms of monetary and other non-pecuniary factors. This is important, particularly in the Eastern African context, where there is limited budget and institutions have less capacity. The project was able to attract sufficient competition in bidding for contracts, which is a prerequisite for an effective auction. However, the range of bid prices was large which suggests that a multi-round process, such as BAFO or MRRA, could have been used to facilitate price discovery and ensure more effective competition. The large bid price range that was observed implies winning bids were unlikely to reflect the true cost of projects. If the bidders (firms) all bid conservatively together, then the procurer will get poor value for money. In a well-designed multi-round process, any bidder with a losing bid will have the incentive to bid higher (or reduce their quote) in the next round, up until their valuation. Alternatively, a firm might be suffering from the winner's curse, where they overbid by overestimating the true value of the contract. A multi-round process allows bidders to learn about all the other bidders' valuations, limiting the welfare loss from the winner's curse.

124 See https://public.tableau.com/app/profile/basani.club/viz/KODEProject-BroadbandGrants-Oct2022/6-Averagesandtotalsiinfo for data on the KODE project.

The single round format involves the auctioneer announcing a MAS for each lot and requires eligible parties to submit one set of bids for funding.[125] Each bidder can express no more than one bid value for each lot in which they would like to invest and is not permitted to request an amount of subsidy above the MAS. Box 7 provides an explanation of the mechanics of the single round "static" reverse auction.

Box 7:

Static Reverse Auction Format: Illustrative Example

Ten areas (lots A, B, … ,J) are potential recipients of funding to support new communications investment. A total of $120 is available in the form of subsidy.

The maximum allowable subsidy is calculated by supposing an efficient provider in receipt of this amount would achieve a normal rate of return in a lot. On this basis, assume the maximum allowable subsidy in lots A and B is $20 and for lots C through J it is $10, reflecting lower costs and/or higher demand.

Assume three bidders qualify to bid for subsidy support. The ten lots fall into three categories. Each bidder forms an estimate of how much subsidy is required to make a normal return for each lot in each category. The estimate of each bidder is known only by that bidder and are shown in the table below.

Bidder	Lots A,B	Lots C,D,E,F	Lots G,H,I,J
1	22	6	9
2	24	4	13
3	17	7	8

The bidders express the lots they are interested in bidding for and make one set of bids. Bidder 1 bids $10 for lots C through J. Bidder 2 bids $8 for lots C, D, E, F and does not bid for any other lots. Bidder 3 bids $20 the lots A and B, and bids $11 for lots C thorough J.

Winning bids:

- Lots A and B are won by bidder 3 for $20 each.
- Lots C, D, E, F are won by Bidder 2 for $8 each.
- Lots G, H, I, J are won by Bidder 1 for $10 each.

Of the total $120 funding available, $116 is disbursed. The bid success rate is defined as the proportion of lots receiving subsidy over total lots in the auction which in this case is 100%.

Achieving a 100% bid success rate involved using 96.7% of available total funds.

If a country currently uses a non-competitive process to allocate funds or if they want to introduce more competition into the market, a single round sealed-bid reverse auction could be advantageous. In certain cases, using a single round sealed-bid reverse auction is more practical and effective than using more complicated versions of reverse auctions. Single round sealed-bid auctions have some key theoretical advantages, though they depend critically on how the winning subsidy amount is calculated in relation to bids received. For example, there is a substantial difference between a single round sealed-bid auction where the winning bidder receives a subsidy as bid, versus a winner receiving the second lowest subsidy bid (in a second-price auction).

125 The MAS is the equivalent in concept to the role played by the reserve price in an auction.

- **Simplicity** – as discussed above in Box 6 in the case of the KODE project, a single round auction is the simplest to implement. Bidders and sellers are less likely to make mistakes when competing because the format is easy to understand. Where the auction is second-price, in theory this encourages all participants to bid truthfully and this is desirable for efficiency. However, wide gaps between winning requested subsidies and the next lowest subsidies may present public perception problems, which can be avoided by deploying multi-round descending clock reverse auctions.[126] Furthermore, winning bidders know that they will receive either zero or an amount bid in a first-price auction, or receive either zero or some amount no less than what they bid in a second-price auction.

- **Experience** – as already discussed, single round reverse auctions are commonly used to allocate funds, so Eastern African countries can draw on wide experience to guide implementation of the format. This makes the process less costly and less prone to mistakes.

- **No opportunity for gaming** – in multiple round formats, bidders may game and choose bids that seek to influence other bidders or encourage collusion, or possibly act as a punishment on other bidders who choose bids perceived as unfavourable. In a sealed-bid single round auction bids are blind and such behaviour cannot occur. On the other hand, common value information is impossible to share and a lack of price discovery means the winner's curse may lead to excessive subsidy requests. Further, if the auctioneer makes public auction result details, this can lead bidders to anticipate regret if they ask for too little in a first-price auction and potentially result in higher subsidy requests.[127]

However, single round auctions may not always be the most effective at achieving value for money and can result in inefficient auction allocations. This is because:

- **No opportunity for price discovery** – as bidders submit one bid per lot or package, the single round format does not give the bidders an opportunity to learn from information about common value revealed in other bids submitted. Revealing information about bids values and allowing bidders to discover more about the other bidders' bids encourages competition and facilitates price discovery.

- **Winner's curse** –the cost of infrastructure build for DCI projects may in some circumstances have similar cost components across bidders, it is reminiscent of a common value auction. In this setting, bidders may ask for subsidies that are too high, lying above their individual values, compromising price discovery and potentially undermining efficiency.

- **Exposure risk** – With multiple objects, it may be difficult with a single round of bidding to organise combinatorial packages and as a result bidders are exposed to the risk of paying too much for an inferior combination of objects if some objects that are desired are won by other bidders.

Experience from the RCIP Tanzania WB Project (see Appendix F.1) shows that a lack of experience and limited expertise can make implementing even a single round reverse auction difficult. In the project, the first use of reverse auctions in 2012 failed to attract any bidders due to a lack of understanding on the part of the operators. In subsequent rounds, certain operators submitted bids higher than the MAS which highlights a continued lack of understanding. Further problems arose due to the participation of a state-owned enterprise because none of the privately owned operators were willing to bid against it because of the fear of consequences.

Problems surrounding complexity and lack of understanding will be worse for more involved auction formats such as MRRA. Effective communication between stakeholders and training is therefore vital for the success of reverse auctions.

Best and final offer (BAFO)

Best and final offer (BAFO) is a simple extension of the single round process by breaking it down into two stages. After receiving bids in the first round, the auctioneer asks for the best and final offer from each bidder, allowing them to improve their offers by reducing the amount of funds they are asking for. The information policy can vary, but typically the bidders will be told if they are winning or not. BAFO is the middle path between a single round auction and MRRA. By extending the number of rounds, a limited form of price discovery can occur because bidders are allowed to adjust their bid to better reflect their true valuation, although there are not enough rounds for proper price discovery to occur. When there is large information asymmetry, revealing information about other bids allows bidders to update their valuation and condition future bids on this information.

126 A wide gap between the lowest subsidy request and the second lowest subsidy request may be large, which can lead to public disquiet if this is known. The latter occurred in a sealed-bid forward auction in New Zealand in the 1990s involving the sale of UHF TV frequencies, when one bidder won a lot by bidding NZ$7m and paying NZ$5,000. See https://blogs.cornell.edu/info2040/2022/10/31/when-an-auction-fails-new-zealand-tv-frequencies-case/ and Mueller, Milton (1993) 'New Zealand's Revolution in Spectrum Management', Information Economics and Policy, vol. 5, no. 2, pp.159–77. https://doi.org/10.1016/0167-6245(93)90020-H

127 In a first-price auction, ex post regret may affect bids in a direction similar to the winner's curse. A bidder experiences winner regret after winning a subsidy the bidder discovers they could have received more subsidy by asking for more – there is a gap between their request and the second lowest request. If the auctioneer makes auction results information available to bidders after the auction (what is called winner feedback), it could influence how bidders approach an auction. If regret matters, a bidder would ask for more subsidy to lower expected winner regret, and trade this off against lowering the probability of winning the subsidy. Filiz-Ozbay and Ozbay (2007) "Auction with Anticipated Regret: Theory and Experiments" American Economic Review, April, 54 (4), 1407–1418, proposed this possibility in both a theoretical and experimental setting. However, the notion that regret is of relevance to corporate entities can be questioned. Evidence supporting the notion of regret derives largely from experimental settings with individuals. Further, Peter Katuš?ák, Fabio Michelucci and Miroslav Zají?ek (2015) "Does feedback really matter in one-shot first-price auctions?" Journal of Economic Behavior & Organization, vol. 119, pp. 139-152, in a series of experiments have called the effect of regret into question.

The complexity of the format is slightly increased by including an additional round, but not noticeably. The trade-off between complexity and price discovery for the single round vs. BAFO should be worth it, because asking for everyone's best and final offer is not much more complex.

Multi-Round Reverse Auction (MRRA)

Multiple round reverse auctions (MRRA) promote price discovery and have the potential to mitigate the winner's curse and, where well-designed, the exposure problem. The modern default format for a MRRA is a clock auction, where the auctioneer announces prices (subsidy amounts) which decline over successive rounds.

A simple clock auction format is as follows. Assume a policymaker has $100 for an area in which one operator is invited to supply service. Suppose three bidders pre-qualify to bid for subsidy. The auctioneer starts by announcing support at $100 and all three bidders' express interest. The three bidders are tied at $100. The auctioneer lowers the price in a subsequent round and announces $95 support. Assume one bidder drops out, leaving two contesting the subsidy. After a further round at which the auctioneer announces $90, only one bidder is left in the auction. See Appendix D of and the World Bank and CEPA (2023) report "Allocating universal service subsidies using multi-round reverse auctions: Telecommunications in Tanzania" for a detailed illustrative example of a clock auction involving multiple areas.[128]

The information made available to bidders is critical to the success of auctions. As per convention, the identity of bidders in the MRRA is kept anonymous until the auction process has ended. Eligible bidders are assigned anonymous labels.

The bidders will be told when there is more demand for subsidies than funds available. Limiting information about participants is intended to minimise gaming. The auction should incentivise truthful bidding based on the bidder's required support amounts, rather than strategically bid based on what they perceive other bidders doing. In Eastern African countries with limited domestic competition, it is often possible for bidders to work out who is who (e.g., in the duopoly case). Therefore, it is better to attract a large number of bidders (including from abroad), if possible.
Activity rules should be in place to ensure the pace of the auction moves along. These rules govern the number and types of lots a bidder can bid for in an auction.

These cover three dimensions: (i) the minimum quantity of lots a bidder is required to bid for; (ii) the maximum quantity of lots a bidder can bid for, and (iii) an overall bid activity constraint. Their purpose is to promote straightforward bidding, competition, and progression. With no activity rules, a bidder may wait till later in the auction process to place a bid so that the price is not pushed too low, resulting in poor value for money for the auctioneer.

MRRA auctions are best executed using an Electronic Auction Platform (EAP), in which an auction is hosted online allowing the auctioneer and bidders to participate remotely. This lowers transaction costs and enables a complete digital audit trail to be maintained which increases transparency. An EAP can either be developed and maintained by the country or procured under a licence. It is typically more cost effective to procure an EAP under licence and outsource its management and maintenance, since it involves highly specialised skills that may be limited domestically. Funds from development institutions, such as the World Bank, can be used to help with the procurement of an EAP. The EAP may also be hired at a regional level, such as by the regional financing facilities which is proposed under the World Bank's IDEA program, to share costs. However, the application of a MRRA using an EAP will present institutional challenges, and require capacity building and education, both for the auctioneer and the bidders. The end-to-end process for a full-scale EAP can be lengthy and the software produced needs to undergo User Acceptance Training (UAT) and penetration testing.[129]

If the right conditions are in place, a MRRA format offers the best opportunity for price discovery. Box 8 outlines an illustrative example of price discovery in a MRRA, building on from the example in Box 7.

Permitting the possibility of multiple rounds allows for price and possibly package discovery. This approach is superior to any of the above approaches when demand exceeds supply at the reserve prices, as the outcome of the process has a greater chance of attaining efficiency. The advantages of using a MRRA format are outlined below.

128 See Appendix D of the report, found at: https://documents1.worldbank.org/curated/en/099651211282373597/pdf/IDU0dbf327200338f04d3e0baf708920f13a346c.pdf
129 UAT is where the auction software is tested by the client or a third-party on behalf of the client, to determine whether it can be accepted or not by the users of the software. In effect UAT is an approval process, validating the software against the auction requirements and is carried out by entities familiar with the auction requirements. Penetration testing is a security exercise where a cybersecurity expert attempts to find and exploit vulnerabilities in a computer system.

- **Price discovery** – Open bidding process reveals information about valuations; this information promotes the efficient assignment of funds since bidders can condition their bids on more information.[130,131] Bidders will bid more aggressively since they have better information about the item's value and the level of competition they face.[132] The generally accepted figures are that reverse auctions can produce savings of between 10 – 40%.[133]

- **Time savings** – One of the principal advantages of MRRA are that they save time due to the compressed nature of negotiations. Negotiations that may have taken weeks or months to produce price concessions become immediate pricing decisions in the auction environment.[134]

- **Mitigates winner's curse** - The format enables bidders to update estimates of common value based on information disclosed about other bidders' estimates during the bidding rounds. The winner will be less likely to overpay, meaning they can bid their true value.

- **Package discovery** –Bidders discover information about the hidden values of combinations of lots available based on information revealed during the course of the auction. This promotes a more efficient allocation of lots. Depending on the specific format applied, exposure risks and substitution risks can be mitigated.

- **Clock format and information policy reduce gaming** – The clock format means that bidders are not able to signal using their bids. An information policy based on limiting the information about who bids what (anonymity) means collusion is less likely to occur as 'cheating' cannot easily be detected.

- **EAP provides transparency** – Using an electronic platform to run the auction, which the MRRA format lends itself to, leaves a complete electronic record for auditing and compliance.[135]

- **EAPs are well suited to handling multiple lots.** For instance under the Digital Malawi Acceleration Program (P505095), approved in June 2024, at least 2,500 lots are envisaged – 500 government sites and 2,000 schools.

However, the price discovery benefits only materialise if bidders know what to do. In the Eastern African context, there are limitations and practical issues of the MRRA format, outlined below, which should be considered. They all arise out of the complexity of the format.

- **Complexity** – The multi-round clock format is more difficult to understand than a single round reverse auction. It is also more complex to implement and ensure it is well-designed with no perverse incentives. Bidders may struggle to know the best strategy, particularly if there are many lots involved. A lack of experience with the format makes this more difficult to implement. However, training and good preparation through mock auctions helps.

- **Cost** – Implementing a MRRA using an EAP could be costly. For small value projects, the cost savings from price discovery may not be enough to offset the higher costs for paying for a license to use an EAP. This may be a factor in considering regional bidding processes, such as under IDEA.

- **Large player advantage** – Firms with large budgets to spend will be able to pay for tools to help them make the optimal decision in the complicated auction. For example, in the Indian spectrum auction in 2015, Vodafone paid for a tool which enabled them to build a clear picture of bidder activity throughout the auction and strategically hide their bidding behaviour.[136] Small firms or new entrants may not have access to this technology, reducing the competitiveness of the auction.

130 See Milgrom, P. 2017)\. "Discovering Prices: Auction Design in Markets with Complex Constraints." Columbia University Press.
131 Milgrom, P. R. and Weber, R. 1982. "A Theory of Auctions and Competitive Bidding." Econometrica, 50(5): 1089–1122.
132 Cramton, P. 2002. "Spectrum Auctions," in Martin Cave, Sumit Majumdar, and Ingo Vogelsang, eds., Handbook of Telecommunications Economics, Amsterdam: Elsevier Science B.V., Chapter 14, 605–639.
133 Tassabehji, R. 2010. "Understanding e-auction use by procurement professionals: motivation, attitudes and perceptions." Supply Chain Management: An International Journal, 15(6), 425–437.
134 Carter, C. R., Kaufmann, L., Beall, S., Carter, P. L., Hendrick, T. E., & Petersen, K. J. 2004."Reverse auctions: Grounded theory from the buyer and supplier perspective." Transportation Research, 40(3), 229–254.
135 Shalev, M.E. & Asbjornsen, S. 2010. "Electronic reverse auctions and the public sector—Factors of success." Journal of Public Procurement, 10(3), 428–452.
136 See https://www.smithinst.co.uk/case-studies/adaptive-bidding-strategies/

Box 8:

Price Discovery and Multi-Round Auctions: Illustrative Example

Assume the same conditions as in Box 7. The auctioneer starts in round 1 by asking whether a bidder would accept a subsidy at an amount announced by the auctioneer. If demand for subsidies exceeds funds available, the auction proceeds to round 2 in which the auctioneer announces lower subsidies than in round 1 and asks the same question again. The auction continues until demand for subsidy equals or is less than the supply of subsidy. Bidding in each category ends when the number of bidders is 1 or less.

Process

- **Round 1:** the auctioneer starts by asking whether bidders would accept 30 for A and B, and 15 for the other lots. Each bidder responds yes. As demand for subsidy exceeds the funds available, the auction proceeds to round 2. The auctioneer discloses information to the bidders before round 2 starts that demand in round 1 for each lot was 3 bidders per lot. Each bidder therefore discovers before the start of round 2 that the other two bidders were prepared to accept the announced subsidy in round 1. This discovery may affect the bidders' estimates of required subsidy to make a normal return.

- **Round 2:** the auctioneer lowers the subsidy to 25 and 13 respectively. All three bidders respond yes. Again, demand for subsidies exceeds total funds available and the auction proceeds into round 3. Bidders discover demand remains at 3 in each lot.

- **Round 3:** the auctioneer reduces funding to 20 and 10 respectively. Bidder 1 lower demand and bids for lots C to J. Bidder 2 lowers demand and bids only on lots C, D, E, F. Bidder 3 bids for every lot. Thus, only Bidder 3 says yes to lots A and B so bidding on lots A and B ends.

- **Round 4:** the auctioneer reduces the subsidy for lots C to J to 9 respectively. All bidders submit bids on C, D, E, F. Bidders 1 and 3 bid on G, H, I, J.

- **Round 5:** the auctioneer announces 8 for the other lots C through J. Only Bidder 3 bids for lots G, H, I, J. All bidders bid for lots C, D, E, F.

- **Round 6:** the auctioneer changes the subsidy available for C, D, E, F only and it is reduced to 6. Bidders 1 and 2 bid for the subsidy and each recognizes that there is at least one other bidder wanting to receive subsidy.

- **Round 7:** and lowers the amount of subsidy to 5. In this instance, only Bidder 2 submits a bid. The auction ends.

Results

Bidder 3 receives $32 for G, H, I, J and $40 for A and B. Bidder 2 receives $20 for C, D, E, F. The total amount of subsidy requested is $92 and the bid success rate is 100%. Achieving a 100% bid success rate involved using 76.7% of available total funds. The example shows that the total subsidy used is below that for the static reverse auction in Box 1 which also had the same bid success rate 100%.

This stylized example suggests price discovery, only possible with multiple rounds, appropriate disclosure of information to bidders and well-designed bidder activity rules, has the potential to improve auction outcomes in terms of a high bid success rate and attaining this at a lower cost.

Box 9:

FCC Auction 904 – MRRA clock format

The USD 20.4 billion Rural Digital Opportunity Fund was established in 2020 to bring high speed fixed broadband service to rural homes and small businesses not currently having high speed broadband services.

The Phase I auction, which began on October 29, 2020, and ended on November 25, 2020, awarded support to bring broadband to over five million homes and businesses in census blocks that were entirely unserved by voice and broadband with download speeds of at least 25 Mbits/s. Auction 904 involved the disbursement of funds of up to USD 16 billion to subsidise broadband rollout. Auction 904, and its smaller precursor Auction 903, was a multiple round reverse clock auction featuring a descending price in which bidders submitted demands for financial support over multiple rounds. Auction 904 invited participants on a technological neutral basis and involved important financial and quality of service dimensions, where the latter had assigned weights reflecting a judgment about performance "Tier" (speed of service) and "Latency" (T+L weights). The motivation for assigning weights was to incentivise higher-speed (T) and lower latency (L) services. As we shall discuss, the weights serve to favour bidders offering higher speed and lower latency. The scale of the auction was immense, with up to USD 16 billion of universal service funding available to support service in over 5 million areas.

The FCC used a descending clock auction format. In each area (or group of areas) a maximum allowable subsidy (reserve price) was set, and the auction started with a 'percentage price' multiplied into the reserve prices. The percentage price was common to all areas, and it was the percentage that descended round-to-round whenever the total demand for funds exceeded the available funds. The auction cleared (ended) when demand for support in aggregate was equal to USD 16 billion or less. The auction closed after: the budget cleared, and there were no areas remaining with competing bids.

The outcome of the auction resulted in winning bidders receiving funding to deploy high-speed broadband to over 5.2 million unserved homes and businesses. This was a bid success rate of almost 99 percent, higher than that achieved in any of the UCSAF reverse auctions, for instance. A total of 180 bidders won auction support from the 386 qualified bidders that participated. The auction unleashed robust price competition that resulted in more locations being awarded at less cost to Americans who pay into the Universal Service Fund. Some 5,220,833 locations were assigned support in the auction had an initial reserve price of over $26 billion. Competition among bidders over multiple rounds meant that the final price tag to cover the locations was just over $9 billion. Only 56 percent of the universal service funds USD 16 billion was needed to achieve a near 100 percent bid success rate

In Eastern African countries without past experience of implementing a MRRA but where conditions indicate it would be beneficial, it makes sense to pilot the format. This would enable stakeholders and government institutions to learn about the format and invest in capacity. It would also enable the MRRA to be designed in a way that best accommodates local conditions.

For KDEAP, for instance, an initial pilot of last-mile connectivity for 213 educational institutions is planned, though eventually the goal is to cover more than 2,000.

Lessons can be drawn from international experience and in Box 9 one of the largest reverse auctions (by value) for universal service fund allocations in telecommunications, FCC Auction 904 in America, is described. The format implemented represents international best practice.

5.3 Conclusion

In this chapter we have identified three classes of reverse auctions for disbursing subsidy funds to support investment in DCI. They increase in complexity from a single round, one bid blind auction through to a multiple round reverse auction that may feature many rounds. In regard of value for money, we view the MRRA as the best format. However, as this format has not yet been applied in the countries which are the focus of this study, we recommend that should it be applied initially in the form of a pilot.

However, the costs of implementing a MRRA may be high relative to the gains in the form of value for money because of the need to develop an EAP. In this regard, there may be merit in the WB investing in the development of a generic EAP that it could lease to governments.

A possible roadmap towards a MRRA is discussed further in the next chapter.

Figure 5-1 Evaluation of Reverse Auction Formats

Auction format	Pros	Cons	Appropriate scenario for deployment
Single Round	■ Simple to implement ■ No opportunity to signal with bids	■ Unlikely to achieve value for money – no price discovery ■ Hard to bid for multiple lots – exposure risk ■ Lack of transparency	■ Two or more bidders ■ Limited number of lot categories ■ Information about investment costs well understood ■ Very limited capacity to implement auctions
BAFO	■ Extra round gives some element of price discovery, albeit limited ■ Simple to implement	■ Unlikely achieve value for money ■ Hard to bid for multiple lots – exposure risk ■ Lack of transparency	■ Two or more bidders ■ Limited number of lot categories ■ Uncertainty about investment costs ■ Limited capacity to implement auctions
MRRA	■ Price discovery ensures value for money ■ Easier to bid for multiple lots ■ Provides transparency ■ Aligns with international best practice	■ Relatively complex to implement and participate in ■ Requires EAP which increases dependency on outside agencies	■ Three or more bidders ■ Multiple lot categories ■ Uncertainty about investment costs ■ Start with small scale pilot ■ Sufficient capacity or experience within government administration

Source: CEPA analysis

Policy Lessons and Recommendations

6

6.1 Key recommendations

Wherever possible we propose that public funding of DCI is allocated as a subsidy to private sector firms by way of MRRA. In this chapter we highlight the conditions under which this recommendation holds. In particular, running a successful MRRA is dependent on there being a sufficient level of competition in the defined market and adequate capacity in government administration. That is, in the sense that there are several firms who could realistically be in a position to deliver the required connectivity infrastructure. In such cases, utilising a MRRA would help to drive an efficient allocation of subsidy funds and enable the government to achieve value for money.

At a high level, the decision process facing each country looking to disburse public subsidies by way of a MRRA is shown in the flow chart in Figure 6-1.

Whilst a MRRA may be perceived to be a relatively complex solution, training can mitigate the risk that it would be too complex for bidders and government administration to participate in and for stakeholders to understand. It is best practice to first ensure the agency overseeing an MRRA has the required capacity and training to conduct a MRRA. Under the three World Bank projects considered here, the preparation of a commercial transaction manual is used as a disbursement condition to ensure that the rules of the procurement process are set out beforehand.

A further consideration when looking to utilise a MRRA is the legislative background of the relevant country and whether its procurement rules enable the mechanism to be utilised (see Appendix A.7). For each of the six countries in this study, we provide in Table 6-1 a summary on the level of competition in the telecoms market, whether legal barriers present obstacles and our recommendation whether to allocate subsidy funds via a MRRA in a pilot.

We should emphasise that when designing a competitive tender and a MRRA, although competition may be effective in retail markets it may not always be the case that specific geographic wholesale markets will be competitive. The latter will likely depend on a whole host of factors related to the specifics of what one auctions and how.

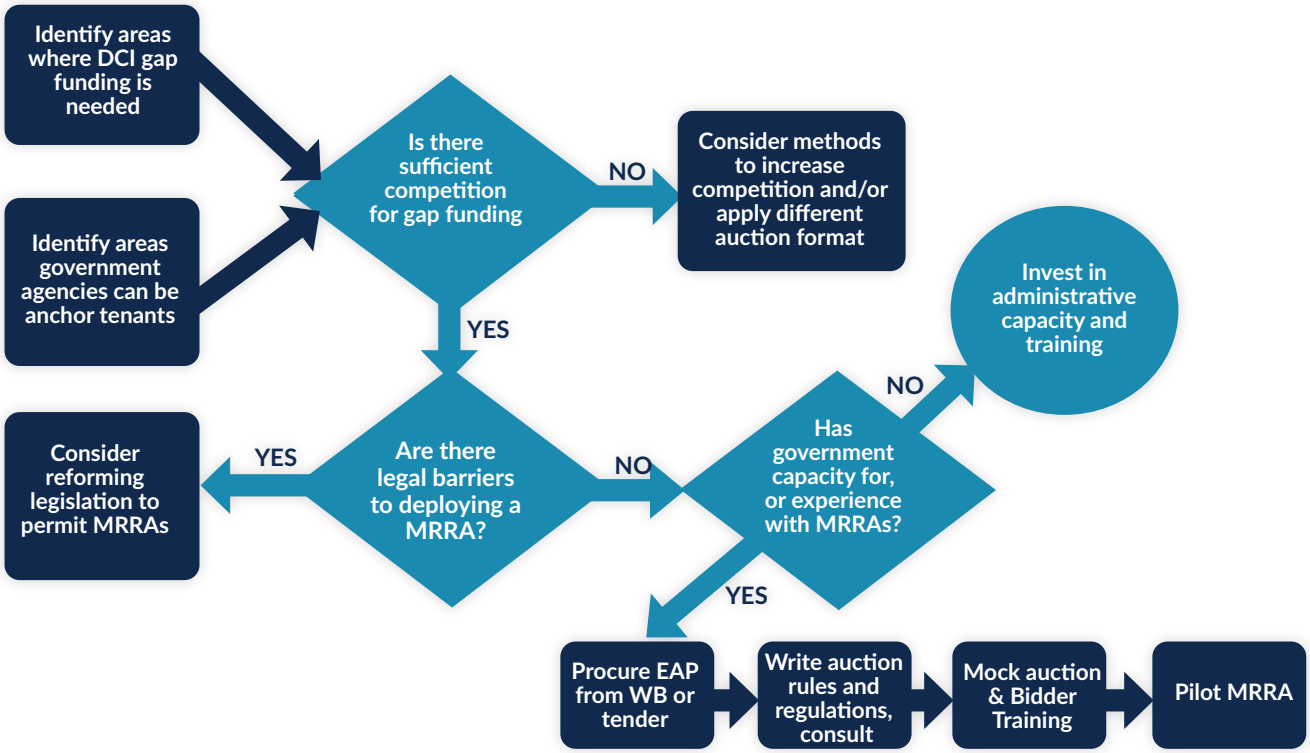
Table 6-1 Recommendation summary table for each of the six Eastern African countries

Country	Level of Competition	Legal barriers	Recommend use of MRRA pilot
Djibouti	Partially sufficient	Yes	No
Ethiopia	Partially sufficient	No[137]	Yes
Kenya	Sufficient	No	Yes
Madagascar	Sufficient	No	Yes
Somalia	Sufficient	No[138]	Yes
South Sudan	Sufficient	No[139]	Yes

In addition to the method of disbursing funds government needs to consider whether there is scope to aggregate demand and create anchor tenants in areas considered for gap funding. This can have the benefit of lowering the demand for gap funding if scale economies are leveraged in favour of the private sector. Further, if credible long-term contracts can be written and agreed between government and the private sector, it may ease fiscal pressures in the short term. For example, government could structure long-term capacity purchase agreements with payments structured over years. The downside of this, however, is heightened risk if the private sector is concerned about future policy change.

137 No mention of e-reverse auctions but no apparent legal restrictions.
138 No mention of e-reverse auctions but no apparent legal restrictions.
139 No mention of e-reverse auctions but no apparent legal restrictions.

Figure 6-1 The decision process for implementing a MRRA for the use of dispersing subsidy funds for investment



Source: CEPA analysis

Given the use of a MRRA would constitute a step change in procurement procedures in each country, we propose that any MRRA is first conducted via a pilot. This is shown as the end process in Figure 6-1. In addition, as setting up an EAP would involve relatively large-fixed costs, we believe there is merit in the WB investing in a generic EAP that it could lease to a government looking to allocate subsidy funding via a MRRA, probably via a regional facility. This would require the regional facility to develop the capability to develop and maintain an EAP, with World Bank support. Such capabilities could be built-up internally or outsourced to specialists. The EAP should be generic so that it can be adapted for the particular circumstances in each country and for each award process. This includes being able to set the number of geographic regions in each country, the number of lots to be auctioned and the number of bidders who will participate.

In countries where there may not be sufficient competition to run a MRRA (i.e. Djibouti), we still recommend that subsidy funds are allocated via auction. Instead, the BAFO model could be used to allocate funds, as long as there is price disclosure after the first round. This approach has the benefit of reducing the potential for collusion by soliciting bids in a sealed-bid manner, important given the increased risk for collusion where there is a lack of competition, whilst also achieving better value for money than a single round auction through the additional final offer round. BAFO has the added benefit of being simple to implement, as it is easy for stakeholders to understand and straightforward to implement, given a less sophisticated EAP is required.

In Appendix G we propose out how a commercial transaction manual might be structured as part of a programme to implement a MRRA in a pilot setting, and also provides guidance on the selection of an electronic auction platform provider.

APPENDICES

APPENDIX A **Eastern Africa and Country Backgrounds**

The Eastern Africa region of SSA spans from Sudan to Tanzania and the island of Madagascar, is home to over 400 million people with a wide range of countries in terms of levels of socio-economic development. Population growth in some of the countries is expected to increase by 30 per cent to 2030, and up to two-fold by 2050.[140] While the population has been rapidly growing across the region, economic growth has been uneven. Djibouti, Ethiopia, and Kenya recorded the highest per capita growth rates, while in Somalia economic growth was broadly in line with estimated population growth; GDP per capita ranges from US$238 in Burundi to US$2,099 in Kenya. Countries in the region are also divergent in terms of their human and social development. For example, secondary school enrolment ranges from 25 per cent in Uganda to 45 per cent in Burundi.[141]

In 2022 around 36 per cent of Africa's overall population had access to broadband internet, chiefly via mobile devices, and the continent had one of the widest digital gender gaps worldwide.[142] A major stumbling block to adoption and usage of the Internet in Eastern Africa is affordability. While competition and scale economies have helped to lower retail prices, Table A-1 shows that in Eastern Africa broadband data is relatively expensive and unaffordable for many. The following sections look at the state of connectivity in the countries in this study.

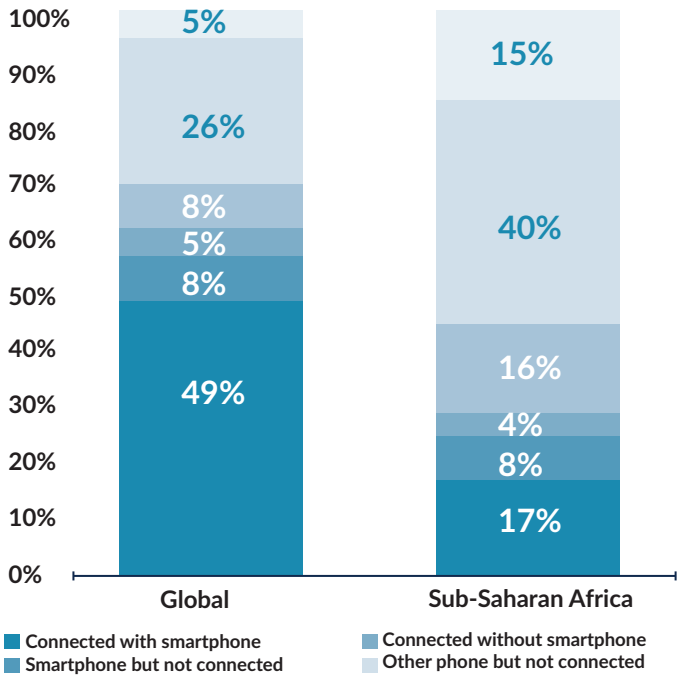
Table A-1: Mobile Data Pricing as Percentage of Monthly Income

2023 Mobile Data Pricing, 2GB as Percentage of monthly per capita gross national income	
Burundi	12.59
Djibouti	6.58
Ethiopia	2.42
Kenya	1.97
Madagascar	8.95
Malawi	8.78
Mozambique	9.04
Rwanda	2.46
Somalia	5.11
South Sudan	32.59
Tanzania	4.44
Uganda	3.55
Zimbabwe	4.76
Average of selected Eastern African countries	7.94
China	0.42
India	0.99
South Africa	1.65
United Kingdom	0.32
United States	0.67

Source: ITU Statistics[143]

Figure A-1 shows that connectivity to the Internet and mobile device usage is significantly lower in SSA versus global data. In SSA, 15 per cent of the population is not covered by mobile broadband, whereas globally only 5 per cent are uncovered. Compared to the global average of 49 per cent, only 17 per cent of the population of SSA is connected to the Internet with a smartphone.

Figure A-1: Regional connectivity and usage gap by device type, 2022



Source: GSMA (2023) [144]

140 UN World Population Prospects: Available at: https://population.un.org/wpp/DataQuery/
141 Para. 1 in the Project Information Document (PID) for EARDIP.
142 See World Bank (2023) Results Brief "From Connectivity to Services: Digital Transformation in Africa" 26 June.
143 Available at: https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/IPB.aspx
144 Available at: https://www.gsma.com/r/somic/

A.1 **Djibouti**

Djibouti is a small low-to-middle income country with a population of just over 1.1 million people and a GDP of US$3.5 billion as of 2022.[145] Mobile and fixed telecommunications services are provided by state-owned (monopoly) provider Djibouti Telecom. There were plans to partially privatise Djibouti Telecom by selling a minority stake in 2022, with ownership of its assets transferred to the Djibouti Sovereign Fund in 2020 to facilitate this privatisation,[146] but the proposition of a significant minority stake generated insufficient interest.[147] There is also a second privately owned operator Afrifiber that has been licensed since 2019 offering a range of internet services.

Djibouti Telecom offers a wide range of communications infrastructure services including network connectivity, data centres and teleport facilities. This includes a significant joint venture with BringCom, a US-based communications technology provider, called Djibouti Teleport. This private company provides IP connections and international backhaul services geared at aeronautical and maritime satellite services.

Djibouti is a strategically important country for submarine fibre cables; as of 2023 hosting nine landing points with more expected.[148] In 2022, South Sudan, which is landlocked, signed a memorandum of understanding (MoU) with Djibouti related to fibre-optic interconnection to benefit from Djibouti's subsea cable connections. Djibouti Telecom is part of a consortium that connected the Djibouti Africa Regional Express (DARE) submarine fibre optic cable which spans 5,500km.[149]

China plays a key role in financing communications infrastructure in Djibouti, with Djibouti Telecom partnering with Chinese firms such as Huawei. Although Djibouti is relatively well connected, with the status as the largest fibre-optic hub in the region, services are less affordable than in Ethiopia and Kenya (see Table A-1) reflecting a lack of competition in the domestic sector. Nevertheless, the proportion of the population using the internet is slightly above the global average, suggesting a population with a high appetite for internet access.[150]

A.2 **Ethiopia**

Ethiopia, a low-income country, is the second most populous country in Africa with an estimated population of 123 million people and a GDP of US$126.8 billion in 2022.[151] Historically, telecoms and internet services in the country were provided exclusively by a state-owned firm, Ethio Telecom, but in 2019 following the passage of a new law which partially liberalised the telecommunications sector, and the establishment of the Ethiopian Communications Authority (ECA), new licences for private telecoms operators have been issued.[152]

In 2021 the ECA awarded Safaricom Ethiopia (owned by Safaricom plc, Vodafone Group, Vodacom Group, Sumitomo Corporation, British International Investment and the IFC which holds around 16% of the equity) Ethiopia's first private sector operating licence for US$850m.[153] In 2-023, it paid a further US$150 million for a mobile money license. The Ethiopian government stated that the move will create jobs for 1.5 million people and stimulate over US$8 billion in domestic investment. Conditions of the licence included commitments to invest on new transmission lines but Safaricom is currently no allowed to bring in a third-party to build infrastructure, such as a specialist tower company.[154]

Attitudes towards private investment have changed in Ethiopia in recent years. The government introduced the Foreign Investment Law in 2020 to attract more Foreign Direct Investment (FDI), a move which has enabled Ethio Telecom to offer a 45 per cent stake to foreign investors; though no takers have yet been found. Ethio Telecom also plans to issue 10 percent of its shares on the new Ethiopian stock exchange. This strategy for growth appears to have arisen out of the increased competition the firm now faces following the establishment of Safaricom Ethiopia. The government of Ethiopia has also begun implementing the PPP Proclamation to allow for private investment in power generation and road construction sectors. This was motivated by government recognising that the private sector is essential to support the country's economic growth and improve the quality of public services, particularly in infrastructure.[155] Joint ventures are also encouraged by the Government of Ethiopia.[156] The changing investment climate has resulted in new investments in fibre transmission lines. For example, Liquid Intelligent Technologies announced in 2023 new projects linking Kenya and Ethiopia which involve participation by the Ethiopian Electric Power company.[157]

145 https://data.worldbank.org/country/DJ
146 See https://oxfordbusinessgroup.com/reports/djibouti/2023-report/ict/widening-the-net-already-a-prominent-regional-data-centre-player-the-country-looks-to-infrastructure-projects-and-privatisation-to-build-capacity-overview/
147 See https://www.imf.org/en/News/Articles/2022/12/16/pr22437-imf-staff-completes-2022-article-iv-mission-to-djibouti
148 The most recent landing point was Meta's 45,000km 2Africa connecting Europe, Africa and Asia, see https://www.datacenterdynamics.com/en/news/worlds-longest-subsea-cable-lands-in-djibouti-east-africa/
149 The members of the consortium are: Africa Marine Express, Djibouti Telecom, Golis Telecommunications, Hormuud Telecom Somalia, Somtel International, Telesom and TeleYemen. See https://itweb.africa/content/lLn14MmjadPqJ6Aa
150 The ITU notes that over half the homes in Djibouti are connected to the Internet, see https://datahub.itu.int/dashboards/umc/?e=DJI&i=
151 https://data.worldbank.org/country/ET
152 https://eca.et/ As of April 2024, more than 3,000 licenses have been issued. A further liberalisation of the ISP sector is expected in July 2024.
153 https://www.aa.com.tr/en/africa/global-consortium-wins-ethiopias-telecom-license-for-850m/2251286
154 Ethiopia raises $850m from historic telecoms auction (ft.com)
155 https://www.mofed.gov.et/programmes-projects/ppp/
156 Ethiopia - Joint Ventures/Licensing | Privacy Shield
157 See https://liquid.tech/about-us/news/liquid-intelligent-technologies-announces-two-new-cross-border-fibre-routes/

Investment in network expansion and mobile penetration has increased internet coverage from 1.1 per cent in 2011 to 22 per cent in 2022, but coverage is still low.[158] The history of telecom monopoly, a lack of reliable power supply (in 2020 only 40 per cent of households were electrified[159]) and unaffordable devices represent key challenges to Ethiopia's further DCI expansion, and therefore World Bank funding is essential.

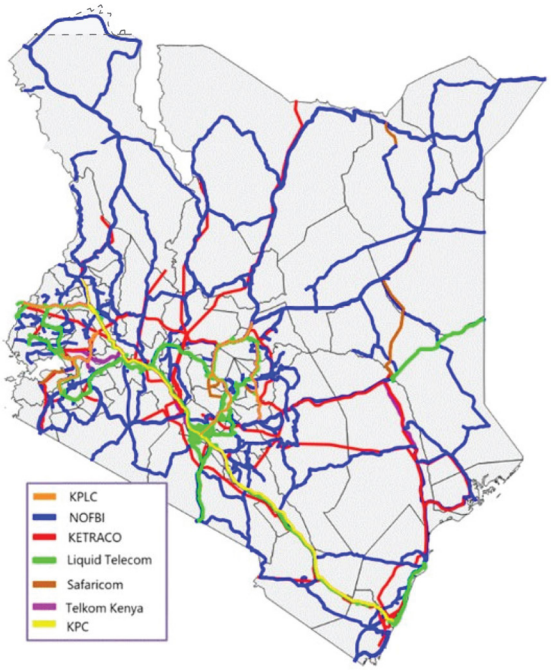
A.3 Kenya

Kenya is a lower-middle income country with a population of 54 million people and a GDP of US$113.42 billion as of 2022.[160] Compared to other countries in SSA, the telecoms market is very competitive with five mobile network operators (MNOs). However, Safaricom PLC holds a substantial share of the market at 66.1 percent of mobile SIM subscriptions and 62.8 percent market share of mobile broadband subscriptions.[161] This is reinforced by the market dominance of its mPesa mobile money platform.

The Communications Authority (CA) of Kenya was established in 1999 by the Kenya Information and Communications Act (1998) and is the regulatory authority responsible for facilitating the development of the ICT sectors. Importantly, in 2020 Kenya's National Information and Communications Technology Policy Guidelines adjusted the requirement for Kenyan ownership in foreign ICT companies from 20 to 30 percent. This was reversed in April 2023 when the President announced that they would lift this 30 percent domestic equity requirement for ICT-licensed companies. This allowed, for instance, a license to be issued to Starlink, a US-owned low-earth orbit satellite operator. In general, Kenya has a positive investment climate, with the government focusing on attracting more FDI to the country.[162]

The government has allocated KES 111 billion (US$853m) for implementing the National Broadband Strategy 2018-2023 (equivalent to 0.3 percent of GDP spent on broadband each year) to increase access to broadband coverage and improve digital literacy. To achieve these goals, the government understands that the private sector will play an important role and is focusing on creating a conducive environment for attracting private investment.[163] This includes a focus on promoting further investment in fibre backbone technology, as shown in Figure A-2.

Figure A-2: Fibre backbone networks in Kenya[164]



Kenya has a Universal Service Fund (USF),[165] which is funded from levies on licensees, appropriations from the government, as well as grants and donations. The fund aims to support widespread access to ICT services, promote capacity building and innovation in ICT services. The fund finances national projects that have a significant impact on the availability and accessibility of ICT services in poor and rural areas. For example, the fund has supported operators to increase last-mile connectivity in rural and underserved areas and improved broadband connectivity to public secondary schools. Projects have so far ensured enhanced mobile connectivity coverage for over 700,000 Kenyans.[166]

A.4 Madagascar

Madagascar is a low-income country with a GDP of US$15 billion and a population of almost 30 million people, as of 2022.[167] As a whole, Madagascar is a well-connected country with 88 per cent mobile network population coverage and four submarine cable links.[168] However, rural areas are still largely unconnected and only around a quarter of households are supplied with electricity.[169]

158 See ITU at https://www.itu.int/en/ITU-D/Statistics/Documents/DDD/ddd_ETH.pdf
159 Source Energy Catalyst, Country Guide: Ethiopia June 2020
160 https://data.worldbank.org/country/kenya
161 Communications Authority of Kenya (2023). See https://www.ca.go.ke/sites/default/files/2023-09/Sector%20Statistics%20Report%20Q4%202022-2023.pdf
162 https://www.state.gov/reports/2023-investment-climate-statements/kenya/
163 See https://www.ict.go.ke/wp-content/uploads/2019/05/National-Broadband-Strategy-2023-FINAL.pdf
164 Source: Figure 1, page 15 in the Project Appraisal Document, KDEAP at https://documents1.worldbank.org/curated/en/099195503152337871/pdf/BOSIB155727ac80b51b9f718ac424208264.pdf
165 https://www.ca.go.ke/universal-service-fund
166 https://www.ca.go.ke/government-starts-search-universal-service-advisory-council-board-members
167 https://data.worldbank.org/country/MG
168 See ITU https://datahub.itu.int/data/?i=100095&e=MDG and https://www.submarinecablemap.com/
169 See Medium (2023) "Connecting Rural Madagascar to Clean and Reliable Electricity"

The telecoms market is competitive and comprises of four network-based companies: Airtel, Telma, Orange and Blueline. Telma, a state-owned incumbent founded in 1896 following the first telephone line service in Madagascar,[170] was privatised in 2001 following liberalisation of the sector in 1996. This liberalisation paved the way for foreign-owned subsidiaries of Airtel and Orange to enter the market. However, foreign ownership in the telecommunications sector is notionally restricted to 66 percent ownership, though, as in Kenya, Starlink has recently gained a license.[171] There is a legal framework for PPPs in Madagascar, as established by the Public Private Partnerships Law which enables partnerships under the BOT model and variants of it.[172] This was aimed to help alleviate problems foreign invested faced when looking to invest in the country. These problems stemmed from the perceived lack of fair and consistent implementation surrounding the laws. The government of Madagascar recommend foreign investors look to enter joint ventures with local partners; however such cooperation is not mandatory.[173] The government has also announced a number of recent decrees in relation to spectrum, open access, and reform of the universal service fund (FDTC), which have been supported by World Bank technical assistance and DECIM funding.

A.5 **Somalia**

Somalia is a low-income country with an estimated population of 17.6 million people and a GDP of US$8.1 billion as of 2022.[174] The telecoms market is competitive, comprising seven MNOs and one MVNO, several of which also offer fixed-line and internet services.[175] The operators are all licensed by the regulator, the National Communications Authority (NCA), which was founded in 2017 with World Bank support, and is tasked with encouraging competition in the market. The competitive environment means that the tariffs offered to consumers are among the lowest in Africa.[176] The quality of network coverage is also improving, in part driven by the interconnection of six telecom operators in 2023, supported by the World Bank.[177] Despite high mobile penetration, internet coverage remains among the lowest in the world.[178] The current focus is on developing a national fibre-optic backbone network.

The Federal Government of Somalia (FGS) encourages FDI. Support of FDI is underpinned by the Foreign Investment Law of 2015 which guarantees foreign investors treatment equal to that given to domestic investors. This includes provisions around compensation in the event of expropriation, international arbitration of disputes between the investors and the Government, the right to remit profits and access to foreign exchange. Investment incentives and special tax incentives to encourage FDI are also in place.[179] All telco operators are privately owned, as are all businesses in the country.[180]

A.6 **South Sudan**

South Sudan, a low-income country, is the world's youngest nation, has an estimated population of 10.9 million people and was estimated to have a GDP of US$12 billion in 2015m though this is highly affected by oli prices.[181] The telecoms market comprises three MNOs: MNT, Zain Telecom and Digitel Telecommunications. MNT and Zain are both foreign-owned subsidiaries, with the launch of Digitel in 2021 significant given it is a South Sudanese-owned telecom company.

The government stated that it played a role in ensuring Digitel operates in the country and signalled intentions to explore tax exemptions to encourage the import of network equipment and telecommunication tools.[182] The government also has a partnership with Liquid Intelligent Technologies to build critical fibre infrastructure in South Sudan. The connection runs between the capital, Juba, and Uganda, with Liquid Telecom managing the infrastructure.[183] The first phase of the project was completed in January 2020 and includes a 200km fibre backbone.[184] More generally, legislation states that foreign individuals are allowed to invest in medium and large size companies in the country provided that a South Sudanese individual has at least a 31 percent share.[185] Government officials will not issue a business licence to a foreign investor without such a local shareholder. However, foreign companies that want to establish a subsidiary in South Sudan are not subject to local shareholder requirements.[186]

170 https://www.telma.mg/data/corporate/2011_en.pdf
171 https://www.export.gov/apex/article2?id=Madagascar-openness-to-foreign-investment
172 Op cit.
173 Madagascar - Joint Ventures/Licensing | Privacy Shield
174 https://data.worldbank.org/country/SO
175 https://developingtelecoms.com/telecom-business/telecom-trends-forecasts/8945-competition-strong-in-somalia-despite-political-turbulence-r-m.html
176 Op cit.
177 The NCA state that "The interconnection will enable seamless connectivity between the operators and provide millions of customers with more options and competitive pricing."https://nca.gov.so/interconnection-among-telecom-operators-goes-successful-enhancing-connectivity-and-competition/
178 See World Bank. 2017. "Strategy and PPP Options for Supporting the ICT Sector and Broadband Connectivity in Somalia." As recently as 2017, Somalia's mobile telephony market had a penetration rate of about 60 pecent, but less than 3 percent of the population had broadband access, one of the lowest rates in the world.
179 https://sominvest.gov.so/why-invest/
180 https://www.state.gov/reports/2021-investment-climate-statements/somalia/
181 https://data.worldbank.org/country/SS
182 https://developingtelecoms.com/telecom-business/operator-news/11508-south-sudanese-owned-operator-launches-in-juba.html
183 https://www.afdb.org/sites/default/files/documents/publications/south_sudan_cfr_2023_.pdf
184 https://liquid.tech/the_first_to_bring_fibre_to_south_sudan/
185 See the Companies Act (2012).
186 https://www.state.gov/reports/2022-investment-climate-statements/south-sudan/

South Sudan has one of the lowest rates of mobile access and connectivity in the world, with a penetration rate of 22 percent in 2022. Poor transport conditions and high fuel prices are major barriers for MNOs to implement and maintain DCI, and violence and conflict has resulted in MNOs suffering major infrastructure losses and caused high population displacement which means that many have moved from areas of connectivity to areas with no connectivity.[187]

In the financial year 2021-22 alone, the WB has developed over 40 digitalization projects for a total of $4.5 billion in 29 SSA countries to support the building of digital economy foundations, including digital connectivity, digital public infrastructure, digital businesses, and digital skills. More recently, the World Bank has accelerated scaling up its support to governments to enable digital transformation and aims to commit around $7 billion to Africa over the period 2023-25. The three projects outlined below represent the World Bank's increasing ambition to facilitate private investment in DCI to support digitalisation in Africa.

A.7 Country Summary

Country	Telecoms competition	Independent regulator	USF	Mobile broadband development	Electrification	Foreign investment climate	Key points
Djibouti	✗	⚠	✗	⚠	⚠	⚠	Quasi-monopoly provider. Relatively well connected.
Ethiopia	⚠	⚠	⊕	✗	⚠	✗	Recently introduced second MNO. Teledensity remains low.
Kenya	⊕	⊕	⊕	⚠	⚠	⚠	Five MNOs but Safaricom dominant.
Madagascar	⊕	⊕	✗	✗	✗	⚠	Four MNOs, high coverage but large digital divide due to low income and poor electrification.
Somalia	⊕	⚠	✗	✗	✗	✗	Seven MNOs. Internet coverage among lowest in the world.
South Sudan	⊕	⚠	✗	✗	✗	✗	Three MNOs, two foreign owned. Very low connectivity.

Legend: ✗ is high risk, ⚠ is medium risk and ⊕ is benign or normal risk.

Risk assessment based on CEPA analysis.

187 See https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2022/10/SOUTH-SUDAN_DW.pdf

APPENDIX B **Project Backgrounds**

In the financial year 2021-22 alone, the WB has developed over 40 digitalization projects for a total of $4.5 billion in 29 SSA countries to support the building of digital economy foundations, including digital connectivity, digital public infrastructure, digital businesses, and digital skills. More recently, the World Bank has accelerated scaling up its support to governments to enable digital transformation and aims to commit around $7 billion to Africa over the period 2023-25. The three projects outlined below represent the World Bank's increasing ambition to facilitate private investment in DCI to support digitalisation in Africa.

Kenya Digital Economy Acceleration Project (P170941)

The Digital Economy Acceleration Project will be conducted in two phases to help Kenya improve its digital infrastructure and access and develop their digital economy. Digital literacy remains a significant barrier to access.

- **Component 1:** Digital Infrastructure and Access (US$220m): a) Extending the reach of the backbone network; b) increasing last mile connectivity for education; c) enhancing government connectivity; d) strengthening the digital enabling environment; e) enhancing regional digital infrastructure.
- **Component 2:** Digital Government and Services (US$104m): - (a) Digitising selected government services; b) developing the critical enablers for digital government; c) enhancing regional data governance.
- **Component 3:** Digital Skills and Markets (US$51m): a) Supporting digital literacy; b) enhancing employment-ready digital skills; c) promoting device affordability; d) positioning Kenya as a Regional Digital Hub.
- **Component 4:** Project Management (US$15m)– supporting project implementation and management of regional activities.
- **Component 5:** CERC – responding to future crises.

Eastern Africa Regional Digital Integration Project SOP-II (P176181)

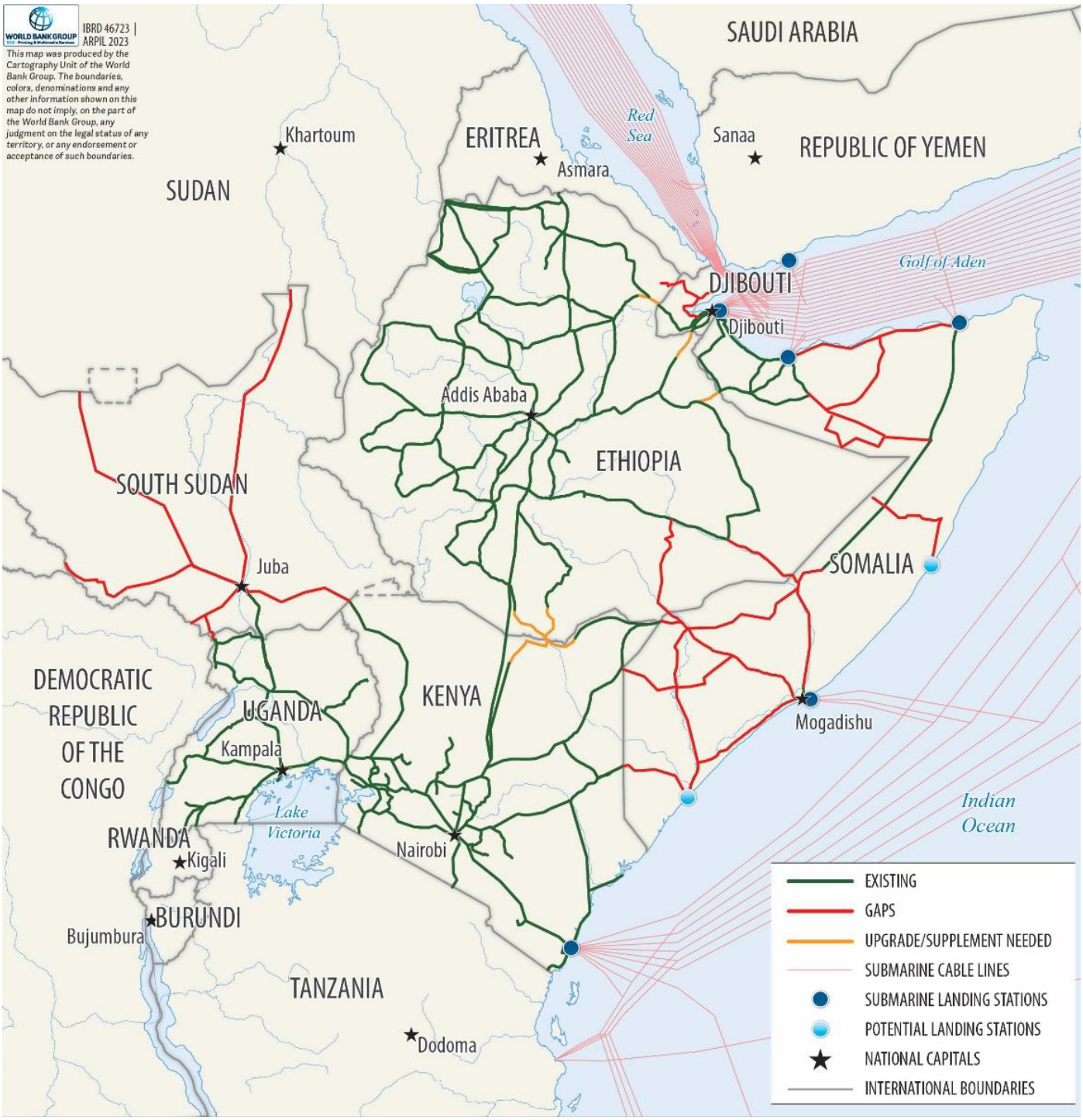
The Eastern Africa Regional Digital Integration Project seeks to advance regional economic integration through the development of cross-border digital infrastructure and services in Eastern Africa (Burundi, Djibouti, Ethiopia, Eritrea, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania and Uganda).

- **Component 1:** Connectivity Market Development and Integration (US$95m) - support reforms to reduce barriers to the provision of cross-border telecoms services through open markets as well as broadband connectivity infrastructure deployment, to increase access and affordability of connectivity for end-users.
- **Component 2:** Data Market Development and Integration (US$55m) - enable the secure exchange, storage and processing of data across borders to support regional deployment and access to data-driven services, innovation and infrastructure.
- **Component 3:** Online Market Development and Integration (US$25m) - support the development and integration of the online market, which would enhance regional economic integration through trade, specifically via cross-border delivery and access of digital goods or services.
- **Component 4** - provide TA and capacity support for project preparation and implementation.

Eastern Africa Regional Digital Integration Project SOP-II (P180931)

The Series of Projects (SOP) development objective is to promote the expansion of an integrated digital market across Eastern Africa by increasing cross-border broadband connectivity, data flows and digital trade in the region. Phase II development objective of the SOP is to advance digital market integration in the Eastern Africa region by increasing affordable access to regional broadband connectivity and strengthening the enabling environment for cross-border digital services. The project is seeking to address gaps in regional fibre infrastructure, as shown in Figure A-3.

Figure A-3: Optimising the regional networks of the Horn of Africa[188]



The first phase of the Eastern Africa Regional Development Integration Project series of project (EARDIP SOP-1; P176181; see above) provides financing for Somalia and South Sudan and grants to two RECs, the, East Africa Community (EAC) and Intergovernmental Authority on Development (IGAD). In addition, the Kenya Digital Economy Acceleration Program (KDEAP) provides US$70m in additional regional funds for supporting Kenya's participation in these activities in parallel with EARDIP. The plans for the second in the EARDIP series of projects (SOP-II) adds two more countries – the Republic of Djibouti and the Federal Democratic Republic of Ethiopia. The programme of projects and funds available for SOP-II sees additional funds being added to the four components described above.

188 Source: Map 1, page 7 in the Project Information Document, at https://documents1.worldbank.org/curated/en/099050423081036143/pdf/P18093108125ee-090869a0089828ff2b8d.pdf

Digital and Energy Connectivity for Inclusion in Madagascar Project (P178701)

The Digital and Energy Connectivity for Inclusion in Madagascar Project aims to increase access to reliable and affordable energy and digital services, with a focus placed on including underserved communities. This project differs from the other two we consider because it considers the energy sector in addition to DCI, because energy is an enabler of digital development and vice versa. The models considered in this report for leveraging private sector investment in DCI also apply to energy. For example, PPPs have been used extensively around the world to involve the private sector in building energy infrastructure. In Pakistan, the government used PPPs and a unique credit enhancement-wind risk guarantee to attract private investment for wind projects.[189] The World Bank report "Linking Up: Public-Private Partnerships in Power Transmission in Africa" draws from examples of successful PPPs in Brazil, Chile, India, Peru, and the Philippines to suggest that the private sector can play a vital role in the financing, building, and operating power transmission lines in Africa using PPPs.[190]
The project is split into 5 components:

- **Component 1:** Expanding Energy and Digital Infrastructure (US$160 million)

  Subcomponent 1.1: Hybridization and digitization of isolated grids

  Subcomponent 1.2: Deployment of digital infrastructure in rural areas

  Subcomponent 1.3: Private sector renewable energy mini grids

- **Component 2:** Enhancing Energy and Digital Inclusion (US$230 million)

  Subcomponent 2.1: Affordable off-grid solar and digital devices for underserved communities and marginalized groups

  Subcomponent 2.2: Digital literacy and renewable energy awareness

  Subcomponent 2.3: Support off-grid solar and broadband connectivity of public institutions to increase service delivery and access for underserved communities

- **Component 3:** Supporting the Enabling Environment for Green Energy and Digital Infrastructure (US$25 million)

  Subcomponent 3.1: Support for digital sector reforms

  Subcomponent 3.2: Support for energy sector reform

  Subcomponent 3.3. Enabling environment for enhanced climate change adaptation and mitigation

- **Component 4:** Project Management and Implementation Support (US$20 million)

- **Component 5:** Contingent Emergency Response Component (budget to be determined)

189 See https://blogs.worldbank.org/ppps/infrastructure-africa-s-development-ppp-imperative
190 See https://openknowledge.worldbank.org/entities/publication/201283a6-1c04-529e-a61c-5ce8df995636

APPENDIX C What is Digital Communications Infrastructure?

As set out in chapter 1.1, Digital Communications Infrastructure (DCI) may be regarded as a subset of Digital Public Infrastructure (DPI), which includes the solutions and systems that facilitate essential society-wide functions and services such as: identity verification, payments and data exchange platforms. However, it is acknowledged by many that both DCI and DPI are part of an evolving concept.[191] To have a clearer understanding of DCI, especially in the context of this study, it is helpful to recognise that it forms a subset of all digital infrastructure:[192]

- **Digital Infrastructure:** According to the UK government, at a general level digital infrastructure "*underpins the digital, cultural and social infrastructures to develop places where people want to live, work and visit.*"[193] The digital infrastructure ecosystem has both physical (hardware) and non-physical elements (software) which work together. Services and applications used by end-users (real or virtual) on terminals and devices interact with connectivity, transportation, storage and processing systems. Digital infrastructure can be private, closed and proprietary; or alternatively publicly accessible and interoperable with open standards.

- Digital Public Infrastructure: Is that part of Digital Infrastructure built for public interest, whether that involves infrastructure used whole or in part by the public sector (e.g., government institutions) or services and applications that provide externality benefits to society (e.g. electronic national ID systems, government e-procurement systems). DPI also involves government orchestration and public governance and accountability.

- Digital Communications Infrastructure: The focus of this study, DCI concerns that portion of digital infrastructure that is used for voice, data and video communications between individuals (one to one), using digital technologies, such as fiber optic cables, cellular mobile communications, microwave or satellite communications. In the definition used here, it does not include one-to-many communications, such as broadcast TV or radio, and does not include equipment used for data storage or analysis, such as data centers or computer servers.

In this study we are largely interested in funding incentives for DCI in relation to connectivity and transportation, which comprises the physical infrastructure that carries digital data between devices, data infrastructure and services. Therefore, we focus on that part of DCI which provides the foundation for a country's digital services. Further, for the purposes of this study we focus on leveraging private investment in DCI within the telecoms space, in particular fibre rollout to provide last-mile or middle-mile connectivity and a national backbone transportation, and the deployment of mobile broadband connectivity in unserved, largely rural, locations.

Both DCI and DPI are key pillars of the UN's SDGs, which are seventeen targets adopted by all UN member states that aim to provide a blueprint for peace and prosperity for the whole planet.[194] In 2023 the UN published an important compendium to the SDGs emphasising the important role to be played by DCI and how lessons can be learned to ensure the SDGs are achieved.[195]

The World Bank also highlights how DCI and DPI can be leveraged to help achieve many ambitious targets across different sectors and help achieve humanitarian goals. In particular, the WB emphasises that DPI is unique and important for four main, inter-related reasons:[196]

1. **It is foundational and cross-cutting.** Physical infrastructure such as fibre-optic cables represent the foundation of the internet and every digital asset. Virtual infrastructure to allow for identity verification and/or making and receiving a payment are at the core of most transactions, and thus DPI prevents the need to re-invent the wheel with every new system.

2. **It complements and works together at policy, process, and technology levels.** For example, a person can use their digital ID to exercise consent over sharing their personal data from official sources, or a small business could use payment transaction data to access cheaper credit. Physical infrastructure aimed at universal access enables all of the population to use these virtual assets.

191 DPI is defined by the UN as a combination of (i) networked open technology standards built for public interest, (ii) enabling governance, and (iii) a community of innovative and competitive market players working to drive innovation, especially across public programmes. The G20's consensus on DCI defines it as a set of shared digital systems which are secure and interoperable, built on open standards and specifications to deliver and provide equitable access to public and/or private services at societal scale and are governed by enabling rules to drive development, inclusion, innovation, trust, and competition and respect human rights and fundamental freedoms. See UN (2023) https://www.undp.org/digital/digital-public-infrastructure and G20 (2023) https://www.undp.org/publications/DCI-approach-playbook.

192 See slide 4 from the G20's DPI Playbook. Available at: https://www.undp.org/sites/g/files/zskgke326/files/2023-08/undp-the-DCI-approach-a-playbook.pdf

193 Department for Digital, Culture, Media & Sport. 2019. "Connected Growth: A manual for places working to boost their digital, cultural and social connectivity", page 37.

194 The SDGs have a target date of 2030 and include numerous ambitious goals including ending all poverty, achieving zero hunger and taking urgent action to address climate change. See https://sdgs.un.org/goals

195 UNDP. 2023. "Accelerating the SDGs through Digital Public Infrastructure: A compendium of the potential of digital public infrastructure".

196 See https://blogs.worldbank.org/digital-development/how-digital-public-infrastructure-supports-empowerment-inclusion-and-resilience

3. **It enables sectoral applications to be easily built 'on top'.** Government agencies and the private sector can focus on their core business, with the ability to innovate further boosted by common standards and open application programming interfaces (APIs). The private sector offers innovative products that can be used in a variety of sectors. For example, the mPesa from Kenya's Safaricom has spread from mobile payments to enabling access to other services such as energy and consumer products. In India, despite the country's public investments in DPI, Meta-owned WhatsApp became the default platform for remote schooling throughout the COVID pandemic.

4. **Public benefit** – not necessarily public ownership. Governments have a primary role in deciding whether and how DPI is provided in the interests of the broader society and economy, through regulation, operation, and/or partnering with the private sector.

An example of the many World Bank projects allocating public funds to promote DCI is the Log-in project operated in Georgia. This is summarised in Box C1 below.

Box C1:

Log-in Georgia Project

About: In 2020, the World Bank approved a EUR 35.7 million (US$38.8m) loan for the Log-in Georgia project which aimed to improve last-mile connectivity for people, enterprises and institutions across rural Georgia and increase access to affordable high-quality broadband. The project will help connect up to 1,000 villages. Nearly 500,000 people living in regions unserved by high-quality broadband services stand to benefit from the deployment of the broadband infrastructure. Through this project, the World Bank will support Georgia's National Broadband Development Strategy for 2020-2025. The project has three components: (i) increasing access to affordable broadband internet; (ii) promoting the use of broadband-enabled digital services; and (iii) project implementation support. So far, funds have been given to public institutions, but the hope is that the private sector will get involved in the future.

How DCI relates:

1. **Foundational:** Fiber provides the foundation for digital services in the modern world. A good quality, fast connection is necessary for uploading and downloading large amounts of data, which is required for almost all digital services e.g., video calling, accessing online information and resources, mobile payments, etc.

2. **Complementary:** Broadband can be used by every part of the economy, from government services to private businesses and households. Improving connection coverage and quality can help the government focus on policy objectives such as economic growth and reducing regional inequality, for example by increasing the amount of ICT jobs in rural areas of Georgia.

3. **Sectoral applications working on top:** Specific sectors of the Georgian economy can build and expand their services due to the improved last mile connectivity and improved access to affordable broadband. For example, the project will promote a vast range of areas including digital financial services and e-commerce, online e-government services, remote e-learning and telemedicine.

4. **Public benefit:** The project will help Georgia overcome economic dualism and ensure that people in rural areas have the same access to opportunity as their urban counterparts. It will help the country harness digital technologies to increase its economic competitiveness and provide better jobs and opportunities for all its people.

APPENDIX D **Procurement Rules**

Summary of key World Bank procurement rules

The World Bank's Procurement Regulations[197] outlines key procurement rules for entities wishing to borrow from the World Bank. These rules are designed to support Borrowers to achieve value for money and to ensure a transparent procurement process.

Section III Governance states that operations should be managed through clear and transparent lines of accountability and have clear definition of the roles and responsibilities of each party.

- The Borrower is responsible for carrying out procurement financed by the Bank in accordance with the procurement regulations.
- The Bank carries out its procurement functions, including implementation support, monitoring and procurement oversight.

The Bank requires the Borrower to develop a Procurement Plan (Section IV), which should include:

- A brief description of the activities/contracts.
- The selection methods to be applied.
- Cost estimates.
- Time schedules.
- The Bank's review requirements.
- The applicable Procurement Documents.
- Any other relevant procurement information.

An open competitive procurement approach is preferred. Approved methods include BAFO and E-reverse auctions. For open competitive procurement the following requirements apply:

- Open advertising of the procurement opportunity;
- The procurement is open to eligible firms from any country;
- The request for bids/request for proposals document shall require that Bidders/Proposers submitting Bids/Proposals present a signed acceptance at the time of bidding, to be incorporated in any resulting contracts, confirming application of, and compliance with, the Bank's Anti-Corruption Guidelines, including without limitation the Bank's right to sanction and the Bank's inspection and audit rights;
- The Procurement Documents include sufficient provisions, as agreed with the Bank, to adequately mitigate against environmental and social (including SEA/SH), risks and impacts;
- Contracts with an appropriate allocation of responsibilities, risks, and liabilities;
- Publication of contract award information;
- Rights for the Bank to review procurement documentation and activities;
- An effective complaints mechanism;
- Maintenance of records of the Procurement Process.

According to the World Bank's E-reverse Auction Guidelines,[198] E-reverse auction methods should only be used when:

- There exist a significant number of potential bidders.
- Price is an important determinant.

The E-reverse auction[199] is a particular application of a Request for Quotations (RFQ). For the auction, the WB states that firms that meet the minimum qualification criteria should receive information on:

- The automated evaluation method that will be used to rank Bidders during the E-reverse auction; and
- Any other relevant information on how the E-reverse auction is to be conducted, including clear instructions on how to access and participate in the auction.

The WB's preferred approach for high-value and complex contracts is international competitive procurement as it can increase competition and may achieve the best value for money. Approaching the national market may be appropriate when the procurement is unlikely to attract sufficient foreign competition, or the financial and administrative burdens involved are too high. In this case, the country's own procurement procedures may be used.

In guidance that particularly affects Djibouti and Ethiopia, state owned enterprises (SOE) of the borrower's country are not normally eligible to participate in procurement. However, when the goods, works, or services provided are of a unique and exceptional nature or the SOEs participation is critical to the project, the Bank can agree to contract them on a case-by-case basis.[200]

197 See World Bank (2020). "Procurement Regulations for IPF Borrowers." Available at: https://thedocs.worldbank.org/en/doc/178331533065871195-0290022020/original/ProcurementRegulations.pdf

198 See World Bank (2005). "e-Reverse Auction Guidelines for MDB Financed Procurement." Available at: https://documents1.worldbank.org/curated/en/591461468162871166/pdf/883170WP0eReve00Box385191B00PUBLIC0.pdf

199 See Annex XII of World Bank (2020). "Procurement Regulations for IPF Borrowers" for details on E-reverse auctions.

200 See World Bank (2018). "A beginner's guide for Borrowers: Procurement under World Bank Investment Project Financing." Available at: https://thedocs.worldbank.org/en/doc/684421525277630551-0290022018/original/BeginnersGuidetoIPFProcurementforborrowers.pdf

Summary of National Procurement Rules

Country	Procurement Institution(s)	Procurement Law	Restrictions on MRRA
Djibouti	National Commission of Public Procurement[201]	Law No. 53/AN/09/6th L on New Public Procurement Code[202]	Bids submitted by envelope. No E-reverse auctions mentioned. Margin of preference given to Djiboutian/State owned entities (up to 7.5 percent).
Ethiopia	Public Procurement and Property Administration Agency[203] (Federal level)	Federal Public Procurement Directive (2010)[204]	Some level of detail on procurement options; no mention of reverse auctions but no apparent restrictions.
Kenya	Public Procurement Regulatory Authority (PPRA)[205]	Public Procurement and Asset Disposal Act (2015)[206]; Public Procurement and Asset Disposal Regulations (2020)	More detail on options in Part IX of PPADA including electronic reverse auctions.
Somalia	Department of Public Procurement[207]	Public Procurement Act (2015)[208]	Limited details on specific auction methods but no apparent restrictions.
South Sudan	Public Procurement and Disposal of Assets Authority	Public Procurement and Disposal of Assets Act (2018)[209]	Chapter V discusses methods including open competitive tendering; no mention of reverse auctions but no apparent restrictions.
Madagascar	Madagascar Public Procurement Regulatory Authority (MPPRA)	Public Procurement Code (2016) - LOI N° 2016-055	A lot of government procurement takes place outside the tendering process[210] Article 33 (IV) states e-reverse auctions can be used under certain conditions e.g., sufficient competition.[211]

201 https://marchespublics.gouv.dj/commision
202 https://marchespublics.gouv.dj/procedure/1
203 http://www.ppa.gov.et/
204 https://ethiopianlaw.weebly.com/uploads/5/5/7/6/5576668/procurement_directive_english.pdf
205 http://www.ppoa.go.ke/
206 https://ppra.go.ke/download/the-public-procurement-and-asset-disposal-act-revised-edition-2022/
207 https://mof.gov.so/department/public-procurement
208 https://mof.gov.so/sites/default/files/2018-09/Public%20Procurement%2C%20Concession%20and%20Disposal%20Act%202015.pdf
209 https://mofp.gov.ss/laws/PublicProcurementandDissposalofAssetsAct2018.pdf
210 https://www.trade.gov/country-commercial-guides/madagascar-selling-public-sector
211 https://www.fao.org/faolex/results/details/en/c/LEX-FAOC203722/

APPENDIX E World Bank Project Task Team Leader (TTL) Interviews

E1. Tanzania

Task Team Leaders: For Digital Tanzania, Paul Seaden, Sara Ballan, Tim Kelly (to 2023). For RCIP Tanzania, Peter Silarsky and Rajendra Singh.

Describe the project, the approach taken to DCI investment and your involvement

World Bank engagements in Tanzania have followed two phases:

- Under RCIP Tanzania (which ran from 2009-2017), the main focus was on establishing the National ICT Backbone network (NICTBB), extending last mile connectivity (with UCSAF) and rolling out different eGovernment projects (with eGA), including for registration of births (with RITA), registration of businesses (BRELA) and digitisation of archives. The project development objective (PDO) covered reduction in the price of broadband internet and extending geographical reach. The project was rated Moderately Satisfactory at conclusion.
- Under Digital Tanzania, which is running from 2021 to October 2026, the same elements of Government connectivity and last-mile connectivity were retained and expanded but with some new elements introduced, notably on the creation a Digital Technology Institute, a national addressing and postcode system, expansion of eCommerce, a data center and an expansion of one-stop-shop service centers. The PDO covered increasing access to high-quality affordable broadband services and extending government delivery of eServices. The project is currently rated Moderately Satisfactory but disbursement continues to be slow.

What models were used to involve the private sector?

For RCIP Tanzania, three models were used for advancing Digital Public Infrastructure (DCI).:

- For the roll-out and expansion of the NICTBB, a conventional PPP model was used, with WB providing technical assistance and project supervision. Network roll-out was carried out by TTCL, which operates the network, and was funded by a loan from China EXIM Bank. At the time, TTCL was partially privately-owned, through an investment by Airtel, but it was fully renationalised in 2017/18. Although the first phase of the NICTBB was completed, it never really succeeded in attracting private investment, apart from in a few metropolitan area networks, and the regulatory framework actively discouraged private investors from investing in areas where NICTBB already had fiber links. The one exception to this was Halotel, the Vietnamese-owned mobile operator which was allowed to invest in fiber in rural areas after market entry, around 2015. It quickly rolled out around 18,000km of fiber, more than twice the size of the TTCL-operated fiber, but it was not allowed to resell capacity.

- For international bandwidth for Government, a "pre-purchase of capacity model" was used, and the tender was won by TTCL. The contract for 2 Gbit/s of capacity for Government use was concluded in 2012 and was due to expire in 2022 but had to be extended several times, under exceptional conditions, as the new bandwidth contract had not yet been awarded (see below).

- For last mile connectivity in rural areas, the reverse auction model was introduced, with some lots funded by UCSAF, the Universal Service Agency, and others funded from project funds. After a slow start, in which initially no bids were received from operators, the model worked well and around 2.6 million people received 2G cellular service for the first time. After project funding ended, UCSAF continued with the model with its own funds, using the reverse auction model.

For Digital Tanzania, the Government had wanted to continue with a similar approach. However, further support to NICTBB was limited because, by this time, TTCL was fully-state-owned. But the other two modalities went ahead, with additional funding:

b) For international bandwidth, a new approach was tried using a fixed price (US$7.5m over a period of either five or ten years), and rated criteria used to evaluate bids, based on capacity (speed), duration, service level guarantees etc. Bids that were submitted covered a wide spectrum of offers, suggesting that communication with bidders was not effective. Nevertheless, good offers were received and a consortium involving Liquid Telecom was selected. However, the tender process failed in the later stages, because of the high prices levied by TTCL for cross-connect, following the award. It was subsequently readvertised with a tighter set of criteria to try to improve competitiveness between supplier bids.

c) For last-mile connectivity in rural areas, again conducted in parallel with UCSAF, a more successful outcome was achieved. Two tenders were issued, one for upgrade of brownfield sites (488 sites, from 2G to 4G) and a second tender for new greenfield sites (763 sites). Each site was treated as one lot and a reverse auction process was used again with some modifications, for instance, to require open access and national roaming after an initial exclusivity period. TTCL was initially allowed to enter the bidding process and was unchallenged in bidding to upgrade its own 2G sites to 4G. But later this approach had to be revised because TTCL should have been excluded from the process as an SOE and because of the conflict of interest with its parent organisation running the tender. Overall, the bidding process was competitive, with a good percentage of bids being competitive and below the maximum allowable subsidy. It is estimated that competitive bidding saved the Government US$3.3m (see summary table below).

Mobile Network Operator	2G upgrade (Brownfield)	New sites (Greenfield)	Total
Airtel	32	111	143
Tigo	148	185	333
Vodacom	69	137	206
Total	249	433	682

Following the completion of the Bank-funded process, UCSAF went ahead and negotiated directly with operators for the allocation of the remaining sites that did not initially attract bids. Thus, this was effectively a two-round process, with UCSAF using its own funds to allocate sites in the second round as shown below:

Mobile network operator	Cell Sites
Airtel	50
Tigo	38
Vodacom	53
Halotel	34
TTCL	100

In the WB-funded bidding rounds, the maximum allowable subsidy(MAS) was set at US$61,500 per new site and around US$22,000 for brownfield sites. The subsidies awarded by UCSAF amounted to between US$77k and US$94k. These subsidies are a lot higher than those awarded under the competitive process where, through competitive bidding, quite a few of the lots (135) were awarded below the MAS. The distribution of awards from UCSAF's own funds look like a "evening out" processes in which all shall have prizes. TTCL received the most sites (100) even though it would only have won 4 under the competitive bidding process. On the other hand, Tigo which was the most aggressive bidder with 49% of the competitively awarded bids was awarded only 14% in the Government process. Halotel also received some sites even though, in the competitive bidding process, it consistently bid above the maximum allowable subsidy. One can conclude from that that the Government's process of direct selection was probably not economically efficient and wasted some of the UCSAF funds compared with if a multi-round auction had been used.

What were the main challenges faced to attract private sector involvement?

Both phases would have benefitted from better consultation and information flow with the private sector. The first use of reverse auctions, around 2012, failed to attract any bidders because of the lack of understanding on the part of the operators. In the second round, in 2022/23, Halotel pitched all its bids at higher than the MAS, again presumably because of a lack of understanding of how the process worked. Further issues arose because none of the privately-owned operators were willing to bid against TTCL in the competitive process, presumably because of fear of consequences. Also, the cell tower operators were unwilling to bid independently of the mobile operators.

What three factors contributed most to the success of each project you have been involved with?

1. The simpler procurement process – using reverse auction subsidies and pre-purchase of bandwidth, with best bid winning – worked better than attempts to set up PPP structures. The use of reverse auctions for the upgrade of 2G to 4G cell sites was innovative and is thought to have been the first time this was used in the WB. It is now being considered for wider application in WB funded lending.
2. By the second phase, the fact that at least four of the operators (Airtel, Vodacom, Tigo and TTCL) were familiar with the reverse auction process helped the competitive bidding process, though the second round of direct negotiation with Government was opaque. A fully transparent multi-round reverse auction, with price discovery, would have worked better, as documented in the WB/CEPA book on the use of multi-round auctions in Tanzania, published in 2023.
3. In the second round of bandwidth bidding, the decision to go with a fixed price revealed in advance (US$7.5m), with competitive bidding over quality criteria, seems to have worked well in generating much lower bid prices and longer IRUs. However, the wide range of offers suggests that not all bidders understood the process.

What three main challenges did you face which may have contributed to not fully achieving expected benefits as quickly as expected?

1. Pretty much all the competitive tendering processes were negatively affected by the participation of TTCL. Although it was partially privately-owned in the first phase, it still inherited the bad practices of a former monopoly. It was also inefficient – it was very slow in implementing the few cell tower sites it was allocated in the first round, and these are likely to have been unprofitable as the Government tends to treat it as an operator of last resort.
2. Lack of price transparency in the reverse auction process, which was initially run as a one stage process, meant the Government gained less value for money in the application of subsidies than might otherwise have been the case. Also, the use of uniform and unchanging MAS proved to be a blunt instrument, with little "learning" embedded in the process.
3. The PIU generally performed poorly, for instance by not providing sufficient opportunities for consultation with the private sector and by generating poor bid evaluation documents, sometimes with mathematical errors in calculations.

Drawing on your experiences, what three factors would you change or do differently?

In retrospect, it would have been better if that World Bank had confronted the TTCL problem head-on, and not appeared to endorse the business concept behind the NICTBB, as a state-owned and operated infrastructure for Government users. At the time of the first project, there were strong signs that it would be an open access network, with participation of TTCL on equal terms with other operators, but this did not turn out to be the case. The Bank's position, that it could not support a state-owned and operated NICTBB, was weakened during project negotiations for Digital Tanzania.

The use of a multi-round auction process for the cellular extension would have worked better than the modified single-round process that was ultimately used. This is well documented in the World Bank/CEPA report.

In retrospect, it might have been better to have competitively selected a transaction advisor to run the procurement processes, rather than leaving it to the PIU, though it is unlikely that the Government would have accepted this.

Do you think the method was successful in providing value for money?

For the last-mile connectivity process, overall, the process has been a successful one and should bring services to more than three million Tanzanians that were previously outside broadband cellular coverage, in the second phase, in addition to the 2.6 million people that received cell service for the first time in the first phase. In total some 1,012 new and upgraded cell sites were provided in rural areas under Phase 2. It should be possible once the process is completed (awards were made in May 2023) to estimate the value of private sector investment that was generated from the process, but it is likely to be in the ratio of around 1:1. This is lower than under RCIP TZ, where project funds leveraged private sector investment in the ratio of around 1:2, but the economic viability of sites auctioned under Digital TZ was much lower than in the earlier process.

However, it is hard to claim value for money for the international bandwidth contracts, as it became necessary to renew the expiring contract with TTCL several times due to delays in the procurement process.

E 2. **Malawi**

Task Team Leader: Luda Bujoreanu, Tim Kelly, Ida Mboob (to 2021) for Digital Malawi; Doyle Gallegos, Casey Torgusson and Rajendra Singh for RCIP Malawi.

Describe the project, the approach taken to DCI investment and your involvement

World Bank engagements in Malawi have followed two phases:

- Under RCIP Malawi (which ran from 2009-2016), the main focus was on establishing Malawi's national fiber backbone network and virtual landing stations in Zambia and Tanzania. The project development objective PDO) covered reduction in the price of broadband internet and extending geographical reach. The project was rated Moderately Satisfactory at conclusion.
- Under Digital Malawi phase 1, which is running from 2018 to October 2024, the focus has shifted to last mile connectivity with a project to connect 500 plus Government institutions, as well as higher education institutions. This phase also invoWlved increasing the amount of international bandwidth available for both Government and University users. The PDO covered increasing access to high-quality affordable broadband services and extending government delivery of eServices. The project is currently rated Satisfactory at conclusion.

What models were used to involve the private sector?

For Phase 1, the main model used was using pre-purchase of international connectivity for Government, under a 10-year Indefeasible Rights of Use (IRU) contract with Government as an anchor tenant to encourage investment from the private sector. Through a competitive tender process, SimbaNet of Kenya was selected and proceeded to invest in a fiber backbone network that extended from the Tanzania border, through northern Malawi to a termination poins in Lilongwe, and from the Zambian border to Blantyre. The modality included establishment of virtual landing points (VLPs) which enabled a total of eight companies to access international undersea cable (up from 0 at project inception) and allowed an increase in the number of internet service providers (ISPs) active in the market from 12 to 21. A key feature of project design was open access thus that the reduced price of access offered to Government was also offered to other private operators, at wholesale rates. All project targets were met or exceeded and the wholesale price of international bandwidth, for instance, fell from over US$10,000 per Mbit/s to just US$481. The Implementation Completion Report (ICR) for the project concluded that the procurement model used, which used the Government as an anchor tenant to incentivize investment, was more efficient that a PPP structure involving government ownership of infrastructure would have been.

For Phase 2, a similar procurement model was used, with IRU purchase of long-term internet supply agreements, with the main difference being that nearly 600 terminational points were defined (500 plus for Government institutions around the country; 60 plus for higher educational institutions (HEIs) and the rest for Government Local Area Network (GLAN) sites in Lilongwe), as opposed to just eight termination points under Phase 1. Consistent with the focus on last-mile connectivity, the chosen sites were more diverse from a sectoral and geographical perspective, with a particular focus on universities, TVETs, teacher training colleges and medical schools, on post offices and public WiFi hotspots, such as markets, community centers and the airports, as well as government institutions in rural locations. The purchase of internet capacity was intended to incentivize the supply of last mile fiber to these institutions, which were selected through a feasibility study.

The procurement for the connectivity transaction was conducted through five lots, of which two were for international connectivity to Blantyre via Mozambique and Zambia (won by Inq Digital), and three were for regional connectivity, in the South, North and Center of the country. The lots in the South and North were won by Bengol Net while in the Center it was won by a consortium of DataCon and Luna Technologies.

What were the main challenges faced to attract private sector involvement?

In both phases of the project lack of access to foreign currency and funds for investment was a major challenge. In Phase 1, SIMBAnet faced delays in raising funding, and the project had to be extended with the final payment being made only after project closure, using the Government's own funds. In Phase 2, Digital Inq made the mistake of submitting its bid in Malawian Kwacha rather than US Dollars, and the devaluation of the Kwacha, by more than 40 percent during the course of the project, affected its ability to finance the international payments due to foreign bandwidth providers. For BengolNet and DataCon, a further challenge was related to high taxes on import of good and equipment, with a real tax rate (import tax plus sales tax) close to 65 percent. All three contractors in phase 2 faced cash flow challenges, not helped by the schedule of payments, which delayed payments to workers.

A further distraction, if not a challenge, stemmed from the fact that the Government contracted a loan from the China EXIM Bank for digital infrastructure at the same time as it agreed the credit from IDA. This led to a delay of a year in the project becoming effective, because the Government was undecided which loan to take (it eventually took both). The China EXIM Bank loan, which was carried out by Huawei without competitive tendering, is a more conventional contract in that the Government purchased equipment on behalf of ESCOM, the government-owned power utility, including a data center, fiber optic cable, electricity and fiber distribution pylons etc. Repayments of interest on the first tranche of debts to China EXIM Bank are now due and this has put ESCOM under considerable financial pressure as it has not been able to sell capacity at a profit. Indeed, for almost a year, the Minister of Information and Digitization (MID) placed a stop order on the World Bank connectivity transaction to try to oblige the contractors to purchase capacity from the ESCOM network. This was eventually resolved, when the Minister was removed, but caused long delays and the project had to be extended by two years.

What three main challenges did you face which may have contributed to not fully achieving expected benefits as quickly as expected?

1. In both phases, the innovative nature of the procurement transaction introduced some delays in receiving World Bank procurement clearances. Under Phase 1, these delays related to the intangible nature of the asset being purchased (bandwidth) while under Phase 2 there was much discussion over the way in which operations and maintenance costs (O&M) would be handled, if they became due after the official closure of the project
2. Under Phase 1, O&M costs incurred after the end of the project closure would be payable by the Government itself. Although O&M costs typically amount to only 2 percent or so or project costs, because of the dramatic falls in bandwidth prices, by the end of the contract these because relatively more significant, and a burden for Government. Under Phase 2 this was handled by requiring the contractors to bundle future O&M costs into the upfront costs of the bandwidth. It remains to be seen whether this arrangement will hold once the project closes. The former Minister had requested that IRU contracts be reduced from ten to three years, but this would have defeated many of the original project objectives for sustainability.
3. Although not a problem for the Bank, the Government appears to have found the concept of private ownership a challenge, and some parts of Government would have preferred to stick with the Chinese model of purchase of equipment to be owned and operated by a state-owned enterprise (ESCOM), despite the losses and inefficiency of those operations. For Phase 1, this sticking point appears to have been the involvement of a foreign (Kenyan) company, SIMBANET, which requires Government departments to pay their debts, unlike ESCOM which is willing to continue service even in the face of non-payment. Under Phase 2, although all three contractors are from the Malawian business community, they are not perceived to be "indigenous".

Drawing on your experiences, what three factors would you change or do differently?

In retrospect, under Phase 1, it would have been better to have confronted the problem of O&M costs at an earlier opportunity as these caused a lot of resentment among Government Ministries, even though they only constitute around 2 percent of total bandwidth costs.

Under Phase 2, the Bank and the Government could have made more effort to have got operators involved in the bidding as opposed to contractors that were interested in providing the last-mile fiber. This may have avoided sustainability problems that could arise later.

Also, if writing bidding documents again, the Bank may have insisted on climate resistant infrastructure (ie buried fiber or LEO satellite connectivity) rather than aerial fiber, which was proposed by the contractors. The aerial fiber is easier to repair, and has lower safeguards requirements than buried fiber, but it may be subject to more frequent cuts.

In the case of the bid for international connectivity via Zambia and Mozambique, an alternative procurement model might have been used whereby the price was fixed and bidders invited to compete on quality (ie speed of connection) and length of contract, as well as coverage of O&M costs, rather than competing on price of connection. This approach was used to good effect under Digital Tanzania (P160766). One outcome of competing for bandwidth on price is that the bandwidth offer (around 3 Gbit/s under a long-term MOU) is relatively low. A second consequence is that the price was settled in Kwacha, rather than US Dollars, and was affected by devaluation.

Do you think the method was successful in providing value for money?

Yes, both phases provided good value for money with targets being easily exceeded. In Phase 1, for instance, the target of US$5,000 per Mbit/s was exceeded with an outcome price of US$481. In Phase 2, the outcome price is as low as US$10 per Mbit/s. Also, in Phase 2, the goal of 400 government sites connected was exceeded ad the total number of sites connected was 640, including HEIs.

A simple comparison can be made with the ESCOM project, where no competitive tendering was used and where the SOE (ESCOM) was expected to own and operate the network. However, the data center constructed by ESCOM at Blantyre is largely unused while the fiber optic capacity is underutilised and pricing does not follow market trends. By contrast, internet capacity purchased under the World Bank model is very heavily utilised (over 90 percent during peak hours).

E3. **Kosovo**

TTLs: Natalija Gelvanovska, Charles Hurpy

Describe the project, the approach taken to DCI investment and your involvement

KODE PAD, page 16: Component 1: Digital Inclusion (€15.38 million) will support digital inclusion through: (a) the expansion of digital connectivity through the co-financing of deployment of high-speed broadband connectivity in areas that have been identified as not connected or underserved, and (b) improving of the enabling environment for wireless broadband services, through the deployment of the National Spectrum Monitoring System (NSMS).

What models were used to involve the private sector?

Matching Grants Model. Private sector operators are invited to compete for a matching grant (initially up to 50%; and later up to 80%) towards capital expenditure resulting from implementation of network construction project in defined lot (bundle of few villages). More details could be found in GOM.

KODE GOM: Subcomponent 1.1 will finance provision of grants to facilitate the deployment of broadband infrastructure of defined quality for unconnected settlements and public institutions (especially healthcare and educational institutions). The Grant Scheme will award grants to the selected beneficiaries. Awarded grants are dedicated to cover the costs of the eligible expenditure, such as deployment of passive and active broadband infrastructure and civil works. Grant amount can cover up to 80 percent (of the eligible expenditure only) of the total project's budget. Remaining part of the project's budget shall be matched by the selected beneficiary. Exact maximum percentage (not exceeding 80 percent) of the total sub-project/lot budget to be covered by Grant will be determined by the bidding process for each Call for Applications. By accepting the Grant, selected beneficiary will assume defined set of obligations. Terms and conditions of the awarded grant, incl. the obligations, will be defined by the Grant Agreement. **Grant applications evaluated based on requested grant amount (70%) and the quality of the project plan (30%)**.

What were the main challenges faced to attract private sector involvement?

Few challenges. However, it is important to agree with the private sector on principal elements of the model and have open channel with them throughout the implementation.

What three factors contributed most to the success of each project you have been involved with?

1. Understand key features of the model that are important for the private sector
2. Ensure model is fast disbursing
3. Develop trust between administrator of the model (Ministry), World Bank and private sector

What three main challenges did you face which may have contributed to not fully achieving expected benefits as quickly as expected?

4. Initial size of the matching grant of 50% became insufficient 2 years into the project as villages started to be more expensive to cover (more remote with less households). Subsequently we have increased size of the matching grant to up to 80%.

5. Pricing for electricity poles rental became an issue with more remote villages (more of poles were needed and share of rental/OPEX went up). Subsequently Ministry negotiated special rate for pole rental for remote villages with electricity distribution company.

6. Throughout the implementation project faced only one complaint from the private sector which was not justified. If administrative process of the model had not been developed in detail, widely communicated, agreed on and followed strictly, then complaints could destroy the project. In the case of this project, the private sector knew that procedures are followed transparently and there was no scope for complaints.

Drawing on your experiences, what elements would you change or do differently?

Nothing major. Model worked well for Kosovo. Throughout the implementation we've only shortened the initial phase of consultation with the market regarding the forthcoming lots (instead of one month, Ministry is now consulting for two weeks).

Do you think the method was successful in providing value for money?

Method was successful.

E4. **Gabon**

TTL: Michel Rogy, Charles Hurpy

Describe the project, the approach taken to DCI investment and your involvement

- This activity mainly concerns the Central Africa Backbone (CAB), phase 4, parent project and additional financing (P122776, US$81m in IBRD financing and US$51m in counterpart financing), which ran from 2012-2020. The project development objective (PDO), consistent with the overall CAB program, was to increase the geographical reach and use of broadband internet and reduce services. Two other overlapping WB projects in Gabon were e-Gabon (P132824), which focussed on entrepreneurship and e-Health, and the new Digital Gabon project (P175987), which focusses on Digital ID but is yet to start disbursement. But neither has a strong connectivity component so is not considered here.

What models were used to involve the private sector?

- Under CAB4, two PPP-type structures were used:
- To cover Gabon's membership of the ACE cable, the World Bank covered the costs of membership (US$15m), under a classic "club cable" arrangement, with a focus on open access. Similar arrangements were used for other West African countries joining ACE.
- To extend Gabon's national backbone, and to ensure connectivity with neighboring countries, a PPP arrangement was established whereby a special purpose vehicle (SPIN) was set up to manage the Government's ownership of domestic cable, funded by the project. The network was constructed by a vendor (CCSI) and operated by a private operator, Axione, both of which were selected through a competitive process. So, effectively, this was a Build-Operate-Transfer (BOT) arrangement.

What were the main challenges faced to attract private sector involvement?

The main challenge appears to have been to deal with poor construction in the first phase and to re-negotiate the terms of the PPP during the additional financing to reflect the interests of both the private operator and the Government. As a consequence, there was a long delay between the completion of the construction of the second cable and its commercialisation. The project had to be restructured five times in total, in part as a result of these delays, requiring a lot of expense of management time, both for the client and the WB. Details are provided, as follows in the ICR:

The first 1,140 km ("Phase 1") of the fiber-optic backbone financed by the parent project has been in commercial operation since February 2019 under a PPP with private wholesale operator Axione, and national accessibility and quality of service are generally satisfactory, with a number of outages repaired promptly and certain infrastructural defects revealed in a February 2020 technical audit addressed by the authorities through the Additional Financing (AF). The performance of the PPP established under the parent project has produced particularly positive results. The parent project also delivered on the MOU and physical interconnection with Congo, with traffic being exchanged between operators across the border as of December 2020 after long-running infrastructural issues on the Congolese side were fixed.

The 620-km extension of this fiber-optic backbone ("Phase 2") financed through the AF was fully completed in March 2020 but was not commercialized as of the project's closing date, due to long delays in the renegotiation of the terms of the original PPP between the Gabonese authorities and Axione (including the extension of the duration of the PPP, financial arrangements, and inclusion of the new Phase 2 links in the PPP.). Negotiations around the network extension's PPP concluded successfully in October 2020, and the revised PPP agreement was signed in March 2021, ensuring the overall continuity of the PPP after the project's closing date. This revised PPP agreement is expected to pre-finance the repair of infrastructural defects revealed in the February 2020 technical audit of "Phase 1". The AF delivered partially on interconnections with Cameroon and Equatorial Guinea, which still require the following before Internet traffic can be exchanged: (i) the finalization of the physical interconnection on the Cameroonian side, knowing that an MOU between the two countries was signed in 2019, and (ii) the signature of an MOU with Equatorial Guinea prior to the installation of the physical interconnection across the border, noting that the final draft of the MOU was finalized in September 2020 but its signature delayed due to COVID-19.

What three factors contributed most to the success of each project you have been involved with?

1. Most indicators have been achieved, and in some cases greatly exceeded, and it is unlikely that this would have been achieved in the absence of the project. Usage of the fiber is also high. The fact that 21 ISPs use the cable can also be considered a success.

2. Good regional cooperation and national coordination. There was good coordination among the various ministries and agencies involved (e.g., MCPEN, ARCEP, ANINF, SPIN, railway operator SETRAG, local governments) through a high-level supervisory structure, and the steering committee conducted regular meetings to follow up on progress and resolve pending issues. In addition, the Government did a very good job at building citizens' awareness and securing their buy-in for the project through a sustained communications campaign.

3. Technical assistance to the regulator generally worked well, and the country's score on the ITU's ICT regulatory tracker rose during the course of the project.

What three main challenges did you face which may have contributed to not fully achieving expected benefits as quickly as expected?

1. Negotiations over the extension of the terms of the PPP led to long delays (see above).

2. Long-term sustainability of the PPP arrangement is not assured as Government continues to own the network, even though it is operated by a private company.

3. It is difficult to tell what might have happened in the case of a fully private venture. Would the fiber have been built in the absence of Government involvement or ownership?

Drawing on your experiences, what elements would you change or do differently?

The ICR judges the project to have had substantial efficacy and efficiency and the overall rating is "Satisfactory". The project had a transformational effect on the telecom sector, as evidenced by a dramatic increase in the geographical reach, usage, and affordability of regional broadband network services. High-level data provided by the private operator Axione in April 2021 reveal that revenues generated through the PPP were 20% higher than those expected at the time of signature.

The project did not experience any cost overruns, but suffered from process inefficiencies that caused time overruns: slow initial implementation due to client-side delays in the national procedure for the approval of the loan agreement (as detailed in the ICR).

An independent technical audit of the "Phase 1" (parent) backbone network financed by the project and completed in February 2020 revealed technical nonconformities in the construction process, and important repairs were estimated to cost around $US 2.8 million. The Bank's team recommended that the authorities fully enforce the contractual guarantees with the vendor (CCSI) to proceed with these repairs as soon as possible, since they were needed to ensure the resilience and service quality of commercial operations in the long run. However, the Gabonese authorities and CCSI entered a dispute (still ongoing), and the amount required for repairs might have to be borne by the Gabonese authorities.

Do you think the method was successful in providing value for money?

Overall, this project has had a satisfactory outcome and the country's usage of the internet has certainly risen substantially and prices have fallen. However, there remains a nagging doubt over whether things could have turned out better with a purely private-sector approach, or using the "government as anchor tenant" approach. One concern over value for money is that the actual amount of fiber constructed (1,760 km) seems very low in relation to the size of the Connectivity component (US$59.5m actually disbursed), though at least part of this expenditure was for ACE membership.

APPENDIX F **Proposed commercial transaction manual roadmap**

A commercial transaction manual will need to be prepared to support the disbursement of funds aimed at promoting additional investments in DCI. In this report CEPA has advocated that market conditions in many of the countries could merit the deployment of a competitive MRRA deployed over an EAP. Below we present an outline of how such a manual might look and this is followed by guidance on the considerations required for procuring an EAP and EAP delivery partner.

F.1. **Introduction:**

- Overview of the purpose and scope of the manual.
- Explanation of the competitive tender disbursement process.
- Explanation of the MRRA format.
- Role of the EAP.
- The EAP delivery partner.
- Importance of transparency, fairness, and compliance with regulations.

2. Legal and Regulatory Framework:

- Overview of relevant laws, regulations, and policies governing competitive tenders.
- Compliance requirements for both the buyer (government/agency) and the bidders.

3. Preparation Phase:

- Identification of procurement needs.
- Development of tender documentation, including:
  - Tender notice or invitation to tender.
  - Instructions to prospective bidders.
  - Technical specifications.
  - Evaluation criteria for pre-qualification.
  - Contract terms and conditions.
  - Establishment of procurement committees and procedures.

4. Advertising and Publicity:

- Methods for advertising the tender opportunity.
- Ensuring transparency and equal access to information for all potential bidders.

5. Application Submission:

- Deadline for bidder pre-qualification.
- Description of available lots (funding).
- Procedures for submitting application, including required documentation.
- Application form templates.

6. Pre-qualification Determination:

- Criteria for successful pre-qualification.
- Notify pre-qualified bidders.
- Publish list if pre-qualified bidders.
- Publish indicative timetable for auction training, mock auction and auction.

7. Auction Phase

- Auction training manual.
- Security protocols.
- Mock auction format.
- Procedures for submitting bids, including required documentation.
- Handling of late bids, modifications and emergency alternative bid submission procedures.
- Auction procedures (online forms).

8. Winner Determination:

- Evaluation of bids, criteria and weights.
- Determination of prices (how winning subsidy is calculated per lot).
- Criteria for selecting winning bids.

9. Negotiation and Clarification:

- Procedures for negotiating with bidders, if allowed.
- Clarification process for addressing bidder queries.

10. Award Decision:

- Announcement of the award decision.
- Notification to successful and unsuccessful bidders.

11. Contracting Phase:

- Negotiation of final contract terms and conditions.
- Signing of contracts.
- Performance bonds or guarantees, if applicable.
- Dispute resolution mechanisms.

12. Post-Contract Phase:

- Monitoring and performance evaluation.
- Contract administration procedures.
- Handling of variations or changes to the contract.
- Contract closeout procedures.

13. Documentation and Record Keeping:

- Requirements for maintaining accurate and complete records throughout the tender process.
- Archiving of documents for audit and compliance purposes.

14. Compliance and Ethics:
- Guidelines for ensuring ethical conduct and avoiding conflicts of interest.
- Procedures for handling complaints and grievances.
- Anti-corruption measures and compliance with bribery laws.

15. Training and Capacity Building:
- Training programs for staff involved in the tender process.
- Mock auction procedures.
- Capacity building initiatives to improve efficiency and effectiveness.

16. Appendices:
- Sample templates, forms and guidelines (e.g., tender notice, bid forms, auction user manual, etc.).
- Relevant laws, regulations, and policies.
- Licence template.
- Bank and funds transfer arrangements.
- Glossary of terms.

17. Contacts:
- Contact information for the procurement team and relevant authorities for inquiries or assistance.

F.2. Commercial transaction manual roadmap in relation to an electronic auction platform

The CTM is intended to guide the tender process in its entirety and in line with international best practice it facilitates a transparent and predictable process.[212] A focus in the CTM should be on the EAP and include the following (much of the material below would populate relevant appendices in the CTM):

A. Decision to use MRRA
Step 1 Identify lots: Identify projects delivering best value in closing digital gaps. Assess to what extent Anchor Tenants could be structured within the process. Finalise lots available in an auction.

Step 2 Market analysis and consultation: Determine the extent of competition in the market and competition for DCI funds. Organise effective private sector stakeholder consultation ahead of the tender process to identify the right universe of bidders, including towercos, satellite providers, mobile network operators and others.

Step 3 Legal and governance framework: Assess the legal and governance framework, identify and resolve any legal obstacles to implementation. Of significance are the legal positions on data management and privacy. For example, can a bidding EAP system be hosted on servers outside the jurisdiction of the auction?

Step 4 Technical implementation: Assess feasibility of deploying a web-based bidding system.

Step 5 Decision on MRRA: Decide whether use of MRRA is appropriate. If yes, proceed to B. If no, recommend alternative disbursement method.

B. EAP Structure
If a decision is made to hold a MRRA web-based auction, the relevant authority should seek to tender for an EAP provider and an EAP.

For an EAP this should cover and set out the following requirements:

Web-based: Requirement for a web based architecture with secure access for clients (bidders and auctioneer). Requirement for bidders and auctioneers to connect through the web without the need for special application software. System to be designed to operate on common browsers including Chrome, MS Edge, Firefox, and Safari. Interaction should be through easy-to-use interfaces supported by clear user manuals and help facilities.

Secure access: Requirement for multiple authentication layers to provide robust security.

Auctioneer control: Auctioneers should be capable of monitoring all aspects of the auction process and set parameters to shape the auction process.

Audit trail: Need for EAP to produce a complete and verifiable audit trail.

Modular architecture: Modular architecture allows flexibility and build of specific auction rules.

Bid tracking tool: The EAP should also be a tool to enable bidders preparing for the auctions to better understand auction dynamics, and try out different bidding strategies and test procedures.

212 See The World Bank and Asian Development Bank (2005) "e-Reverse Auction Guidelines for MDB Financed Procurement." Available at https://openknowledge.worldbank.org/server/api/core/bitstreams/ff8316b3-201a-579f-9379-b606787dc548/content

C. EAP Provider and Role of EAP Delivery Partner

Build or Procure? We strongly recommend that the Authority tasked with disbursing the DCI funds should procure from an established EAP provider. A decision on this can be justified in terms of risk management and efficiency.
EAP Provider Leads Implementation: The selected delivery partner should manage the entire procurement process on behalf of the Authority, supervising auction preparations, training, user manual production, workshops, the auction and post-auction assessments.

D. Auction Structure Variables

The authority in consultation with stakeholder and the EAP delivery partner should consider the following factors when implementing the EAP:

- Number of lots
- Lot areas
- Maximum Allowable Subsidy
- Pricing rule
- Winner determination
- Obligations – whether the connectivity infrastructure built will be open access, restricted access, or becomes open after a set number of years

E. EAP Development

- Consider who will maintain the EAP over the long-term (for instance a national eProcurement Authority or a regulator), or whether the platform may be closed at the end of the project.
- The selected EAP provider and delivery partner to run the auction process under the supervision of the project implementation unit (PIU) for each national project. This could be delegated to a regulator, but as per WB rules it would be better that the Implementing Agency supervise the process.

F. Bidding Specifications

The published specifications should contain information on all conditions and technical information needed to participate in the auction, including:

- The event and timing of the auction
- Rules for participation
- Valid bid increments
- How to bid
- Whether the auction is divided into successive phases
- The information which will be made available to bidders in the course of the electronic auction and, where appropriate, when it will be made available to them

G. Advertising and Stakeholder consultations

- The notification of the auction should be published on a publicly accessible website.
- The notification should include all the specifications, terms and conditions for the proposed contract.
- There should be provision for consultations with potential bidders

H. Operation

- The EAP provider shall provide sufficient resilience and contingencies to cope with power outages.
- The EAP provider shall run the auction according to information specified in the invitation to the e-reverse auction.
- The EAP shall be subject to rigorous user acceptance testing (UAP). A separate contract with a UAP provider is likely required.
- The EAP shall be tested rigorously in regard of its security to prevent unauthorized access. This will require a third party penetration testing service provider.
- The EAP will collect bids electronically and automatically rank bids, without human intervention.
- If a bidder submits an invalid bid, it will be notified online immediately with a message explaining why the bid is rejected.
- The Authority shall close the auction either at the time and date as previously published or when a previously advertised time period has elapsed during which no new valid bids have been received.
- The Authority shall monitor whether there is improper use of the reverse auction e.g., collusion.

I. Information Policy

- Under no circumstances shall the identities of the bidders be able to be disclosed or identified by any party during any phase of the auction.
- When deciding to give out additional information, the contracting authority shall verify that this information does not distort competition and informs all bidders simultaneously.
- It shall inform bidders instantaneously of new ranking(s) as they occur, together with price in such a way that bidders are able to ascertain their ranking at any moment.

J. Ex-post Evaluation

Clear criteria should be specified to evaluate the success of the tender process ex post. These include the amount of private capital mobilisation, a good geographical allocation (funding for routes in remote areas), all the lots are filled (x% success rate); and smoothness of implementation.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