SUB-SAHARAN AFRICA, AGENDA 2063, DIGITAL CONNECTIVITY, AND GENDER: POLICIES TO BRIDGE GAPS

The African Union's Agenda 2063 recognizes the importance of widening access to ICT as a key enabler for enhancing economic development.[1]

In Cameroon this August, the African Telecommunications Union (ATU) is meeting in Yaoundé to discuss preparations for the World Radiocommunication Conference 2023 in Dubai.

The ATU will be looking at measures to promote "the rapid development of info-communications in Africa in order to achieve universal access, and full inter-country connectivity".[2]

In this note we explore where Sub-Saharan Africa (SSA) stands today in regard of digital connectivity and highlight digital gaps, in particular the gender digital divide, that need to be closed to achieve Agenda 2063.[3]

We focus on two policies directed towards bridging digital gaps. The first is an example of a top-down policy involving procurement of mobile broadband coverage by government. We present a case study from Tanzania where reverse auctions have been used to allocate public subsidies to promote investment in mobile broadband.

The second intervention is bottom-up in flavour and emphasises how action on the ground is complementary to top-down policies.

Our case study looks at Francophone West Africa where Vanessa Mbamarah successfully transformed her life as a result of free training in digital skills offered by a global tech company.

Bridging the gender divide

Of the estimated 2.7 billion people currently unconnected, the majority are women and girls.

Only 19% of women in Least Developed Countries (LDCs) used the Internet in 2020, compared to 86 percent in developed world (in 2019).

In SSA in 2022 the gender gap in mobile internet was 36%, among the widest gender gaps in the world.

GSMA (2022) & ITU (2022)

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[1] The African Union Commission (2015) "Agenda 2063: The Africa We Want, Framework Agreement". Policy on digital policies is set out in the context of Agenda 2063 by the African Union (2020) in "The digital transformation strategy for Africa (2020-2030)"

[2] https://atuuat.africa/about/

[3] A measure we refer to in this briefing is the *gender gap*. This is defined as: [% of male users - % of female users]/ % of male users. On the gender gap, see Victoria Kwakwa (2023) "Accelerating Gender Equality: Let's Make Digital Technology Work for All" World Bank blog and GSMA (2023) "The Mobile Gender Gap Report 2023".

Digital connectivity and internet access in SSA has grown markedly over the last decade, spearheaded by expanding mobile telephony coverage, new submarine fibre cables connecting the continent to the global Internet, expanded satellite coverage, improved digital literacy, more reliable electricity grids and rising prosperity.[4]

Increased penetration of mobile broadband has been a key enabler of economic development in SSA and continues to be an important driver for future growth. Evidence linking economic growth to mobile broadband has been shown by the ITU to lead to a 2.5% increase in GDP per capita for a 10% expansion in mobile broadband penetration.[5]

The impact on growth and prosperity provides investment incentives for telcos to expand and upgrade networks. The GSMA estimates nearly $30 billion will be invested by operators in SSA between 2022 and 2025, further boosting growth.[6]

New investments will bring more of the population online and by 2025 it is estimated some 50% of the SSA population (around 613m) will be connected to a mobile network. Of the connected population, one third will be on 4G networks and 4% on advanced 5G networks.[7]

While recent improvements in digital connectivity have been impressive, significant digital gaps remain and policy interventions are required to help the region catch-up with other parts of the world. In this short note we look at two examples of policies targeting digital gaps in which CEPA and associates have been involved.

The first intervention illustrates a top-down policy: the role of procurement to enhance and expand mobile broadband services into areas which are commercially unattractive. We look at experience in Tanzania, where millions of dollars of subsidies have been granted to communication service providers to invest in new and upgraded mobile facilities.

Our second focus is a bottom-up intervention that focuses on Francophone West Africa where Vanessa Mbamarah successfully transformed her life as a result of free training in Digital Skills offered by a global tech company. Today she now runs a digital marketing business and is helping to teach other women digital skills thereby increasing digital access in the region.

Tanzania subsidy programmes[8]

Tanzania started to modernise ICT policy in the early 2000s when it liberalized the telecommunications sector and established a new regulator.[9]

The Government also committed to universal service with the passage of the Universal Communication Service Access Act in 2006. The goal of universal service is a high priority and features prominently in current National ICT Policy:

"*One of the major initiatives that the government has pursued is the improvement of the ICT infrastructure*

[4] Other important factors include more effective service competition, lower price smartphones, better regulation, improved spectrum management, the adoption of mobile money services, more targeted and effective lending, improved and lower cost off-grid power generation systems and battery systems. It is estimated that up to 50% of mobile base stations in SSA are powered off-grid or by unreliable grid networks, which makes battery storage and reliable onsite power generation critically important, see https://continuouspower.com/energy-and-the-telecommunications-sector-in-sub-saharan-africa/

[5] Table 4 in Katz, Raul and Fernando Callorda (2019) "Economic contribution of broadband, digitization and ICT regulation Econometric modelling for Africa", ITU Regional Initiatives ITU Publications Africa.

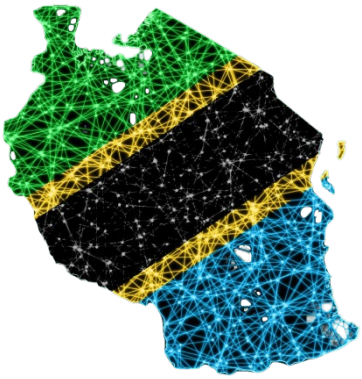
[6] GSMA (2022) The Mobile Economy Sub-Saharan Africa 2022

[7] In contrast, 25% of the world's population will be on 5G networks by 2025 according to GSMA (2022). Ericsson (2023) 'Mobility Report' estimates those on 5G networks in SSA will rise to 13% by 2028, but that around 30% will still be on legacy non-mobile broadband 2G networks.

[8] This section draws on a CEPA report for the World Bank "Allocating universal service subsidies using electronic multi-round reverse auctions: Telecommunications in Tanzania", forthcoming CEPA, Digital Development Partnership & World Bank (2023).

[9] The Tanzania Communications Regulatory Authority (TCRA), established by the TCRA Act No. 12 of 2003, is an independent Authority for the postal, broadcasting and electronic communications industries and started operations in 2005.

to bridge the digital divide and lower the cost of communications"[10]



Digital Tanzania[11]

In pursuing universal service, the Universal Communication Services Access Fund (UCSAF) was established. UCSAF is funded by a universal service levy applied on the gross operating revenues of licensed service providers, by Government and by loans provided through international agencies.[12]

In collaboration with other government ministries, UCSAF has allocated millions of dollars to telecoms operators in a number of *static reverse auctions*[13] (see box) since 2010. The award of subsidies has helped in:

"*Increasing the number of fixed and mobile subscribers from 21.2 million (2010) to 48.9 million in (2020). This increase is attributed to the continued investment in communication services, including in rural areas via the UCSAF*".[14]

UCSAF mobilized TZS 120 billion (about $50 million) between 2013-19. The level of subsidies awarded has steadily increased and it is expected to continue over the coming years.[15]

Static Reverse Auctions

These are common in procurement and involve a single buyer (e.g. UCSAF) facing multiple sellers (e.g. telcos seeking subsidies). A buyer specifies in a tender the services required (e.g. type of mobile service and coverage) and solicits one bid from each potential supplier. The supplier submitting the response that the buyer considers best satisfies the award criteria is the most advantageous tender.

In early 2021 the Government announced plans to increase internet penetration in the country from 43% to 80% by 2025, to extend access to telecommunications to a further 173 unserved villages, and to switch off 2G.[16] By March 2023 Tanzania was on its way to achieving the target with around 33.1 million of the population had access to internet services, a penetration rate of over 50%.[17]

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[10] National ICT Policy 2016 p.1, https://www.ega.go.tz/uploads/publications/sw-1574848612-SERA%202016.pdf.

[11] Source: Alexxandar at https://www.freepik.com/free-photo/map-tanzania-polygonal-mesh-line-map-flag-map_24571531.htm

[12] Sources of funds for UCSAF are set out in general terms in the UCSAF Act 2006, section 23, *op cit.* Currently the UCSAF Regulations allow a levy charge of 1%, which was gradually increased from an initial 0.3% in 2015-16 to 1% in 2019-20.

[13] A reverse auction is where sellers bid and a buyer chooses the seller submitting the lowest bid. In contrast, a forward auction is where a seller offers lots to multiple buyers.

[14] Page 25 in Ministry of Finance and Planning (MFP, 2021), "Report on the Implementation of the Istanbul Programme of Action for LDCs for the Decade 2011-20: Tanzania Country Report", March.

[15] Page 7 in EU (2021) "Action Document for Digital4Tanzania – e-Governance Support Programme"

[16] Source https://itweb.africa/content/KA3WwMdD99eMrydZ

[17] Table 3.1 in TCRA (2023) Communication Statistics, Quarter ending March 2023.

Digital Tanzania Project (DTP)[18]

The Government of Tanzania is promoting wider access to broadband services and the internet, especially in rural areas, through the Digital Tanzania Programme (DTP). The DTP programme has three main pillars, including the promotion of digital connectivity and Rural Broadband for Development (RBD).

In a recent static reverse auction tender under the RBD scheme to upgrade 2G mobile networks to 2G/3G and/or 4G networks, UCSAF announced a list of 488 areas eligible for receipt of subsidy funding with each area allocated a maximum allowable subsidy of TZS 20 million (around $8,350).

A static reverse auction was also held recently for subsidies in areas currently not served by mobile network operators. The auction for these 'greenfield' sites comprised 764 areas (wards). Each area had a subsidy ceiling in the region of US $60,000. Five bidders qualified to bid in the tender and could submit one bid for each area. UCSAF selected the lowest bidder in each area.[19]

In the CEPA report for the World Bank we have advocated modifying the auction process in Tanzania to a dynamic reverse auction featuring multiple rounds. This would provide bidders the opportunity to revise bids and yield improvements in value for money – less subsidy awarded, for more investment.[20]

In the table below the static reverse auction format is compared with the dynamic reverse auction format. On the criteria shown, the dynamic reverse auction format is superior for allocating subsidies for the promotion of mobile broadband in Tanzania.

Principles & Objectives of Public Procurement	Static Reverse Auction	Dynamic Reverse Auction
Competition	✓	✓✓✓
Transparency	✓	✓✓✓
Accountability	✓✓	✓✓✓
Value for Money	✓	✓✓✓

Static and Dynamic Reverse Auctions[21]

A dynamic reverse auction format is ideal for application in Tanzania because competition in the mobile market is present. Tanzania currently has six active mobile network operators. This competitive landscape can be leveraged to deliver better value for money as rivalry promotes valuable *price discovery*.

Price Discovery

When bidders seek a subsidy to support investments, they are often unclear about the level of subsidy needed. If different bidders could share insights about the prospective investments, then each bidder would be better informed about the required subsidy needed. In the static reverse auction format applied by UCSAF there is no opportunity for bidders to exploit such *price discovery*, as inter-bidder communication is forbidden and there is only a single round of bids.

In a static reverse auction bidders do not have the opportunity to revise bids in light of information about hidden valuations revealed through other bidders' bids. This matters because the value of an area has

[18] Digital Tanzania Project (DTP) Stakeholders Engagement Plan March 2021 at https://www.mawasiliano.go.tz/uploads/documents/sw-1616059071-Digital_Tanzania_Program_%20SEP_March_2021.pdf

[19] 437 areas received at least one bid.

[20] Rather than bidding blind, multi-round auctions provide bidders opportunities to react to information discovered during the auction, a view echoed in GSMA (2021) "Auctions Best Practice" GSMA Public Policy Position, September.

[21] Based on analysis in CEPA & World Bank (2023) op cit.

significant *common value*[22] e.g. mobile network operators will likely hold very similar values about demand for services and costs of service (e.g. installation and operating base stations).

Winner's Curse

The winner's curse is when rational inferences about hidden true common valuations cause bidders' to demand higher subsidy requests. It arises as a bidder anticipates that should a subsidy be won for a given bid choice it is likely too little was requested, as the losers (other bidders) view a higher subsidy is required.

Accounting for this, rational bidders increase the amount of subsidy requested in an effort to lower the prospect of being *cursed* by winning. As a result, in a static auction setting, a higher level of subsidy will usually be requested than is needed by the winner.

By contrast, in a dynamic multi-round reverse auction bidders have an opportunity to revise estimates for hidden common values following the revelation of bids at the end of each round. This enables price discovery and should lead to better value for money.

A very simple example illustrates the winner's curse. An auctioneer is awarding one subsidy and has a ceiling of $10m. There are four potential bidders, and respectively these form estimates of the minimally acceptable subsidy needed as $9m, $9m, $10m and $11m. Only the two bidders with $9m estimates submit bids in round 1. Assume two bids of $9.9m are presented, reflecting winner curse thinking. In a static reverse auction the auctioneer awards a subsidy to one of the bidders at $9.9m.

If the bidders had an opportunity to submit bids in subsequent rounds, things might unfold differently. As before, in round 1 the two bidders with the lowest estimates submit bids of $9.9m. In round 2, the bidder with an estimate of $10m revises its estimate of required subsidy below $10m and submits a bid of $9.8m. In round 3, one of the round 1 bidders also lowers its required subsidy and submits a bid of $9.5m. The process would continue until the no new bids are submitted. Suppose this happens when the demand for subsidy is $8.8m.

The hypothetical numerical illustration suggests a dynamic reverse auction gives better value for money. The drivers of this are two-fold: price discovery and competition.

In practice dynamic reverse auctions have delivered significant gains. According to the Office of Federal Procurement Policy in the United States, electronic reverse auctions have brought savings of around 12-14% for several Federal agencies in the United States.[23]

Also in the United States, billions of dollars of subsidies to promote broadband access have been awarded by dynamic reverse auctions and Ajit Pai, Chair of the FCC, remarked on one of the largest reverse auctions:

"*We aimed for maximum leverage of taxpayer dollars and for networks that would meet consumers' increasing broadband needs, and the results show that our strategy worked.*"[24]

Using dynamic reverse auctions could save a substantial amount of money and result in more areas receiving mobile broadband.

We have recommended to UCSAF to pilot a dynamic reverse auction. Our report describes the pilot auction design and shows the format can incorporate goals like gender inclusivity.

Gender inclusivity

The design of high-value auctions requires careful consideration of bidding rules. Where the principal

[22] In common value auctions, an item has the same value for all bidders. In contrast, in private value auctions each buyer's valuation is independent of every other buyer's valuation. In practice auctions involve lots having both private and common value components. In auction theory, a mix of valuations is described as *affiliation* – each bidder's valuation is influenced by their type and also by the possible types of other bidders. See ch.5 in Menezes, Flavio M. and Paulo K. Monteiro (2004) *An Introduction to Auction Theory*, Oxford University Press.

[23] Memorandum for Chief Acquisition Officers, Anne E. Rung "Effective Use of Reverse Auctions", 1 June 2015.

[24] Source: https://www.fcc.gov/document/fcc-auction-bring-broadband-over-10-million-rural-americans

objective is value for money, this translates into ensuring the rules result in the award of subsidies to bidders seeking the lowest contribution in each area.

However, government often accounts for other objectives when shaping auction rules. These might include concerns about service level competition and wider social objectives.

As has been documented,[25] there is a significant gender digital divide in SSA. Its negative impact on development is leading governments to consider measures to bridge this gap and well-designed dynamic reverse auctions can help in this regard.

For example, qualification to participate in a government subsidy reverse auction could be made conditional on gender-based criteria. This approach is actively applied elsewhere in the world, such as the European Union.[26]

Second, auction bidding rules should be designed to reflect goals such as closing gender gaps. For example, this might take the form of weighting bids in favour of entities offering financial support to upskilling and educating women and girls in ICT.[27]

The FCC in the United States in some early dynamic auctions for spectrum licences extended bidder credits to businesses owned by women and minorities.[28] In some analysis of the FCC bidder credits application in spectrum auctions, researchers claimed higher auction revenues resulted. Ayres and Cramton (1996) observe:[29]

"*Moreover, affirmative action's capacity to enhance competition is not limited to situations where the government is a seller. Indeed, the government buys far more than it sells, and affirmative action bidding preferences may reduce the cost of government acquisitions for the same reasons. When competing against subsidized bidders for government contracts, unsubsidized suppliers may lower their bids to increase their chances of winning the new contract.*"

Other research shows it is important to design bidder credits and the weighting of bids carefully. Where certain bidders' bids or participation is favoured, other bidders may react in ways that could lower competition and have the unintended consequence of diminishing value for money benefits. The auction designer should be mindful of the trade-offs involved.[30]

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[25] World Wide Foundation, Alliance for Affordable Internet (A4AI) and UN Women (2018) "Universal Service and Access Funds: An untapped Resource to Close the Gender Digital Divide", March. In this report it is noted that by 2018 only 3 of 37 countries in Africa with universal service access policies explicitly aim to connect women and girls through the fund. Policy on bridging the gender digital divide was set out comprehensively in OECD (2018) "Bridging the gender digital divide: Include, upskill, innovate" Paris. The ITU is leading on many projects and initiatives to help bridge the gender digital divide in Africa and elsewhere, see https://www.itu.int/women-and-girls/women-in-ict/women/.

[26] An excellent practical example of this approach is set out by the European Institute for Gender Equality (EIGE) (2021) "Gender Mainstreaming – Gender Responsive Public Procurement: Step-by-step toolkit" European Union. See also https://en.wikipedia.org/wiki/European_Institute_for_Gender_Equality

[27] An example of bidding credits of this kind is applied in offshore wind energy auctions by the Bureau of Offshore Energy Management (BOEM) in the United States. BOEM provides credits to bidders who commit resources to, for example, labour training programmes. This approach could be applied by governments and regulators in SSA by, for example, giving credit to bidders who commit resources to training and digital literacy initiatives.

[28] For example, see https://www.fcc.gov/auction/1#Bidding%20Credits

[29] The claim is based on the idea that 'established' or non-favoured bidders tend to bid more aggressively (towards their maximum willingness to pay) to counter the elevated competition of favoured bidders. Ian Ayres and Peter Cramton (1996) "Deficit Reduction Through Diversity: How Affirmative Action at the FCC Increased Auction Competition" *Stanford Law Review*, vol. 48, pp. 761-815.

[30] In a study of procurement contracts for the New Mexico Department of Transport, Rosa (2019) showed that bidder credits slightly decreased value for money in return for greater diversity. This effect, he argues, is due to hidden common value (he uses the term *affiliation* of costs). Benjamin V. Rosa (2019 "Resident and bid preference, affiliation, and procurement competition: evidence from New Mexico", *Journal of Industrial Economics,* vol. LXVII, pp. 161-208. Rosa (2022) looks at 25% bid credits for small businesses in FCC spectrum auctions and shows that a higher bidder credit of 50% s may have resulted in similar auction revenues for more small business winners, Benjamin V. Rosa (2022) "Bid credits in simultaneous ascending auctions" *Games and Economic Behavior*, 132, pp. 189-203.

Action on the ground

Women in SSA are significantly less digitally connected compared to their male counterparts; fewer women own digital devices and are able to access mobile internet compared to men (GSMA, 2023).[31]

This digital gender gap is a multifaceted issue and can be attributed to a number of factors; in many African communities, women and girls are often subject to social and cultural restrictions that men are not subject to, many women are not able to own a device and often have to share a "family owned" device, and girls are often subjected to restrictions in educational and personal agency.

Infrastructural limitation is also a key factor, 70% of the SSA population does not have access to electricity World Bank (2021)[32] and many rural areas do not have the required network infrastructure to enable mobile connectivity and internet access.

Private sector initiatives

There have been multiple interventions across the years to address this pertinent issue on the continent. In the private sector, big tech organisations have instituted programs to help provide digital literacy and access to women and youth in SSA.

Intel's 'She will Connect', Meta's (formerly Facebook) 'She Means Business', Google's 'Women Will', IBM's 'Digital Nation Africa' and SAP's 'Africa Code Week' are examples of initiatives that have been launched on the continent to tackle the digital divide.[33]

Multilateral agency initiatives

Multilateral organisations are also active in bridging the digital divide, the African Development Bank's 'Africa Digital Financial Inclusion Facility' and the IFC's 'Digital2 Equal initiative' are examples of these kinds of interventions.[34]

Partnerships

Interventions often involve partnerships between the private sector, governments, multilateral agencies and other stakeholders. For example the World Bank Group's 'Digital Economy for Africa' (DE4A) initiative which supports the ambition to ensure that every individual, business, and government in Africa is digitally enabled by 2030 is implemented in coordination with multiple national and regional stakeholders, including governments, the private sector, and international partners.[35]

Promoting digital literacy

There is ample evidence showing access to digital literacy helps to create beneficial economic and social returns for women and the continent as a whole. For example, this is shown in detail in the excellent report of the Africa Growth Initiative at the Brookings Institute (2023).[36]

Action on the ground illustrating how digital literacy can yield substantial benefits is evidenced by the case of Vanessa Mbamarah,[37] a single mother who attended free training in Digital Skills offered by a global tech company. Vanessa Mbamarah has successfully built a digital marketing business while also helping to teach other women digital skills and increase digital literacy in Francophone Africa.

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[31] GSMA (2023) op cit.

[32] Access to electricity, rural (% of rural population) – Sub-Saharan Africa

[33] She will Connect, She Means Business, Women Will, Digital Nation Africa, and Africa Code Week.

[34] See https://www.afdb.org/en/adfi and https://digitalforwomen.worldbank.org/multi-region-ifc-digital2equal

[35] The World Bank (2023) "From Connectivity to Services: Digital Transformation in Africa"

[36] Africa Growth Initiative at Brookings (2023) "Digitalization and Digital Skills: Gaps in Africa – An empirical profile" May by Haroon Bhorat, Landry Signé, Zaakhir Asmal, Jabulile Monnakgotla and Christopher Rooney.

[37] https://www.youtube.com/watch?v=FXLJ9Mvuu0M

Vanessa Mbamarah has gone on to become an employer of labour, primarily hiring women who were in a similar case as her when she launched her business. The Digital Economy in Africa is estimated to be worth $180bn by 2025, with the potential to grow to $712 billion by 2050 according to Google and the IFC.[38] A persistent digital gender divide could cost the continent up to $500bn of these gains by 2025.[39]

Programmes to include women in digital literacy like the one that has helped Vanessa Mbamarah, have the potential to yield substantial positive returns on social and economic development.

As the digital revolution continues to ripple across the globe and new and emerging technologies like Artificial Intelligence, virtual and augmented reality, become more widely adopted, it is critical that the foundations are laid to enable women in SSA to participate in and derive the benefits of these technologies on the continent.

Lessons for policymakers

Regulators and governments in SSA countries can help to bridge digital gaps, like the digital gender divide, by application of both bottom-up and top-down policies aimed at extending and upgrading mobile broadband coverage, and improving digital literacy and inclusion.

We have argued that the award of subsidy funding should be allocated in auctions that leverage competition and result in price discovery. In our view, dynamic reverse auctions will lead to better value for money and increased investment in mobile broadband.

Furthermore, dynamic auctions offer flexibility and can be adapted to incorporate important social goals such as gender equality.

On the ground we have illustrated that policies aimed at bridging the digital gender divide can provide significant benefits.

Action on the ground should include:

1. Educational programs that help get young girls into STEM early. As digital technologies continue to rapidly evolve, it is crucial that the gender divide should not exist in the next generation of skilled digital workers on the continent, securing access to STEM training early will help girls overcome many of the barriers typically faced as they get older.

2. Investment in digital training opportunities for all ages is essential. While special focus should be given to marginalised communities to ensure equal access to digital skills and knowledge, women of all ages especially in the most impacted communities should be able to access digital training opportunities of varying levels of complexities – basic, intermediate and advanced.

3. The creation of safe digital spaces. This is crucial to ensure freedom from harassment and discrimination in the digital world and to encourage women and girls actively to engage and benefit from the digital ecosystem without fear. It is critical that private and public sector partners establish the foundations of safe digital access for women and girls to enable greater female participation in the digital economy.

In conclusion, closing the digital gender divide and empowering women and girls with digital skills are key to fostering economic development in SSA.

By investing in education and creating a safe digital environment, we can drive innovation, inclusion, and economic growth and contribute to a more equitable SSA.

[38] https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=26066

[39] A4AI (2021) "The costs of exclusion economic consequences of the digital gender gap"

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