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Output Report on ITU-D Question 5/1

Telecommunications/ICTs for rural and remote areas

Study period 2022-2025

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Telecommunications/ICTs for rural and remote areas: Output Report on ITU-D Question 5/1 for the study period 2022-2025

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Acknowledgments

The study groups of the ITU Telecommunication Development Sector (ITU-D) provide a neutral platform where experts from governments, industry, telecommunication organizations and academia from around the world gather to produce practical tools and resources to address development issues. To that end, the two ITU-D study groups are responsible for developing reports, guidelines and recommendations based on input received from the membership. Questions for study are decided every four years at the World Telecommunication Development Conference (WTDC). The ITU membership, assembled at WTDC-22 in Kigali in June 2022, agreed that for the period 2022-2025, Study Group 1 would deal with seven Questions within the overall scope of "enabling environment for meaningful connectivity."

This report was prepared in response to Question 5/1: **Telecommunications/ICTs for rural and remote areas**, under the overall guidance and coordination of the management team of ITU-D Study Group 1 led by Ms Regina Fleur Assoumou-Bessou (Republic of Côte d'Ivoire), as Chair, supported by the following Vice-Chairs: Mr Ali Rasheed Hamad Al-Hamad (State of Kuwait), Mr Amah Vinyo Capo (Togolese Republic), Mr George Anthony Giannoumis (Norway), Mr Roberto Mitsuake Hirayama (Federative Republic of Brazil), Mr Sangwon Ko (Republic of Korea), Ms Umida Musaeva (Republic of Uzbekistan), Ms Caecilia Nyamutswa (Republic of Zimbabwe), Ms Memiko Otsuki (Japan), Ms Khayala Pashazade (Republic of Azerbaijan), Mr Sunil Singhal (Republic of India), and Mr Mehmet Alper Tekin (Republic of Türkiye).

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Executive summary

This report presents the results of the study of ITU-D Question 5/1 on ICTs for rural and remote areas for the study period 2022-2025.

This report comprises six chapters covering:

- an overview and findings of the previous study period (2018-2021), and the scope of the current study,
- cost-effective telecommunication/ICT solutions to connect rural and remote areas,
- quality of service and maintenance of rural telecommunication infrastructure, and operational aspects,
- applicable business models for sustainable development of networks and services,
- effective use of universal service funds (USFs), and integration of Internet applications in the day-to-day life of rural and remote communities, and
- conclusions and guidelines for the connection of information and communication technology (ICT) in rural and remote areas.

The content of this report was derived from written contributions from ITU Development Sector members, who participated in the Rapporteur Group Meetings on the Study Question and Study Group 1 meetings. These Development Sector members represented Member States, Sector Members and Academia.

The majority of contributions were in the form of case-studies. Summaries of all the contributions made are presented in Annex A of this report.

This report presents findings in Chapter 6, and offers guidelines that can be utilised by Member States, Sector Members, telecommunication/ICT services operators, and regulators.

The main findings were that meaningful[1] connectivity including broadband connectivity, has become an urgent need for rural and remote areas. Without broadband connectivity, service delivery is adversely impacted, and this is particularly the case during emergency and pandemic situations. Solutions to bridge the rural-urban divide, are numerous and diverse and there is no one size fits all. Renewable energy plays a critical role in the sustainable provision of broadband services, and telecommunication service providers need to adopt cost-effective solutions that allow them to prioritize service provision in rural and remote areas through high-quality networks. For rural and remote communities, universal service funds, if utilised effectively, can constitute a game changer, in both infrastructure development, and affordable access to telecommunication/ICT services and applications. In areas with challenging and remote terrain, satellite technology can play an important role in addition to, and together with, other network solutions. The importance of digital literacy, local content, affordability, and access to emerging technologies, and what Member States and stakeholders are doing to ensure these, are also covered in this report.

[1] Meaningful connectivity is a level of connectivity that allows users to have a safe, satisfying, enriching and productive online experience at an affordable cost.

This report presents guidelines to encourage Member States and stakeholders, to concentrate on connecting the remaining unconnected, through the expansion of fibre-optic networks, enhanced by satellite connectivity, collaborative regulation, and the effective use of universal service funds.

This report also highlights issues for future studies incorporating the employment of artificial intelligence (AI) in relation to rural and remote areas, and in particular, benefits and challenges of AI adoption in rural and remote areas, as well as the harnessing of AI to enhance digital literacy and skills in rural communities.

Abbreviations and acronyms

This table presents abbreviations/acronyms relating to international, regional or supranational bodies, instruments or texts, as well as technical and other terms used in this report.

Abbreviations/acronyms of national bodies, instruments or texts are explained in the text relating to the country concerned, and are thus not included in this table.

Abbreviation	Term
2G/ 3G/ 4G/ 5G/ 6G	Second/Third/Fourth/Fifth/Sixth Generation mobile communications (see note 1 below)
AI	artificial intelligence
ANATEL	National Telecommunications Agency (Brazil)
ARPU	average revenue per user
CN	community network
DSL	digital subscriber line
FTTH	fibre to the home
FWA	fixed wireless access
G3ICT	Global Initiative for Inclusive ICTs
HAPS	high altitude platform station
IDB	Inter-American Development Bank
IoT	Internet of things
ITU-D	ITU Telecommunication Development Sector
ITU-R	ITU Radiocommunication Sector
ITU-T	ITU Telecommunication Standardization Sector
IXP	Internet exchange point
LDC	least developed countries
LEO	low earth orbit
LLDC	landlocked developing country
MNO	mobile network operator
NTIA	National Telecommunications and Information Administration
NGSO	non-geostationary satellite orbit
NRA	National Regulatory Authority
PPP	public-private partnership

(continued)

Abbreviation	Term
QoS	quality of service
RAN	radio access network
RIFEN	International Network of Women Digital Experts (abbreviation is in French)
RMIO	rural mobile infrastructure operator
SIDS	small island developing states
SDG	sustainable development goal
SME	small and medium enterprise
TVWS	television white space
USF	universal service fund
USO	universal service obligation
USOF	universal service obligation fund

Note:

1. While care was taken in this document to properly use and refer to the official definition of IMT-generations (see Resolution ITU-R 56, "*Naming for International Mobile Telecommunications*"), ITU-D would like to note that parts of this document contain materials provided by the Membership which refer to the frequently used market names "xG": This material cannot necessarily be mapped to a specific IMT-generation, as the underlying criteria by the Membership is not known, but in general, IMT-2000, IMT-Advanced, IMT-2020 and IMT-2030 are known as 3G/4G/5G/6G, respectively. Furthermore, sometimes earlier available technologies such as GSM, EDGE, and GPRS are referred to as "2G" by the market and could be considered as "pre-IMT" or "pre IMT-2000" technologies in ITU documentation and regulation.

Chapter 1 – Overview of findings of the previous study period (2018-2021), and scope of the current study period (2022-2025)

1.1 Introduction

Worldwide, an estimated 2.6 billion people remain unconnected, and the bulk of these unconnected people live in rural and remote areas of developing countries, including least developed countries (LDC), landlocked developing countries (LLDCs) and small island developing states (SIDS). In some cases, even where connectivity exists, it is often at speeds which do not allow meaningful access to digital services. There is, therefore, a significant need for broadband connectivity in general, including terrestrial and non-terrestrial high-speed and high-quality broadband network technologies, which support the most common broadband applications required by users for digital equity, and attainment of the sustainable development goals (SDGs).

1.2 Overview of the findings of the previous study period (2018-2021)

The 2018-2021 study period report for Question 5/1 identified the installation of cost-effective and sustainable digital infrastructure, through the deployment of emerging technologies such as next-generation high-speed mobile terrestrial and non-terrestrial networks and fixed-broadband wireline and wireless transmission systems suited for rural and remote areas, as an important aspect calling for further studies.

The report highlighted the need for the vendor community to make available broadband Internet connectivity, in order to support up-to-date e-services for the quality of life of inhabitants in rural and remote areas. As existing network systems are primarily designed for urban areas, where the necessary support infrastructure including adequate power, buildings and shelter, accessibility, and skilled manpower are abundant, there is need for innovative solutions to the problems associated with implementing rural broadband connectivity. The need to bridge the urban-rural digital divide, became even more apparent during the COVID-19 pandemic, as it threatened to derail efforts for the achievement of sustainable development goals (SDGs), and leave at least 2.7 billion people digitally behind.

1.3 Scope of the current study

Existing network systems are primarily designed for urban areas, where the necessary support infrastructure (adequate power, buildings and shelter, accessibility, skilled operating expertise, etc.) for setting up a broadband telecommunication network is assumed to exist. This raises the need for network systems that are adequately adapted to specific rural requirements in order to be widely deployed.

Power supply shortages, difficult terrain, lack of expertise, poor road access and transportation infrastructure, and the difficulty of installing and maintaining networks, continue to be challenges that impact upon the extension of ICT infrastructure to rural and isolated landlocked areas, and remote islands.

This constitutes a case for detailed studies addressing the challenges of deploying cost-effective and sustainable next-generation broadband ICT infrastructure in rural and remote areas. Such studies also need to take into account the need for digital transformation and social innovation.

It is important to update the study of broadband digital connectivity, adoption, usage of broadband services, capacity building, and applicable policies for rural and remote areas, particularly in developing countries, including LDCs, LLDCs and SIDS. This report therefore updates the study on broadband digital connectivity for rural and remote areas and covers the following aspects:

- An overview of the findings of the previous study period (2018-2021);
- Modern techniques, technologies, and sustainable and cost-effective solutions impacting the provision of ICTs and the availability of broadband digital infrastructure, for rural and remote areas;
- Policies, mechanisms and regulatory initiatives to reduce the digital divide;
- Business models for sustainable development of networks and services;
- Integration and promotion of Internet applications for rural and remote areas;
- Conclusions and guidelines.

1.4 Methodology

The methodology employed by the Study Group included collecting contributions, analysing them and summarizing the content for inclusion in the appropriate chapters of this report, and collecting and analysing case studies, organizing workshops, and analysing the results.

Chapter 2 – Modern techniques, technologies, and sustainable and cost-effective solutions impacting the provision of ICTs and the availability of broadband digital infrastructure, for rural and remote areas

This chapter illustrates some of the many techniques, technologies, and cost-effective solutions that can promote and enhance the provision of ICT services and the availability of broadband infrastructure.

The range of technologies that can be used to promote broadband connectivity in rural and remote areas includes fibre-optic cables, 5G mobile networks, geostationary, low earth orbit, and multi-orbit satellite systems, wireless mesh networks, Wi-Fi (including Wi-Fi 6 and 6E), TV white space (TVWS) technology, light fidelity (Li-Fi) technology, low-power wide-area (LPWA) networks, network function virtualization (NFV), and software-defined networking (SDN). As this report demonstrates, the best technology, or combination of technologies, for expanding the provision of ICTs is often dependent on local circumstances and consumer demand.

Deploying these ICT technologies by utilising energy-efficient, green infrastructure, and powering them with renewable sources of energy such as solar, wind, and hydroelectric power, can ensure their long-term environmental sustainability.

The economic sustainability of ICT projects can be supported with solutions including infrastructure sharing, community-owned networks, crowdsourcing and open-source solutions, community-led total communication initiatives, open-source software and hardware, low-cost infrastructure (e.g. bamboo towers, etc.), community-driven network deployment, public Wi-Fi hotspots, rural-focused start-ups and innovations, social entrepreneurship models, and subsidy schemes and government initiatives.

Funding techniques such as private sector investments, collaborative funding, and public-private partnerships (PPPs), and demand stimulating techniques such as digital literacy and skills development, and local content and service development, can also help increase the deployment of ICTs in rural and remote areas.

To gain a more comprehensive appreciation of the benefits of these techniques, the following topics are considered:

- Quality of service (QoS) including maintenance and operational aspects
- Sustainable deployment of networks and services in rural and remote areas based on economic and social indicators
- Sustainable deployment of networks and services in rural and remote areas based on economic and social indicators

- Financing mechanisms including universal service funds (USFs)
- Community networks (CNs)

2.1 Quality of service including maintenance and operational aspects

Providing meaningful connectivity in rural and remote areas is affected by a unique and mutually reinforcing set of challenges, ranging from economic and technical to social and policy related issues.

Maintenance of networks in sparsely populated rural and remote areas is more costly and does not often provide a good return on investment (RoI).[2]

Most discussions of rural and remote connectivity overlook the fact that network coverage alone is not enough if the aim is to bridge the digital divide between urban and rural/remote areas, and foster digital inclusion. Connectivity must be accompanied by a high level quality of service (QoS), defined by ITU as the *'totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service*'.[3] Ensuring QoS requires regular network monitoring, maintenance, delivery of system upgrades, and regular scheduled and unscheduled repairs and maintenance.

Quality of service benefits from state initiatives to foster investment, competition, and innovation in the provision of networks and services. Likewise, the utilisation of these networks and services, may benefit from state investment in digital literacy and skills development, as well as development of relevant content that drives adoption, including through government e-services.

The Government of **Australia** funds delivery of basic publicly accessible telecommunications services in approximately 457 small remote First Nations (indigenous peoples) communities under the Remote Indigenous Telecommunications programme. The National Indigenous Australians Agency (NIAA) has a contract with a telecommunications provider for the monitoring, maintenance and delivery of these telecommunications services, including data services, delivery of system upgrades, annual scheduled maintenance visits, and unscheduled repairs and maintenance. Ensuring high level QoS requires regular QoS related services, including network monitoring, maintenance, delivery of system upgrades, and scheduled and unscheduled repairs and maintenance. To this end, in Australia, the network provider of telecommunications services in remote communities is also required to provide the QoS related services[4].

The spatial and geographical divisions in the **State of Palestine**[5] have led to the inability to provide mobile telecommunication coverage and services in an integrated and continuous network, both in the West Bank and Gaza. This has greatly affected the efficiency and quality of wireless telecommunication services. Consequently, it may be necessary to provide new quality and control standards, that are better suited to the unique regional situation[6].

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2 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France

3 ITU-T Recommendation E.800 (09/08) https://www.itu.int/rec/T-REC-E.800-200809-I/ Notably, the focus is on the service as the entity under consideration – not the network (given a variety of networks may be used to deliver a service), nor the end user as a person (considering the 'end user' may be a machine).

4 ITU-D Document https://www.itu.int/md/D22-SG01-C-0259/ from Australia

5 The State of Palestine is not an ITU Member State; the status of the State of Palestine in ITU is the subject of Resolution 99 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference.

6 ITU-D Document https://www.itu.int/md/D22-SG01-C-0175/ from State of Palestine

According to the experience of **Haiti**, the passive resilience of telecommunication networks and infrastructures depends on the quality and type of equipment and architecture, while active resilience is constituted by the ability of the telecommunication operators and service providers to react or adapt. It is important to emphasize that the quality and type of equipment must be guaranteed by manufacturers. While the redundancy strategy falls mainly within the responsibility of the service providers and telecommunication operators, there is also a need to improve the existing architecture, especially in terms of route diversity[7].

2.2 Sustainable deployment of networks and services in rural and remote areas based on economic and social indicators

Economic and social indicators serve as a basis for decision-making when deploying networks and services in rural and remote areas. ITU Members have undertaken a variety of measures to extend ICT networks and services to unserved and underserved areas in an affordable and sustainable manner. Such measures have included expanding access to common infrastructure such as the national fibre-optic backbone, or antenna towers, etc., using post offices and other public facilities as anchor institutions for broadband access, supporting the development of utilities such as electricity, utilizing government support to expand the reach of specific broadband access technologies, and fixed wireless access (FWA) systems, among others.

Access to common infrastructure

In **Republic of Madagascar**, the national fibre-optic backbone network had for years been managed by a single operator which made broadband excessively expensive for end users, as upstream costs were passed down to these end users. The regulator consequently decided to open up the national backbone network to competition. Currently, two operators share the national fibre-optic backbone market. The hope is that this policy will eventually lead to a significant drop in the price of broadband access[8].

Central African Republic, through the Ministry of the Digital Economy, Posts and Telecommunications, set up a public-private partnership with the South African company MTN Global, for the commercial exploitation of the national fibre-optic backbone in order to connect unserved and underserved segments of the population in rural and urban areas and to ensure affordable end-user prices on the national fibre-optic backbone[9].

The Government of **Kingdom of Bhutan**, through its "Bhutan Telecommunications and Broadband Policy" created a Demand Aggregation project in which it developed a national fibre-optic network and leased access to telecommunications operators in order to reduce broadband tariffs and so make broadband access affordable for all citizens. The ICT sector in Bhutan has experienced rapid growth in the past two decades, fostering increased economic activity in the form of productivity gains and the generation of significant consumer benefits within the country[10].

The vast majority of the population of **Republic of Burundi** lives in rural areas where subsistence farming is the main economic activity. The introduction of policies and strategies to connect rural areas will help the population to flourish economically and socially. The National Development

[7] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0165/ from Haiti
[8] ITU-D Document https://www.itu.int/md/D22-SG01-C-0039/ from Madagascar
[9] ITU-D Document https://www.itu.int/md/D22-SG01-C-0167/ from Central African Republic
[10] ITU-D Document https://www.itu.int/md/D22-SG01-C-0048/ from Bhutan

Programme[11] (2018-2027) focuses in particular on strategic ICT infrastructure development including optical fibre deployment throughout the national territory, 2G/3G/4G mobile networks, and community telecentres[12].

In **Brazil**, the Government instituted regulatory and economic incentives to stimulate the development of an independent, vibrant, and sustainable tower industry, that was critical for the future development of mobile telecommunications in rural areas of the country.[13]

Anchor institutions and community hubs

The postal network in many countries offers a unique and critical national infrastructure to provide meaningful connectivity and bridge the digital divide in unconnected communities. Connected posts provide essential government, commercial, and financial services for sustainable and inclusive development in the digital economy. The **Universal Postal Union (UPU)** has developed the "Connect. Post" initiative to connect all post offices worldwide into digital hubs connected to the Internet by 2030, in order to attain the practical digital inclusion of businesses and individuals in the communities they serve.

In **India, India Post** undertook a large-scale post office connectivity project where it networked the 155 000 post offices in India using various technologies such as multi-protocol label switching (MPLS), wireless/radio frequency (RF), virtual private network (VPN) over broadband, national optical fibre network (NOFN)/ fibre to the home (FTTH), and 3G/4G subscriber identity module (SIM)-based connectivity.

In **Italy, Poste Italian** launched the Polis Project[14] in January 2023, to transform post offices into digital services hubs (*case dei servizi digitali*), enabling quick and easy access to a variety of public administration services in 7 000 municipalities of less than 15 000 inhabitants. In addition to postal, banking, parcels, insurance, and telecommunications services, citizens can request registry and civil status certificates, electronic identity cards, passports, tax codes for newborns, social security and judicial certificates, and a variety of other services[15].

In the **State of Palestine,** the Ministry of Telecommunications and Information Technology developed a programme to utilize the existing post office network as one-stop-shop service points.[16]

Activities in **Republic of Cameroon** have been informed by the sustainable development goals (SDGs) to create hubs for sustainable development and balanced connectivity.[17]

The digital divide continues to grow due to the lack in reliable and accessible ICT infrastructure in rural areas, which is related to the absence or the inadequacy of a local electrical power supply. Given the linkage between energy access and connectivity, the ITU publication "*From electricity grid to broadband Internet: Sustainable and innovative power solutions for rural*

11 https://www.presidence.gov.bi/wp-content/uploads/2018/08/PND-Burundi-2018-2027-Version-Finale.pdf
12 ITU-D Document https://www.itu.int/md/D22-SG01-C-0054/ from Burundi
13 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0049/ from Brazil
14 https://www.posteitaliane.it/en/press-releases/posteitalianepoli-1476578364058.html
15 ITU-D Document https://www.itu.int/md/D22-SG01-C-0200/ from Intel, United States
16 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0104/ from State of Palestine
17 ITU-D Document https://www.itu.int/md/D22-SG01-C-0036/ from SUP'PTIC, Cameroon

connectivity"[18] examines the challenges of providing access to electrical power supply, which is vital when connecting rural areas to the Internet.

The **Radio Research & Development Institute**[19] in the **Russian Federation** have developed a new domestic solution for providing communications to remote regions of the country. This solution is a telecommunications complex with a completely autonomous electricity supply. It can be used even in arctic conditions. Electricity is generated by a wind-solar power installation mounted at the complex with the generated electricity stored in batteries buried in the ground[20].

Government support for specific broadband access technologies

Although it is widely recommended that governments adopt technologically neutral positions with respect to expanding access to broadband technology, in some instances government support for specific technologies can help create new markets and new opportunities to close the digital divide.

The ICC White Paper *Delivering universal meaningful connectivity*[21], provides a menu of concrete policy options for decision-makers to consider, combine, and adapt to their specific needs. The paper draws on real-life case studies, to explore various barriers to the creation of an interoperable, seamless ICT ecosystem and showcases innovative approaches to overcome them. An interoperable, seamless ICT ecosystem is crucial to help populations reap the benefits of ICTs, and further development opportunities. The PaFEN project in **Burundi**, aims to modernize the digital infrastructure of Burundi and extend access to high-speed connectivity in rural areas. The "Access to Local Connectivity" sub-component of the project specifically targets rural areas where commercial incentives for network expansion are insufficient to stimulate investment. The main objectives of this "Access to Local Connectivity" sub-component are to:

- stimulate high-speed access in rural areas by filling coverage gaps;
- promote the modernization of digital infrastructure in underserved areas;
- promote digital inclusion, particularly with regard to women and youth;
- mobilize private capital to support the development of connectivity infrastructure[22].

In order to overcome communication difficulties for people living in administrative villages in poor, mountainous, and remote areas of **China**, the Ministry of Industry and Information Technology (MIIT) together with the Ministry of Finance, have, since 2015, made active joint efforts to promote universal telecommunication services, and support the development of communication networks in rural and remote areas. By the end of 2021, broadband access had been made available in all the existing administrative villages in China, unblocking the "information artery" for rural areas to enter the digital economy era, and solving the long-standing problem of communication difficulties in poor areas. These measures provide a solid network for comprehensively promoting rural revitalization, and accelerating agricultural and rural modernization. MIIT guides the development of high-quality rural networks, in alignment with the goal of high-quality and efficient agriculture, pleasant villages for both life and work, and prosperous and satisfied farmers. China enhances support for rural 5G network construction

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18 https://www.itu.int/en/ITU-D/Technology/Documents/Publications/From%20electricity%20grid%20to%20broadband.pdf
19 https://www.niir.ru/en
20 ITU-D Document https://www.itu.int/md/D22-SG01-C-0068/ from Russian Federation
21 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France
22 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0210/ from Burundi

year by year, and encourages basic telecommunication operators to build high-quality 5G, and gigabit optical fibre networks in rural areas, so as to gradually expand their coverage, and improve network quality[23].

The ITU report 'ICT infrastructure business planning toolkit 5G networks' 2023 Edition[24] considers the design of networks to support sustainable 5G technology roll-out. 5G networks have the potential to expand high-speed connectivity, but adoption remains a challenge in many developing countries. The toolkit addresses mechanisms to evaluate the sustainability of 5G projects[25].

Satellite

In April 2024, Telesat and the Government of **Canada** agreed to the final terms on a CAD 2.14 billion loan in support of the Telesat Lightspeed project. It is expected that the Telesat Lightspeed service that will begin in 2027, will deliver a global, next-generation, enterprise-class, low earth orbit (LEO) network delivering resilient, high-capacity connectivity[26].

Amazon aims to launch a non-geostationary (NGSO) satellite system known as Project Kuiper that will expand connectivity in unconnected and under-connected regions of the world, including rural and remote communities in developing countries. Project Kuiper will improve connectivity for individual households, as well as schools, hospitals, libraries, businesses, and government agencies in communities that struggle without access to reliable, affordable broadband. By providing network services featuring speed and latency on par with traditional fibre-optic networks, NGSO satellites can help bring these communities into the digital age.[27],[28]

In the **Dominican Republic,** the Biennial Project Plan of the Telecommunications Development Fund of INDOTEL-RD for 2021-2022, "Connecting the Unconnected", brought connectivity through the installation of Internet satellite kits for eight communities located in three of the poorest, least developed provinces of the country. These Internet satellite kits served as the basis for implementing a wireless Internet access network using Wi-Fi 5 (802.11ac) technology in each of the beneficiary communities, with the aim of providing efficient, high-quality connectivity for the residents. The Internet satellite kits were provided by Starlink, pursuant to its obligations under the concession agreement between SpaceX and INDOTEL[29].

2.3 Financing mechanisms including universal service funds

There are different financing mechanisms for digital connectivity and adoption, and these can be broadly classified under the following categories:

- Public financing mechanisms which include universal service funds (USFs), government grants and subsidies, public-private partnerships (PPPs), national broadband plan funds, digital divide reduction programmes, tax incentives for ICT investment, and State-backed loans and guarantees

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[23] ITU-D Document https://www.itu.int/md/D22-SG01-C-0041/ from People's Republic of China
[24] https://www.itu.int/en/publications/ITU-D/pages/publications.aspx?parent=D-PREF-EF.ICT_STRUCT_KIT-2023&media=electronic
[25] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0081/ from BDT
[26] https://www.itu.int/dms_pub/itu-d/oth/07/31/D07310000040038PDFE.pdf
[27] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0095/ from Amazon
[28] https://www.itu.int/dms_pub/itu-d/oth/07/31/D07310000040037PDFE.pdf
[29] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0167/ from Dominican Republic

- Private financing mechanisms also include venture capital and private equity, corporate social responsibility initiatives, crowdfunding initiatives, private sector-led PPPs, infrastructure investment funds, and telecommunications company investments
- International financing mechanisms of multilateral financial institutions can also assist greatly.

Innovative financing models can also be implemented and include pay-as-you-go models, revenue-sharing agreements, social impact bonds, green bonds for sustainable ICT infrastructure, community-based financing initiatives, cooperative ownership models, pooled market demand campaigns, and device financing and subsidies.

Universal telecommunications service

To address the digital divide, a number of governments have created universal service funds (USF). These funds, when utilised effectively and efficiently, ensure that everyone, regardless of location or income, can access essential telecommunications services.[30][31] Any universal service programme needs to define both who provides the service, and who pays for it. The four key models used to pay for universal service programmes, are:

- the single operator model,
- the multiple operators model,
- the government funding model, and
- subsidies, spectrum auctions, and fines exchanged for investment commitments[32].

Development of national broadband and computer programmes for households, schools, universities, etc., is essential for the achievement of digital equity, digital skills, and the development of a digital economy, and countries may consider to using universal service funds, and other funding opportunities such as development banks, for these programmes[33].

The Government of **People's Democratic Republic of Algeria**, through the Ministry in charge of telecommunications, works alongside the Regulatory Authority for the Post and Telecommunications, and in collaboration with various bodies, to implement a number of network connection and coverage projects in line with current regulations in this area. Universal service for telecommunications has become a core pillar of government policy aimed at achieving social equity in the telecommunication sector and coverage of uncovered areas. The Telecom Authority of **Syrian Arab Republic**, is managing the provision of universal service by establishing a set of necessary regulatory rules, aimed at making telecommunication services accessible to everyone, at a price and quality appropriate for all segments of society, regardless of their geographical distribution, and without the imposition onerous financial burden[34].

In **Republic of Uganda**, the Uganda Communications Commission under the Uganda Communications Universal Services and Access Fund, undertook a pilot phased project in 2020, to provision rural households with communication devices. In order to assess the impact of the project, the Uganda Communications Commission collaborated with the Global Digital Inclusion Partnership, to evaluate the implications and sustainability of the project while focusing

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30 ITU-D Document https://www.itu.int/md/D22-SG01-C-0168/ from United States
31 ITU-D Document https://www.itu.int/md/D22-SG01-C-0527/ from GSOA
32 Axon Partners Group – Common Universal Service models in the international practice and their implications (Q5/1 & Q4/1 Joint Workshop)
33 ITU-D Document https://www.itu.int/md/D22-SG01-C-0076/ from Intel Corporation, United States
34 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0170/ from Syrian Arab Republic

on aspects including socioeconomic impact, the effectiveness of the digital skills training provided to the beneficiaries, and user satisfaction and experience[35].

The Digital Development Global Practice programme at the **World Bank** works to create strong foundations to help digital economies, governments, and societies to thrive. Through the analytical work programme and strategic partnerships, such as the Digital Development Partnership[36], that includes developed country and private sector donors, the World Bank works closely with client countries to promote the deployment of low-cost advanced technologies, and innovative business models. Working in collaboration with global teams across the World Bank, the International Finance Corporation, and the Multilateral Investment Guarantee Agency, a range of products, services, and partnerships are deployed to advance global knowledge around key digital development topics, and to provide support to countries in defining and implementing their vision for digital transformation. This work includes financing to governments in the form of grants, loans, guarantees, and risk management products, to support digital investment projects and implement policy reforms[37].

Community networks (CNs)

Across the world, a growing number of CNs, municipal networks, and social enterprises are successfully connecting those who have historically been unserved or underserved by traditional Internet service providers. While many of these complementary 'connectivity and access solutions' have lower startup costs than other approaches to connectivity, access to government funding can also be a significant aid to their success. Access to additional government funding can have a significant positive impact, especially as these connectivity and access solutions are often launched in low population density areas, and in low-income communities. Often, funds are only needed to help launch and maintain a CN until they reach a point of economic balance and scale. There is a need to unlock funding in innovative ways from both the public and private sectors in order to reach the goal of connecting the unconnected by 2030. For the private sector, it is key to help funders of broadband infrastructure to identify opportunities for investment in 'complementary connectivity and access solutions'. Funders can consider participating in the blended capital stack of a fund, and can identify the evolving financing needs, and capital structures, over the life cycle of these innovative connectivity solutions.[38]

Recommendations for innovative funding mechanisms for complementary connectivity and access solutions:

- Countries that do not have a universal service programme should consider creating one that includes support for CNs and other small operators, or should create funds to support innovative connectivity projects. Countries that have USF programmes should consider revising them to include CNs and/or create additional funding opportunities, specifically for CNs. This could entail a separate grant programme, support for public-private partnerships (PPPs), or low-interest loan opportunities. For example, a 2018 report from the Alliance for Affordable Internet (A4AI), and the Web Foundation, suggests ways

[35] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0246/ from Uganda
[36] https://www.digitaldevelopmentpartnership.org/
[37] ITU-D Document https://www.itu.int/md/D22-SG01-C-0070/ from World Bank
[38] Financing Mechanism for Locally Owned Internet infrastructure pp. 102- 105: https://www.internetsociety.org/resources/doc/2022/financing-mechanisms-for-locally-owned-internet-infrastructure/

for multilateral lending institutions to help bridge the inclusion gap, and considers ways to free-up additional resources[39].

- Consider exempting CNs from various taxes, regulatory and licensing fees, and import fee requirements, or reduce fee requirements during the development of the operational model. The Gigabit Broadband Voucher Scheme[40] in the United Kingdom is part of the governmental Project Gigabit programme. The Gigabit Broadband Voucher Scheme pools demand among homes and businesses in eligible rural areas, to help cover the cost of deploying gigabit-capable broadband infrastructure in areas where they are not eligible for Gigabit Infrastructure Subsidy procurement. Project Gigabit focuses on supporting access in hard-to-reach areas and uses government subsidies to complement, rather than displace, commercial rollout plans. The Scheme works by pooling together households and businesses in a geographic area into a single project proposal by an eligible broadband supplier, who then receives the 'voucher' funding directly. This helps overcome potential limitations of a single user trying to request connectivity in a way that may not be feasible in isolation as a business model, by aggregating the demand of multiple users in a geographic area. Each voucher (per premise, as of 2022) is a one-off contribution worth up to GBP 4 500, and over 215 different suppliers are registered with the scheme, supporting a broad and diverse communications market within the United Kingdom. As of September 2023, over 100 000 vouchers have been used to fund new gigabit-capable broadband connections to premises (households and businesses). The project has supported a wide diversity of smaller-scale broadband suppliers. This has encouraged the growth of a more diverse and competitive broadband market in the United Kingdom.[41]

The Government of **Australia** funds provision of basic publicly accessible telecommunications services in approximately 457 small remote First Nations (indigenous peoples) communities under the Remote Indigenous Telecommunications programme. Under this arrangement, First Nations communities have access to free public telephone and Internet services (including community telephones, Wi-Fi hubs, and Wi-Fi telephones). Historically, these services were established to service very remote First Nations communities that were unable to access or afford services under the universal service obligation[42].

In **Kingdom of Saudi Arabia**[43], important incentives for rural broadband deployment include tax incentives, grants, and public-private partnerships to mobilize funding for infrastructure investments in underserved areas.

In the **United States**[44], in order to serve varying community needs, the National Telecommunications and Information Administration (NTIA), designed multiple programmes to address lack of connectivity issues for tribal nations and minority communities. These programmes are also intended to create jobs and new manufacturing industry, promote digital skills, and address the issue of access affordability, under the Internet for All initiative. The programmes include:

- Broadband Equity, Access, and Deployment (BEAD): BEAD provides USD 42.45 billion to expand high-speed Internet access by funding programmes for planning, infrastructure deployment and adoption across the United States.

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39 Closing the Investment Gap: How Multilateral Development Banks Can Contribute to Digital Inclusion https://a4ai.org/research/closing-the-investment-gap-how-multilateral-development-banks-can-contribute-to-digital-inclusion/

40 Gigabit Vouchers (culture.gov.uk) https://gigabitvoucher.culture.gov.uk/

41 ITU-D Document https://www.itu.int/md/D22-SG01-C-0246/ from United Kingdom

42 ITU-D Document https://www.itu.int/md/D22-SG01-C-0259/ from Australia

43 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0224/ from Saudi Arabia

44 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0247/ from United States

- Tribal Broadband Connectivity Programme: This USD 3 billion programme supports tribal government efforts to bring high-speed Internet to tribal lands. To ensure meaningful digital transformation, the National Telecommunications and Information Administration has awarded more than USD 1.86 billion in grants to support network deployment, as well as devices and digital skills training for 226 tribal entities.
- Broadband Infrastructure Programme (BIP) and the Connecting Minority Communities (CMC) pilot programme: The BIP provides USD 288 million for states and Internet providers to expand Internet access to areas without broadband service, and especially to rural areas. Recognizing the importance of Internet access to increased opportunities through education, CMC provides USD 268 million to help colleges and institutions that serve minority and tribal communities, with the purchase of broadband Internet access service and suitable equipment, or help in hiring and training information technology personnel.
- Digital Equity Act Grant Programmes: The United States Digital Equity Act responds to the critical principle that digital access alone does not ensure transformation or inclusion, and provides USD 2.75 billion for three programmes to help ensure that all people and communities have the skills, technology, and the capacity needed, to reap the full benefits of the digital economy.

The experience of **Republic of South Africa** highlights the importance of incentives for the realization of rural broadband access. Such incentives include tax incentives, grants, and public-private partnerships (PPPs) to mobilize funding for infrastructure investments in underserved areas.[45]

The Innovation Fund for Rural Connectivity, was created by the GSM Association (GSMA) to test innovative solutions for providing sustainable connectivity to rural communities[46]. The fund worked in partnership with Vodafone Ghana and MTN Uganda to award two grants to iSAT Africa and NuRAN Wireless to deploy mobile network sites in Uganda and Ghana. In Uganda, iSAT Africa in partnership with MTN Uganda, deployed five mobile network sites, which used innovative solutions, including concreteless towers, solar power and open radio access network (RAN) technology to provide coverage. In Ghana, NuRAN worked with Vodafone Ghana, to provide connectivity at seven sites using specialised low-cost RAN equipment, and renewable solar energy. Both grantee projects were successful in delivering connectivity to underserved areas in Uganda and Ghana[47].

[45] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0249/ from South Africa
[46] GSMA (2023). Accelerating Rural Connectivity: Insights from the GSMA Innovation Fund for Rural Connectivity https://www.gsma.com/mobilefordevelopment/resources/accelerating-rural-connectivity-insights-from-the-gsma-innovation-fund-for-rural-connectivity/
[47] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0203/ from GSMA & Orange, France

Chapter 3 – Policies, mechanisms and regulatory initiatives to reduce the digital divide

This chapter explores various policies, mechanisms, and regulatory initiatives aimed at reducing the digital divide. A range of policies, mechanisms, and regulatory initiatives are presented, highlighting the multifaceted approach required for reducing the digital divide, and ensuring equal access to ICTs for all communities.

3.1 Digital divide between urban and rural and remote areas

Universal telecommunications service is of great significance to individuals, societies and nations, and is also an important driving force for social progress and economic development.

- **Fostering an information society:** In the information society, universal telecommunication services, bridge the digital divide thus fostering an information society. The case of **Burundi** emphasizes that an inherent part of the economic and social development of a country, is developing the capacity to manage information linked to all forms of human activity.[48] The case of **Algeria** universal telecommunication services help promote regional cohesion by reconciling differences in regions, and reducing inequality among citizens.[49]
- **Enhancing national economic strength:** Broadband penetration is closely related to the level of socio-economic development. The research shows that broadband penetration is positively correlated with growth in gross domestic product (GDP), and stability in most developed economies.[50]
- **Demonstrating care for special groups:** Special groups such as low-income groups, and persons with disabilities are key beneficiaries of subsidies for universal telecommunications service so that they can access telecommunication services at reasonable and affordable prices. The case of the **Syrian Arab Republic**, highlights the need for universal service policy and regulations to cover rules, procedures, and the criteria for the selection and implementation of projects, as well as the calculation of growth in expected development indicators, such as the accessibility of telecommunication and ICT services, for persons with specific needs, and possibility of using telecommunications and ICTs for disaster risk reduction and management.[51] The case of **Thailand** demonstrates that universal telecommunications service enables development and provides opportunities for citizens, particularly those residing in rural and remote areas, low-income persons, persons with disability, children, the elderly, and underprivileged persons to access and use basic telecommunication services.[52] The National Strategy of **Burundi** concentrates universal telecommunications service in the target priority populations of the State, such as people with disabilities, indigenous peoples, and refugees in order to overcome barriers to digital access.[53] In India, the *Pradhan Mantri Gramin Digital Saksharta Abhiyan* (PMGDISA), a digital literacy mission initiated by the Government of India in 2019, prioritizes marginalized populations, such as the underprivileged, women, and girls. PMGDISA promotes social inclusion, poverty reduction, and overall rural development.[54]

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48 ITU-D Document https://www.itu.int/md/D22-SG01-C-0054/ from Burundi
49 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0160/ from Algeria
50 ITU-D Document https://www.itu.int/md/D22-SG01-C-0054/ from Burundi
51 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0170/ from Syrian Arab Republic
52 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0186/ from Thailand
53 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0187/ from Burundi
54 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0209/ from Broadband India Forum, India

Drawing on the contributions presented in this report, the main factors contributing to the urban-rural digital divide, can be outlined as follows:

- **Inadequate infrastructure:** Economic market development can be constrained by inadequate construction and universalization of telecommunication infrastructure, as well as by insufficient development of policies and regulations. In **Cameroon**, highlights how governmental opening-up policies, and competitive market mechanisms can facilitate the development of telecommunications infrastructure[55] Contributions from **China** and **Bhutan**, highlight factors relating to the complexity and diversity of geographical conditions, such as mountainous, desert, and regions considered as harsh terrain, which are often remote and rural, meaning that construction and maintenance of telecommunication infrastructure in these areas is generally more costly,[56][57] and incurs a low return on investment (RoI). A joint report submitted by **Ericsson** with **Huawei**, **Nokia** and **ZTE**, discusses some of the challenges posed by rural connectivity projects for network operators. The average revenue per user (ARPU), when compared to urban and suburban areas can be significantly lower, and consequently, the business case for investment is often weak.[58]
- **Affordability:** This factor concerns Internet cell phone affordability including the cost of cell phones, user income levels, user willingness to spend, and consumer confidence, etc. **Uganda** highlights how in a culture of highly patriarchal households, device sharing was not feasible, as men would dominate usage of devices. In order to foster sustainability, such family households need more than one device to achieve the desired objective[59]. Mobile data affordability is another of the main obstacles to overcoming the digital divide. Approximately 41 per cent of countries worldwide[60] fail to meet ITU standards for affordability of mobile broadband services, i.e., where the cost of median mobile broadband services as a percentage of gross national income (GNI) per capita is below two per cent. Factors affecting the affordability of mobile data include the price level of mobile services, and user income levels, etc.

  A contribution from **Madagascar** highlights pricing problems arising from a margin squeeze, which makes broadband excessively expensive for end users, as upstream costs, are passed down to them[61].

  Central African Rep. emphasized the challenge of making high-speed broadband access prices accessible to the entire population, as being one of the major challenges in the country,[62] along with reliable and affordable electricity,[63]and frequencies affordability. A case study from **Madagascar** revealed that some operators are reluctant to pay frequency allocation prices and a great deal of negotiation was undertaken to finally reach agreement on an appropriate price[64].
- **Lack of literacy and digital skills:** This factor comprises lack of literacy skills; not knowing how to use a cell phone; not knowing how to use a cell phone to access the Internet; not having the time to learn how to use the Internet on a cell phone; and not having enough support for learning how to use the Internet on a cell phone.
- **Lack of awareness:** A contribution from **Uganda** highlighted how enhancing literacy levels directly addressed adoption and usage challenges related to low awareness and understanding of the devices and applications. There is need for continuous education

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55 ITU-D Document https://www.itu.int/md/D22-SG01-C-0036/ from SUP'PTIC, Cameroon
56 ITU-D Document https://www.itu.int/md/D22-SG01-C-0041/ from China
57 ITU-D Document https://www.itu.int/md/D22-SG01-C-0349/ from Bhutan
58 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0010/ from Ericsson
59 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0246/ from Uganda
60 GSMA:The State of Mobile Internet Connectivity 2023 https://www.gsma.com/r/wp-content/uploads/2023/10/The-State-of-Mobile-Internet-Connectivity-Report-2023.pdf
61 ITU-D Document / https://www.itu.int/md/D22-SG01-C-0039 from Madagascar
62 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0189/ from Central African Republic
63 ITU-D Document https://www.itu.int/md/D22-SG01-C-0060/ from BDT
64 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0029/ from Madagascar

and training initiatives specifically tailored for the beneficiaries needs, to ensure acquisition of necessary skills by beneficiaries in order to maximize usage.[65]

- **Concerns about cybersecurity**: This factor comprises personal data privacy leakage, and other risks.

3.2 Strategies for the integration of ICTs in education, and promotion of innovation to achieve national economic development and growth

ICTs play a critical role in achieving the 2030 Agenda for Sustainable Development and for building inclusive digital societies worldwide. Integration of ICT in education is a key enabler for digital skill development, and broadband demand creation. Contributions from the Member States and entities have highlighted various strategies for the integration of ICTs in education, and promotion of innovation to achieve national economic development and growth. These strategies are summarized in this section.

A holistic approach to digital inclusion, encompassing access to telecommunication networks and services, affordable tariffs and terminals, and training, is fundamental to making digital inclusion a reality.[66]

A study from **India** proposed long-term and short-term approaches for connecting underserved rural and remote areas, employing a mix of both approaches.[67]

A **Cameroon** study highlighted the need for the integration of a digital literacy programme into the basic education system, in tertiary and university institutions.[68]

In **Bhutan**, a research and education network called the Druk Research and Education Network was established in 2018, to interconnect all research and education institutions, schools and hospitals with dedicated high-speed (up to 1Gbps) Internet connectivity.[69]

Capacity building is clearly an important factor in bridging the digital divide, as can be seen from a number of contributions from the International Network of Women Digital Experts (RIFEN), covering empowerment of women and youth in rural areas, in cybersecurity, agriculture and digital literacy, and including case studies from countries such as Cameroon and Burundi.[70]

A study from **Burundi** shared the policies and strategies employed to connect rural areas, and highlighted the fact that an inherent part of the economic and social development of a country, is developing the capacity to manage information linked to all forms of human activity.[71]

The **World Bank** Digital Development Global Practice helps advance global knowledge around key digital development topics, which further help countries define and implement their vision for digital transformation[72]. **Intel Corporation** emphasised the importance of integration of

[65] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0246/ from Uganda
[66] ITU-D Document https://www.itu.int/md/D22-SG01-C-0392/ from Senegal
[67] ITU-D Document https://www.itu.int/md/D22-SG01-C-0393/ from India
[68] ITU-D Document https://www.itu.int/md/D22-SG01-C-0036/ from SUP'PTIC, Cameroon
[69] ITU-D Document https://www.itu.int/md/D22-SG01-C-0048/ from Bhutan
[70] ITU-D Documents https://www.itu.int/md/D22-SG01-C-0371/, https://www.itu.int/md/D22-SG01-C-0374/, https://www.itu.int/md/D22-SG01-C-0377/ and https://www.itu.int/md/D22-SG01-C-0396/ from RIFEN
[71] ITU-D Document https://www.itu.int/md/D22-SG01-C-0054/ from Burundi
[72] ITU-D Document https://www.itu.int/md/D22-SG01-C-0070/ from World Bank

ICT in education, and that the use of computers is essential for the realization of all SDGs and programmes to empower women, and girls, and for other applications[73].

ITU Telecommunication Development Bureau (BDT) shared information on IMT 2020/5G, concerning technical assistance, as well as the resources which are available to Member States, to facilitate the implementation of ICT infrastructure, policies, and strategies in their respective countries and regions.[74]

A study from **Burkina Faso** highlighted their experience in providing communication services to consumers in areas and localities affected by insecurity and terrorist groups. Burkina Faso has set up a support fund for the implementation of exceptional measures in the electronic communications sector to finance the restoration of destroyed telecommunications sites.[75]

In its efforts to enhance capacity building in the ICT domain, **South Africa** has established the ".za" Domain Name Authority (ZADNA), a not-for-profit entity to regulate and manage the ".za" namespace, and so ensure a secure namespace, particularly for rural and remote areas.[76]

A study from **Haiti** considers how the country has progressed in the national quest to improve adoption of broadband services by making users more confident, through the implementation of electronic signatures and by making this capability universal across the country. Electronic signature capability, alongside other e-applications, serves as a catalyst for digital transformation in an enabling environment.[77]

A report from the **State of Palestine** highlighted some of the initiatives and projects for broadband proliferation, that were launched by the Ministry of Telecommunications and Information Technology, including utilizing the existing post office network, as one-stop-shop service points, connecting schools in most underserved areas.[78]

A report from **Brazil** detailed how the Brazil National Telecommunications Agency (ANATEL) has successfully used crowdsourcing, and data analytics to identify the connectivity gap, and enable planning to bring broadband connectivity to unconnected areas.[79]

In **Republic of Mozambique**, a non-profit organization **Kamaleon**, have developed the Interactive Mobile Digital Unit (IMDU), which is a platform that can be transported on a trailer. The IMDU is intended make ICTs available in remote rural areas of developing countries, including hard-to-reach communities, with particular focus on addressing the needs of persons with disabilities, and those with other specific needs. The IMDU is capable of delivering a wide range of digital services, from e-education, and e-health, to rural banking, or e-government services, enhancing socio-economic development and civic participation of the most vulnerable communities. The IMDU is designed to promote the digital inclusion of rural communities through its 'Universal Design for Learning' based communication approach.[80]

The **Argentine Republic** outlined the Federal Training Plan to develop technical and digital skills in information and communications technologies (ICT), mainly where the Federal Fibre

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[73] ITU-D Document https://www.itu.int/md/D22-SG01-C-0076/ from Intel, United States
[74] ITU-D Document https://www.itu.int/md/D22-SG01-C-0060/ from BDT
[75] ITU-D Document https://www.itu.int/md/D22-SG01-C-0173/ from Burkina Faso
[76] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0072/ from South Africa
[77] ITU-D Document https://www.itu.int/md/D22-SG01-C-0369/ from Haiti
[78] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0104/ from State of Palestine
[79] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0107/ from Brazil
[80] ITU-D Document https://www.itu.int/md/D22-SG01-C-0147/ from Kamaleon, Mozambique

Optic Network (REFEFO) was illuminated and/or is in the process of being illuminated, and so provide job opportunities for young people and adults in those locations.[81]

Republic of Indonesia highlighted the Inclusive Communication for Fishermen programme to solve the issue of the interference in the aeronautical mobile service (AMS) frequencies through improper use of frequency by fishermen.[82]

In **Senegal**, the Wireless Solutions for Fisheries in Senegal (WISE) project uses advanced wireless technology to improve the income and livelihood of small fishing and processing operators, to support sustainable fishing practices, and to improve the safety and security of fishermen.[83]

A report from **Republic of Bulgaria** has revealed that in order to deploy very high capacity networks (VHCNs) in many areas of the country, investments need to be made in fibre-optic networks for transmission to remote and sparsely populated locations.[84]

3.3 Access to services in local languages for indigenous people and people with specific needs

Language, culture, identity, and knowledge hold immense power in fostering inclusivity. Preserving and promoting indigenous languages is integral to safeguarding of cultural heritage. Providing access to broadband services for indigenous people, and for people with specific needs, involves adopting inclusive practices and measures to ensure equal opportunities, as can be seen from the following:

The Government of **Australia** is dedicated to delivering essential telecommunications services to approximately 457 small, remote First Nations (indigenous peoples) communities[85].

In **Mexico**, the Federal Institute of Telecommunications has organized a series of workshops dedicated to translating over 500 informational materials into 40 indigenous languages.[86] Mexico has taken several steps to promote the use of indigenous languages, including conducting translation workshops, and training interpreters in indigenous languages.[87]

The Government of **Uganda**, commisioned a project designed to boost the adoption of ICT4Agric innovations among various agriculture stakeholders, with particular focus on smallholder farmers in rural regions.[88]

A report from **Burkina Faso** pointed out the need to use availability, affordability, and accessibility as guiding principles, in the implementation of a national strategy[89]. A case study from **Kamaleon (Mozambique**) highlighted the importance of the Interactive Mobile Digital Unit, which plays a pivotal role in overcoming accessibility challenges in rural areas, catering to persons with disabilities and specific needs. Another insightful contribution from **Kamaleon (Mozambique)**

81 ITU-D Document https://www.itu.int/md/D22-SG01-C-0180/ from Argentina
82 ITU-D Document https://www.itu.int/md/D22-SG01-C-0195/ from Indonesia
83 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0149/ from Senegal
84 ITU-D Document https://www.itu.int/md/D22-SG01-C-0304/ from Bulgaria
85 ITU-D Document https://www.itu.int/md/D22-SG01-C-0259/ from Australia
86 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0101/ from Mexico
87 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0098/ from Mexico
88 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0043/ from Uganda
89 ITU-D Document https://www.itu.int/md/D22-SG01-C-0173/ from Burkina Faso

highlighted the unique challenges faced by rural communities in general, as well as people with specific needs, in gaining access to essential ICT services.[9091]

The key to success in this quest, lies in collaborative efforts. Governments, technology developers, and local communities must work hand-in-hand to ensure that digital services are not only available, but also genuinely accessible.

3.4 Promotion of small and medium enterprises (SMEs)

Small and medium enterprises (SMEs) can play a pivotal role in bridging the digital divide. Member countries have undertaken various initiatives to promote SMEs for the proliferation of broadband connectivity.

ITU-APT Foundation of India highlighted the strategies used to increase the deployment of broadband in **India,** using Wi-Fi connectivity through public data office, popularly known in India as Wi-Fi Access Network Interface.[92]

Rep. of Korea detailed the unique infrastructure-sharing model in Peru, that works with other infrastructure models to provide coverage to rural and preferred social interest locations, designated by the Government of Peru, through the rural mobile infrastructure operator (RMIO).[93]

A contribution from the **Internet Society**, highlighted the importance of creating an enabling regulatory environment for complementary connectivity, and access solutions, and Internet exchange points (IXPs). IXPs help create shorter, more direct routes for Internet traffic which is key to developing a sustainable connectivity environment in developing countries.[94]

After examining case studies from Federal Democratic Republic of Ethiopia and the Asia Pacific region, **Access Partnership UK** makes the following policy recommendations:

To empower SMEs and work towards bridging the digital divide, it is essential for governments, regulatory bodies, and industry stakeholders to collaborate in creating a conducive policy framework:

1) **Workforce training**: Governments should partner with educational institutions and technology companies to create curricula that equip individuals with skills in networking, coding, data analysis, digital marketing, e-commerce, and cybersecurity. In **South Africa**, a public-private partnership with the Government and Cisco's Networking Academy, established a dedicated laboratory within a government office. In this laboratory, cybersecurity training is provided to government employees, utilizing the Networking Academy curriculum to enhance their skills and knowledge.[95]
2) **Public-private partnerships (PPPs)**: Foster robust public-private partnerships to enhance digital infrastructure and accessibility, particularly for SMEs in rural and underserved urban areas.

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90 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0007/ from Kameleon, Mozambique
91 ITU-D Document https://www.itu.int/md/D22-SG01-C-0147/ from Kameleon, Mozambique
92 ITU-D Document https://www.itu.int/md/D22-SG01-C-0091/ from ITU-APT Foundation of India
93 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0026/ from Republic of Korea
94 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0094/ from Internet Society
95 BBC: How Cisco is bridging the global 'digital divide' to connect the world, Available at: https://www.bbc.com/worklife/article/20240119-how-cisco-is-bridging-the-global-digital-divide-to-connect-the-world

3) **Regulatory sandboxes**: Implement regulatory sandboxes specifically for SMEs to test new products and services without immediate full compliance obligations.[96]

3.5 Affordability of services/devices for rural and remote areas

The affordability of services and devices, and access to affordable Internet connectivity in rural and remote areas are critical factors in ensuring digital development, and bridging the digital divide. A significant contribution from the **World Bank** outlines three key approaches that help establish an enabling environment for the development of telecommunications/ICTs:

- broadband connectivity, access, and use;
- ICT industry and digital jobs; and
- digital data infrastructure.[97]
- **Argentine Republic** highlighted efforts to expand connectivity in rural areas through a community-led approach.[98]

In **Cameroon**, the **National Advanced School of Posts, Telecommunications and ICTs** highlights the need for collaboration with other countries to address connectivity and expertise gaps.[99]

A contribution from **China**, highlights efforts to increase rural Internet access through policies promoting universal telecommunication services. These include strengthened top-down planning, expanded funding, and optimized application of technologies.[100]

The **ICC White Paper on delivering universal meaningful connectivity** highlights the importance of an interoperable, seamless ICT ecosystem in promoting ICT and development opportunities, particularly in developing countries.[101]

A contribution from **Rep. of Korea**, discusses the rural mobile infrastructure operator (RMIO) model, which involves deploying and operating network facilities in areas where no mobile network operator (MNO) has previously established their own network.[102]

United Republic of Tanzania has implemented various projects, including subsidies amounting to USD 100.3 million, for telecommunication towers, and provision of ICT equipment and Internet connectivity to public schools.[103]

A contribution from **South Africa**, highlights the benefits of the spectrum auction, and emphasized the social obligations of telecommunications operators to connect schools, clinics and hospitals, traditional authority offices, libraries, and government service centres.[104]

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96 ITU-D Document https://www.itu.int/md/D22-SG01-C-0401/ from Access Partnership, United Kingdom
97 ITU-D Document https://www.itu.int/md/D22-SG01-C-0070/ from World Bank
98 ITU-D Document https://www.itu.int/md/D22-SG01-C-0085/ from Argentina
99 ITU-D Document https://www.itu.int/md/D22-SG01-C-0036/ from SUP'PTIC, Cameroon
100 ITU-D Document https://www.itu.int/md/D22-SG01-C-0223/ from China
101 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France
102 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0026/ from Rep. of Korea
103 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0085/ from Tanzania
104 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0115/ from South Africa

A contribution from the **Association for Progressive Communications (APC)** highlights the challenges faced by community connectivity providers. It emphasizes the need for an enabling regulatory environment and financing strategies to support small-scale networks.[105]

A contribution from **Bhutan**, stresses the importance of developing ICT infrastructure to improve network connectivity, and the adoption of ICT services. The Ministry of Information and Communications in Bhutan has implemented various strategies to deploy high-speed broadband connectivity in the country, including providing subsidies/incentives to telecommunications operators for infrastructure development, and leasing of infrastructure to operators.[106]

A report from **Burkina Faso**, highlights the commitment of Burkina Faso to promoting socio-economic development, environmental sustainability, and gender equality.[107]

A contribution from **Arab Republic of Egypt** highlights the importance of the Egyptian broadband strategy in improving the overall broadband ecosystem.[108]

A report from the **Central African Rep.**, highlights how it initiated strategies and policies to ensure broadband access for all. Grants from the European Union and African Union have facilitated the deployment of optical fibre.[109]

Union of the Comoros is developing legislative measures to collect funds for investment in modern infrastructure, and to establish a policy for the dissemination of ICT services nationwide.[110] With the support of the World Bank, Comoros has embarked on a process to redraft the 2014 Law, and reintroduce the Universal Service fund. This is intended to meet the requirements of Resolution 11 (Rev. Kigali, 2022) and Annex 2 of Resolution 2 (Rev. Kigali, 2022),[111] which encourage the continuation of efforts by developing countries, and intensify contributions to the universal service fund (USF), through incentive-based regulation[112].

In order to overcome the communication difficulties for people in administrative villages in poor, mountainous, and remote areas, the Ministry of Industry and Information Technology, and the Ministry of Finance in **China**, have jointly promoted universal telecommunication services, and supported the development of communication networks in rural and remote areas[113]. The Ministry of Information and Communications in **Bhutan** leverages the USF to provide telephony and entry level broadband services, to rural and remote communities[114].

Policy in **Burundi** aims to "achieve universal access for ICTs in order to boost economic growth and become a centre of excellence and a regional figure of reference in the ICT sector by 2025"[115].

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105 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0071/ from Association for Progressive Communications
106 ITU-D Document https://www.itu.int/md/D22-SG01-C-0048/ from Bhutan
107 ITU-D Document https://www.itu.int/md/D22-SG01-C-0173/ from Burkina Faso
108 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0018/ from Egypt
109 ITU-D Document https://www.itu.int/md/D22-SG01-C-0167/ from Central African Republic
110 ITU-D Document https://www.itu.int/md/D22-SG01-C-0031/ from Comoros
111 WTDC Final Report, Kigali, Republic of Rwanda (6-16 June 2022) https://www.itu.int/dms_pub/itu-d/opb/tdc/D-TDC-WTDC-2022-PDF-E.pdf
112 ITU-D Document https://www.itu.int/md/D22-SG01-C-0031/ from Comoros
113 ITU-D Document https://www.itu.int/md/D22-SG01-C-0041/ from People's Republic of China
114 ITU-D Document https://www.itu.int/md/D22-SG01-C-0048/ from Bhutan
115 ITU-D Document https://www.itu.int/md/D22-SG01-C-0054/ from Burundi

A contribution from **Intel Corporation**, provides information on the importance of computer and broadband access programmes for households, students, and education with various financing mechanisms, including USF[116].

The approach in the **Russian Federation** to universal service funds, involves designating a single network operator for "universal communication services." Rostelecom, the designated single operator of the universal communication services, has expanded broadband connectivity through free Wi-Fi access points, and telephone access through existing payphones.[117]

The **universal service** policy of **China** comprises:

- Seeking financial subsidies and strengthening financial management;
- Deployment and construction tasks;
- Providing subsidy funds to encourage enterprises to increase investment;
- Improving public services and strengthening infrastructure;
- Promoting the empowerment of new technologies, and expanding the content of supports.[118]

In the **United States** the Federal Communications Commission (FCC) is responsible for overall management and oversight of the USF, including all policy decisions. The USF includes following four key programmes:

- Connect America Fund: supports service in rural and other high-cost areas;
- Lifeline: reduces costs for low-income consumers;
- E-Rate: reduces costs for schools and libraries;
- Rural Health Care: reduces costs for healthcare provision.[119]

The approach taken in the **United Kingdom** to universal service comprises an obligation model. The broadband Universal Service Obligation (USO) was established in the United Kingdom by legislation in 2018, and implemented by Ofcom in 2020, to guarantee 'decent' fixed broadband connection at home for all[120].

The approach of **Egypt** to USF includes:

- Extending accessibility from basic telecommunications service to 4G and fibre-optic deployment;
- Extending accessibility to include road coverage in regions and communities; and
- Extending accessibility for national projects / initiatives[121].

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[116] ITU-D Document https://www.itu.int/md/D22-SG01-C-0076/ from Intel Corporation, United States

[117] Universal Service Fund in Russian Federation https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040029PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

[118] China, Bridging the urban-rural digital divide https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040028PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

[119] United States, The role of the Universal Service Fund in building broadband and digital infrastructure in rural and remote areas https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040016PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

[120] United Kingdom, Universal Service: The UK's Experience https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040023PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

[121] Egypt, Enhancing Accessibility of ICT Services https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040017PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

A dashboard tool developed by **Deloitte**, uses geographic modelling to map existing broadband infrastructure, access, and potential service in underserved areas. The tool could be used by regulators for the deployment of broadband infrastructure in rural, unserved and underserved areas, and to identify areas where the universal service fund should intervene[122].

APC has experience in setting up "complementary networks" in areas where both private investment and universal service funds are not able to cover. APC has also published a paper[123] in partnership with ISOC & Connect Humanity[124].

The Economic Community of West African States (**ECOWAS**) strategic plan recognizes that digitalization provides solutions to the development challenges of the region and that efforts are needed to guarantee universal access. Governments have also focussed on the "gender digital divide" and the reduction of poverty[125].

The COVID-19 pandemic underscored the importance of connectivity, both in the adoption of broadband, and in the uptake of digital skills. According to ITU[126] and A4AI[127] reports, USF remained underutilized due to poor governance, unclear or unmeasurable objectives, poor coordination and unfair processes for allocation of resources. "Connected Homes" in **Costa Rica,** and "Connect the Unconnected" in Dominican Republic, are good examples of use of USF for broadband adoption. It is also important to establish digital skills programmes by using USF for unserved and underserved areas. In the **United States**, the **Broadband Equity, Access, and Deployment (BEAD)** programme, provides USD 42.45 billion to expand high-speed Internet access by funding planning, infrastructure deployment, and adoption programmes including on ICT use, digital skills, and workforce development. Programmes prioritize unserved locations that have no Internet access, or that only have access at under 25/3 Mbps, and underserved locations that only have access at under 100/20 Mbps.[128]

The **European Union** Universal Service policy expanded from only telephony; to broadband and Internet access, and is grounded in the two principles of availability and affordability. The 2020 BEREC Report, outlines best practices on "adequate broadband," which can also be used by Member States in establishing their own regimes.[129]

The ITU "Universal Service Financing Efficiency Toolkit[130]", provides policymakers with practical guidance in assessing their universal service policies, as well as usage/coverage gaps. The ITU Datahub[131] is informed by three major ITU surveys: a statistic survey, a tariff policy survey, and a regulatory survey. It is important to note the aspects of "Datahub" with relevant universal service

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122 Deloitte – How to identify areas where the USF should intervene first? https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040020PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

123 https://www.apc.org/en/pubs/financing-mechanisms-locally-owned-internet-infrastructure

124 AlterMundi, and APC Labs-Community Networks – Intervention https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040035PDFS.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

125 Senegal – Towards an evolution of universal service mechanisms and Universal Service Funds in ECOWAS? https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040025PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

126 https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF-2021-ECO_FIN-PDF-E.pdf

127 https://webfoundation.org/docs/2018/03/Using-USAFs-to-Close-the-Gender-Digital-Divide-in-Africa.pdf

128 Intel, USA- USF Policies for ICT Use and Digital Skills https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000040019PDFE.pdf (Q5/1 & Q4/1 Joint Workshop, 2023)

129 https://www.berec.europa.eu/sites/default/files/files/document_register_store/2021/6/BoR_%2821%29_70_BEREC_Annual_Reports_2020.pdf

130 https://www.itu.int/itu-d/reports/regulatory-market/usf-financial-efficiency-toolkit/

131 https://datahub.itu.int/

related data, such as how Administrations approach "universal access/service definitions", financing, and administration, among other topics[132].

In **Algeria**, universal service for telecommunications is financed by operator contributions, and provides a nationwide census, covering all areas, including those classified as white zones with no telephone or Internet network coverage[133].

In **Dominican Republic,** as part of the strategy for universal connectivity, Indotel is executing a plan for the expansion of connectivity for digital transformation in the country, with USD 115 million in financing from the Inter-American Development Bank (IDB)[134].

In the **Syrian Arab Republic**, it is initially necessary to develop a universal service policy as the basic guide for the deployment of telecommunication and ICT services in rural and underserved areas[135].

In **Thailand,** the universal service obligation (USO) Bureau has defined two basic aims:

- To promote and develop the extension of telecommunication networks and services, in local, and remote areas.
- To provide opportunities and development for those residing in both local and remote areas, low-income persons, disabled persons, children, the elderly, and underprivileged persons. Since 2005, the USO Bureau in **Thailand** has developed four iterations of the USO Masterplan. The current USO Masterplan, USO Masterplan No. 4 (2023) adopts a universal access/service framework policy for broadband services[136].

In **India**, the Universal Service Obligation Fund (USOF) has been the force behind the establishment of high-quality network infrastructure across the rural and remote areas of the country. Various projects have been funded through USOF including the flagship "BharatNet" project, the laying of undersea cable to provide high speed network connectivity along the Andaman and Nicobar islands and the Lakshadweep archipelago, the installation of mobile towers and satellite connections to ensure last-mile connectivity in the uncovered remote regions and villages of the islands, and financial support to promote the telecommunications research and design ecosystem. The new Telecommunications Policy (1999), provided that the resources for meeting the USO would be raised through a "universal access levy", which would be a percentage of the revenue earned by the operators under various licences. A sum of INR 786 billion received through parliamentary approvals has been utilized to fulfil the objective of USOF towards development and augmentation of telecommunications infrastructure. The balance of the "universal access levy" available as potential funds under the USOF, is INR 771 billion as of 2023.[137]

In **Central African Rep.**, the Government, has signed a public-private partnership (PPP) agreement with the South African telecommunication company MTN Global, targeting very high speeds over the national and international fibre-optic backbone, by extending the national coverage of fibre-optic infrastructure into unserved areas, with a view to integrating and implementing ICT services in the country. The contribution rate of operators is set at two per cent of the previous

[132] ITU – BDT Work on USF (Q5/1 & Q4/1 Joint Workshop Presentations on Universal Service Financing Efficiency Toolkit, Universal Service Policies, Sustainable& innovative power solutions for rural connectivity, May 2023)
[133] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0166/ from Algeria
[134] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0166/ from Dominican Republic
[135] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0170/ from Syrian Arab Republic
[136] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0186/ from Thailand
[137] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0206/ from India

year's turnover for each operator. This enables the *Agency de Régulation des Communications Electronique et de la Poste* (ARCEP) to recover the funds with a view to serving unserved and underserved populations in non-rural and urban areas.[138]

The Government of **Burundi** developed the "PAFEN 2022-2027" project, to support the foundations of the digital economy, at a cost of USD 50 million. An additional funding of USD 42 million is in the process of being finalized, and the project will be extended until August 2028[139].

For as long as the digital divide between urban and rural areas continues to persist, collaborative efforts will be needed to address the affordability challenges facing rural communities.

3.6 Integration and implementation of emerging technologies in rural and remote areas

Digital connectivity underpins our daily lives, access to knowledge, and the prosperity of the global economy. With the continuing expansion of our reliance on communications, as well as the increasing scale, and reach of such technologies, the need for further developments in communications technologies and networks persists.[140]

In rural regions, innovation and the emergence of new technologies can have a variety of sources. However, innovation is generally different in rural regions compared to cities, and can take several different forms. Adoption of innovation requires connections to the places where the innovation was developed, as well as the resources to acquire and introduce the new technology.[141]

In this context, a study "Inequality and its impact on access to information technologies", prepared by the Federal Telecommunications Institute of **Mexico**[142], aims to estimate the size of the impact that access to mobile terminals and computers, mobile service coverage, and fixed Internet service has, in relation to the development of the country. To overcome geographical barriers to connectivity infrastructure in rural areas, the following can be considered:

A. Wireless communications

Mobile networks: Leveraging existing mobile networks, or expanding coverage can be crucial for connecting remote areas. Technologies such as 4G, 5G and 6G can offer high-speed Internet access.

Regarding wireless network coverage, in **China**, 5G is rapidly extending into rural areas. By the end of August 2024, China had a cumulative total of four million 5G base stations, achieving the goal of "5G coverage in every county."[143]

Satellite communication: In areas with no terrestrial infrastructure, satellite communication can be a viable option. Satellite communication provides fast, flexible, and secure connectivity,

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138 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0189/ from Central African Republic
139 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0210/ from Burundi
140 Allen Ben and Al Rawi Anas 2021, Innovative and emerging communications concepts and Technologies Proc. R. Soc. A.4772021084420210844
141 Enhancing Innovation in rural regions, https://web-archive.oecd.org/2020-10-14/566726-Rural-innovation-background.pdf
142 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0185/ from Mexico
143 ITU-D Document https://www.itu.int/md/D22-SG01-C-0407/ from China

whilst on the move, anytime, anywhere, as well as connectivity in remote regions[144]. Satellites that operate in low earth orbit (LEO) can offer several critical benefits, including the power to connect the unconnected, support for disaster response, and network resiliency, as well as valuable new business models in conjunction with incumbent network operators[145][146]. By encouraging terrestrial telecommunication operators to integrate satellite communications, nations can reduce time lag for the adoption of new technology between urban and rural populations[147]. For example, by using satellite multi-beams payload, and frequency re-use techniques such as high throughput satellites (HTS), and next generation software defined satellites (SDS), spectrum sharing mechanisms can be implemented without impacting on incumbent services, and refarming strategies can be promoted to optimize spectrum use and so accommodate the growing demand for wireless broadband[148] [149] [150] [151].

In **Dominican Republic**, the Biennial Project Plan of the telecommunications development fund of INDOTEL-RD for 2021-2022, "Connecting the Unconnected", executed an 'access and infrastructure' component of the plan to bring connectivity to small and isolated rural communities, and mountainous and unserved regions, through the installation of nine Internet satellite kits for eight communities, located in three of the poorest, least developed provinces of the country[152].

In **Bhutan**, the geographical challenges of providing telecommunication and broadcasting services to rural areas have necessitated the use of innovative solutions.[153] One such solution is the South Asia Satellite (SAS) ground station network, which has been instrumental in providing critical communication services in areas that remain unconnected by traditional infrastructure.

Mesh networks: Establishing wireless mesh networks can help in creating a decentralized and self-sustaining communication infrastructure. Each node in the mesh network can act as a repeater, further extending the coverage.

High altitude platform stations (HAPS): HAPS can be employed as an extension to terrestrial networks, and can deliver communication coverage from space and the stratosphere. Non-terrestrial network (NTN) solutions including satellites and HAPS, can add connectivity for coverage of developing countries and rural areas, can ensure seamless connectivity during disasters, and can be used to provide three-dimensional (3D) mobile coverage.[154]

B. Wired communications

Fibre-optic networks: While laying fibre-optic cables can be expensive, fibre-optic cable does provide high-speed and reliable connectivity. In some cases, it is feasible to deploy fibre-optic infrastructure, especially in areas with critical or urgent needs.

144 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0215/ from GSOA
145 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0095/ from Amazon
146 ITU-D Document https://www.itu.int/md/D22-SG01-C-0527/ from GSOA
147 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0109/ from GSOA
148 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0224/ from Saudi Arabia
149 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0249/ from South Africa
150 ITU-D Document https://www.itu.int/md/D22-SG01-C-0454/ from GSOA
151 ITU-D Document https://www.itu.int/md/D22-SG01-C-0455/ from GSOA
152 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0167/ from Dominican Republic
153 ITU-D Document https://www.itu.int/md/D22-SG01-C-0349/ from Bhutan
154 ITU-D Document https://www.itu.int/md/D22-SG01-C-0402/ from SoftBank Corporation, Japan

In **Brazil**, regulations were developed to promote fibre-optic based infrastructure deployments. Lack of long-distance telecommunications infrastructure, also known as 'backhaul' is one of the key challenges in bringing connectivity to rural and remote communities. To address this, ANATEL employed two regulatory strategies: 'obligations to do' and 'universalization credits', that are held by public switched telephone network (PSTN) incumbents in accordance with the "General Plan of Universalization Goals for the Fixed Switched Telephone Service Provided in the Public Regime (PGMU)"[155]. The 'obligations to do' are sanction modalities that can be applied cumulatively, with or without a fine penalty, if the competent authority observes, by applying criteria of convenience and opportunity, that the imposition of a certain conduct or its abstention, will provide a more appropriate and reasonable solution to the achievement of the public interest. Criteria of legality, reasonableness, proportionality, and economics must be observed in the application of 'obligations to do'. The 'PGMU universalization credits' are a set of obligations negotiated with service providers in exchange of other types of mandatory regulatory dispositions. These initiatives are of a regulatory nature and can also be considered by other countries[156].

The objective of the "Large-scale deployment of digital infrastructure on the territory of **Bulgaria**" project, referred to in section 3.2 of this report, is to support the deployment of very high capacity networks (VHCN), including 5G connectivity, with a focus on less populated and remote rural areas.[157] In **India**, there is a project to extend fibre-optic cable connectivity to all 260 000 village administrations[158]. There is also under this scheme, a provision to extend connectivity to 380 000 nearby villages, using fibre-optic cable or alternative technologies. Approximately USD 5 billion has already been spent on this project, and there is a proposal for further expenditure of approximately USD 16 billion over the next ten years.

Digital subscriber line (DSL): DSL technology can be used over existing telephone lines to provide broadband connectivity in areas where laying new cables is not feasible.

Power line communication: Using electrical power lines for communication can be an option in areas where power infrastructure is more readily available than dedicated communication infrastructure.

Due to the lack of reliable and accessible ICT infrastructure caused by the absence of electricity the digital divide is growing in rural areas, a study by ITU aims to assist Member States in upgrading their networks by integrating modern and energy-efficient technologies such as wireless electricity and power line communications[159].

An Internet exchange point (IXP) improves traffic flow and helps people get cheaper, faster, and better Internet service[160].

C. Emerging technologies

Internet of things (IoT): Implementing IoT devices can aid in various sectors such as agriculture, healthcare and infrastructure monitoring, improving efficiency and quality of life.

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155 PGMU – Plano Geral de Metas de Universalização (General Plan of Universalization Goals)
156 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0241/ from Brazil
157 ITU-D Document https://www.itu.int/md/D22-SG01-C-0304/ from Bulgaria
158 ITU-D Document https://www.itu.int/md/D22-SG01-C-0393/ from India
159 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0081/ from BDT
160 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0094/ from Internet Society

Renewable energy: Implementing renewable energy sources can address power supply challenges. Solar-powered communication systems, for instance, can be effective in remote locations.

TV white spaces (TVWS): Utilizing unused portions of the TV spectrum for Internet access can be beneficial, especially in rural areas. A case study done by **International Chamber of Commerce** shows that because TVWS are in lower band frequencies, signals can travel over longer distances and penetrate numerous obstacles, making it useful in remote areas where the topography can obstruct other fixed wireless access (FWA) technologies that rely on clear lines of sight from the base station to the antenna[161]. On the other hand, some other spectrum sources, available from different parts of radio spectrum, could be made usable for provision of mobile broadband wireless access services for urban and rural areas. Such a study was carried out by **South Africa** in using the complementary bands, IMT700, IMT800, IMT2600 and IMT3500[162].

In addition to these complementary bands, it has been recommended by the **African Telecommunications Union**, that policymakers could also consider permitting voluntary spectrum trading between market actors, so that a market player focused on serving a rural segment could acquire the necessary spectrum, that may be unused by the original licensee, whose strategic plans may not include rural network deployment[163].

Cognitive radio technology can then be used to allow sharing of geographically unused spectrum allocated to the TV broadcasters, and ensuring that no harmful interference is caused to the incumbent operation of TV broadcasting.[164]

D. Community involvement and education

Involving local communities in the planning and implementation processes is essential for the success and sustainability of technology initiatives.

A contribution from **Madagascar**, indicates that capacity building is necessary for the population groups who will use these technologies on a daily basis[165].

The National Broadcasting and Telecommunications Commission of **Thailand** concluded that, in long term development, remote infrastructure with digital services does not guarantee the expansion of user adoption of broadband Internet services in the area[166]. In order to attain community involvement and education, electronic citizen service centres have been deployed in **Syrian Arab Republic**, with the aim of reducing the burden on citizens, by providing various services within the same place[167]. In **Uganda**, rural and remote households were provided with grid and solar-powered smartphone devices. The devices are loaded with a one-time 6-month start-up data subscription. Positive transformations in the following key criteria were noted: educational empowerment, economic upliftment, communication enhancement, health and information access[168].

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161 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France
162 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0115/ from South Africa
163 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0010/ from Ericsson
164 ITU-D Document https://www.itu.int/md/D22-SG01-C-0435/ from ITU-APT Foundation of India
165 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0029/ from Madagascar
166 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0186/ from Thailand
167 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0199/ from Syrian Arab Republic
168 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0246/ from Uganda

E. Government and NGO initiatives:

Governments and non-governmental organizations can play a crucial role in funding and supporting technology projects in remote areas, as well as in harnessing innovative technologies such as IoT, AI, and renewable energy solutions, to enhance the efficiency and effectiveness of integration and implementation of emerging technologies in rural and remote areas.[169]

In this context, the WISE project in **Senegal** is a good example of a government and NGO initiative[170]. Like many other African countries, the Government of **Republic of Chad**, has embraced ICTs in order to compensate for some of the country's infrastructural shortcomings and thereby achieve profitable economic integration[171].

To leverage telecommunications/ICT to build an inclusive society benefitting disadvantaged groups in Kenyan society, including women, youth, and persons living with disabilities, the Government of **Republic of Kenya**[172], aided by its national USF, is working to facilitate accessibility and inclusivity, through availing of e-agriculture content, and leveraging of the existing digital infrastructure. Though intended to be a nation-wide programme, priority has been given to rural areas.

As part of the strategy for universal connectivity in the **Dominican Republic**[173], Indotel is executing a plan for the expansion of connectivity for the digital transformation in the country, with USD 115 million in financing from the Inter-American Development Bank (IDB). In order to stimulate high-speed access in rural and remote areas of **Burundi**, where commercial incentives for network expansion are insufficient to encourage investment, a project entitled "Project of the Government of Burundi to support the foundations of the digital economy" has been launched[174]. In terms of integration and implementation of emerging technologies in rural and remote areas, in the context of government and NGO Initiatives, the rural mobile infrastructure operator (RMIO) model of **Peru** could be considered as another good example[175]. A RMIO is a telecommunications model specifically oriented to reach small communities, in isolated rural areas, for both voice and data services. A project to look into the current digital divide in the northwestern region of **Republic of Guatemala** was conducted in 2022, between the Government of **Rep. of Korea** and the Government of **Guatemala**, with assistance from the International Development Bank. The focus was on the four departments within the northwestern region where the digital divide is high[176].

This jointly coordinated project assisted Guatemala with ICT policies relating to rural and remote areas, as well as strengthening cooperation between the two countries, allowing sharing of knowledge and practices, to assist in reducing the digital divide in rural and remote areas of Guatemala.

Transparency can be an important aspect in the integration and implementation of emerging technologies. To promote increased transparency, the National Telecommunications and Information Administration (NTIA) in the **United States**, created a funding database for the

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169 https://utilitiesone.com/transforming-rural-areas-infrastructure-development-in-remote-regions
170 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0149/ from Senegal
171 ITU-D Document https://www.itu.int/md/D22-SG01-C-0303/ from Chad
172 ITU-D Document https://www.itu.int/md/D22-SG01-C-0316/ from Chad
173 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0116/ from Côte d'Ivoire
174 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0210/ from Burundi
175 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0026/ from Rep. of Korea
176 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0230/ from Rep. of Korea

public to consult online regarding the issuance of 'Internet for All' grants, according to State/Territory in the United States[177]. This allows the public to know where funds are directed, the status of projects, and amounts expended.

The integration and implementation of emerging technologies in rural and remote areas has immense potential to bridge the digital divide, foster economic growth, and improve quality of life, yet the path forward is paved with both challenges and opportunities. Wireless communication solutions, such as 5G, 6G and LEO satellite networks, and HAPS have emerged as viable options to overcome geographical barriers, offering scalable connectivity where traditional infrastructure falls short. Meanwhile, wired communication, through fibre-optic expansions, remains an indispensable for reliability and speed, though its deployment is often hindered by high costs and difficult terrain in remote regions. Emerging technologies, including AI-driven network optimization, and solar-powered base stations, further enhance these efforts by improving efficiency and sustainability, and tailoring solutions to the unique needs of rural and remote areas.

In addition to these technological advancements, supplementary administrative measures are needed. Community involvement and education are critical to ensuring adoption and long-term success and sustainability. Local engagement, through training programmes and workshops, improve the ability of people to leverage these tools effectively and efficiently. To achieve this, government and NGO initiatives play a key role by providing the necessary funding, policy frameworks, and public-private partnerships to offset economic constraints, and accelerate deployment. Examples similar to the various projects that are outline above or the universal service funds in various countries, illustrate how coordinated efforts can extend connectivity to the most isolated areas.

[177] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0247/ from United States

Chapter 4 – Business models for sustainable development of networks and service

This chapter focuses on improving telecommunication access in rural and remote areas, and covers issues such as the increasing availability of cost-effective connectivity, the role of complementary access and village networks in line with national regulations, the affordability of services and devices, and the effective use of universal service funds in rural and remote areas. The approaches presented, collectively aim to bridge the digital divide and ensure broader digital inclusion, and the issues are examined in this chapter, under relevant subheadings.

4.1 Increasing availability of telecommunication that provide enhanced connectivity at lower costs

The optimum solution for connectivity does not lie with one technology alone, but through a combination of multiple technologies. The growing availability of telecommunications infrastructure has revolutionized connectivity, increasing access to high-speed Internet and mobile services, while improving affordability for a broader population. Despite these advancements, challenges remain in fully addressing the needs of all rural communities.

Providers need to find innovative approaches to connectivity infrastructure that address the inherent risks involved in building and sustaining costly network infrastructure. Partnership models which bring together the private sector and the public sector, investment banks, and local NGOs have proven successful.

In the **Dominican Republic**[178], Indotel is implementing a plan for the expansion of connectivity for digital transformation in the country, with USD 115 million in financing from the IDB. It is expected that by 2026, 64 urban locations, with low to medium population density, will have an access network based on fibre to the home (FTTH) infrastructure. The number of beneficiaries is estimated at 144 973. Additionally, the biennial Project Plan of the Telecommunications Development Fund, of Indotel for 2021-2022, "Connecting the Unconnected", has implemented an 'Access and Infrastructure' component of the plan through the installation of nine Internet satellite kits for eight communities. These kits served as the basis for implementing a wireless Internet access network using Wi-Fi 5 (802.11ac) technology. The Internet kits were provided by Starlink pursuant to its obligations under the concession agreement between SpaceX and INDOTEL.

In **Peru**[179] Telefonica, Facebook, and two regional development banks, IDB Invest and CAF, collaborated together to create IpT Peru, a rural mobile infrastructure operator (RMIO). This initiative introduced a new business model that had a different risk investment profile and lower return on investment (RoI) requirements.

[178] ITU-D Documents https://www.itu.int/md/D22-SG01.RGQ-C-0166/ and https://www.itu.int/md/D22-SG01.RGQ-C-0167/ from Dominican Republic

[179] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France

The RMIO model is an infrastructure-sharing approach, to deploy and operate network facilities in rural areas and locations of special social interest, designated by the Government of Peru. RMIOs provide wholesale services to mobile network operators (MNOs) in areas where MNOs do not have a network. This approach helps to overcome challenges related to low return on investments in these regions.

As of November 2021, a total of seven RMIOs have been providing wholesale services, in rural and remote areas, to MNOs in Peru, with Mayu Telecom being the first RMIO to start services in 2016.

The typical technologies used by RMIOs include microwave and satellite for backhaul, and satellite for access networks. Mayu and IPT, two RMIOs operating in Peru, initially relied on satellite technology to deploy their networks. However, as these operators expanded, they faced significant cost issues associated with satellite technology. As a result, both Mayu and IPT are now moving toward mobile technology due to apparent cost issues[180]. The main challenges faced by RMIOs are: high loss rates due to poor signal quality, antenna misalignment or external interference, high tower costs mainly when they are needed to overcome the height of the trees (30-40m), high transportation costs due to the lack of roads, unreliable power and difficult network management, and high costs to repair faults.

In the **United States**[181], the Digital Invest programme, led by the United States Agency for International Development (USAID), is a blended finance initiative that partners with impact-focused private sector companies, including investment fund managers, and Internet infrastructure developers, to expand Internet connectivity, and digital financial services in underserved communities in emerging markets.

To date, USAID has leveraged an initial USD 8.45 million in United States government funding to support Digital Invest partners in mobilizing an estimated USD 500 million in investment capital. These partners have raised over USD 300 million, and have invested in 68 ISPs and fintech companies across 40 countries. As a result, these companies have raised an additional USD 1.2 billion in financing from external investors. Through this programme, USAID partnered with Roke Telkom, to develop fixed wireless infrastructure and provide affordable wholesale services in 12 under-connected districts across Uganda. In Yumbe, one of the target districts, this initiative has expanded Internet coverage to over 200 000 people, including residents of Bidi Bidi refugee settlement, while also enabling other ISPs to use the infrastructure, fostering competition and lowering consumer prices.

In **Ghana**, where 30 per cent of the population live in rural areas with limited or no connectivity, several initiatives, through a combination of public-private partnerships, have been implemented to improve access to mobile networks and ICTs.

These initiatives include, a tripartite co-operation model involving the Ghana Investment Fund for Electronic Communications (GIFEC), mobile operators and private investors to optimize capital expenditure (CAPEX) and operational expenditure (OPEX), and the deployment of UMTS 900 rural star technology, the installation of sites powered by solar and grid electricity, the deployment of 500 sites within three years, and another 2 016 sites to provide coverage to 3.4 million people in Ghana, the development of community information centres (CICs)

[180] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0026/ from Rep. of Korea
[181] ITU-D Document https://www.itu.int/md/D22-SG01-C-0423/ from the United States

to provide rural communities with access to government information and services, and the authorization of 4G deployment in rural areas using the 800 MHz frequency band.

The mobile industry continues to seek new and innovative means to finance and deploy broadband technologies in new areas. From lighter, easier-to-install mobile towers and solar powered equipment, to the deployment of open-source virtual networks to improve network coverage in the **Sub-Sahara Africa region**, Orange Middle East & Africa, uses lighter mobile towers that are easier to install, and solar-powered equipment that consumes less energy and is easier to upgrade to 3G + / 4G. In addition, Orange is partnering with medium earth orbit satellite providers to help connect landlocked countries, and is part of the Africa submarine cable consortium. In **Cameroon,** the **Democratic Republic of the Congo, Côte d'Ivoire, Republic of Liberia, Burkina Faso,** and **Madagascar**[182], Orange partnerships with Africa Mobile Networks (AMN), Vanu, and NuRAN made it possible for people across the Sub-Sahara Africa region to connect to the Internet for the first time, while the deployment of more than 700 operational sites in Cameroon and the Dem. Rep. of the Congo, has enabled two million inhabitants to access digital mobile services, from voice and data, to financial services.

6G aims to bridge the digital divide by providing ubiquitous connectivity, addressing global connectivity challenges, and supporting the sustainable development goals (SDGs) of the United Nations. Approved by ITU for India in June 2023, 6G seeks to extend reliable broadband coverage to rural and remote areas, connecting billions of unserved or underserved people. This advancement could revolutionize businesses and industries through high-quality connectivity for both people and IoT[183].

For many service providers, fixed wireless access (FWA) represents an alternative for achieving operational savings and optimizing CAPEX, as it deploys lower upfront costs, and lower costs per home compared to fibre-optic networks. As a comparison, Norway offers subsidies for FWA-connected rural homes of approximately USD 1 000, while Sweden has provided subsidies for fibre-optic connected rural homes that are five times higher, at approximately USD 5 300. Additionally, service providers can achieve a faster coverage, and reuse mobile infrastructure. Among emerging markets with 5G FWA launches, Reliance Jio in **India** recently committed to connecting 100 million homes and SMEs with 5G FWA.[184]

As an extension to terrestrial networks, satellite and high altitude platform stations (HAPS) in various orbital altitudes, can provide affordable connectivity in remote locations where traditional networks are impractical. This option was used in 21 states in **Federal Republic of Nigeria** with 500 rural sites deployed, providing 2G and 3G connectivity to 1.5 million people.

As indicated in Resolution 37 (Rev. Kigali, 2022), among terrestrial, stratospheric and space services, HAPS is an example of a stratospheric service that contributes to bridging the digital divide. High altitude systems are uncrewed aircraft that fly or float in the stratosphere, typically at altitudes of around 20km. They could be high-altitude free-floating balloons, dirigibles, or powered fixed-wing aircraft that use either solar power or an on-board energy source. Much closer to the earth than a satellite, a HAPS platform can project smaller beams onto the ground from a directional antenna, increasing the capacity delivered per unit area. The White Paper

[182] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0203/ from GSMA and Orange
[183] ITU-D Document https://www.itu.int/md/D22-SG01-C-0435/ from ITU-APT Foundation of India
[184] ITU-D Document https://www.itu.int/md/D22-SG01-C-0426/ from Ericsson, Sweden

published by **GSMA**[185] summarises several use case scenarios, such as greenfield coverage, white spot reduction, emergency communications and disaster recovery, connectivity for urban air mobility and extended coverage over the sea. The **HAPS Alliance**[186] contribution provides basic information on HAPS, as well as an account of technological progress in the HAPS industry,[187] and regulatory recommendations for governments in implementing appropriate HAPS regulations within their national frameworks.[188].

Amazon[189] notes the benefits of non-geostationary satellite orbit (NGSO) technology in bridging the digital divide, and particularly of low earth orbit (LEO) satellites that provide high quality broadband connectivity to underserved people around the world, including in rural and remote communities. Amazon recommends several measures that governments can adopt to support LEO satellite network deployment including:

1) Simplifying regulatory processes for NGSO satellite services.
2) Implementing general authorization and blanket licensing regimes for customer terminals and network gateways.
3) Creating transparent and predictable regulatory regimes.
4) Preserving spectrum allocations for the fixed satellite service (FSS) and mobile-satellite service (MSS).
5) Adopting satellite regulations that promote competition and technology neutrality.
6) Adopting a reasonable administrative fee structure for the issuance of licences and authorizations for the provision of satellite services.
7) Licensing and authorizing of satellite communications providers and operators on a non-discriminatory basis.

In the **Arctic region**[190], a technical solution to difficulties posed by the physical environment involved using a LEO connection as backhaul to the network, which was then distributed throughout the community over a mobile network.

To deploy backbone infrastructure, there are several options available, with each option suited to different environments and needs. In **Brazil**[191], a fibre-optic based backbone to isolated urban centres and frontier cities in the Amazon region, is being constructed with minimal environmental impact, by submerging the cables in river beds. The network extends 14 596 kilometres and serves 10 million people.

4.2 Complementary access and village connectivity networks in accordance with national regulations

Administrations could also help village connectivity networks through various regulatory measures including spectrum licensing conditions, facilitating site permits, allowing the use of state-owned assets, such as utility poles and reliable power sources, and permitting location of

[185] High Altitude Platform Systems: Towers in the Skies (Version 2.0 https://www.gsma.com/futurenetworks/resources/high-altitude-platform-systems-towers-in-the-skies-version-2-0/
[186] ITU-D Document https://www.itu.int/md/D22-SG01-C-0402/ from Softbank, Japan
[187] Unlocking the Potential of the Stratosphere (Q2 2024) (https://hapsalliance.org/pitch-deck/)
[188] Creating an Enabling Regulatory Environment for HAPS Deployment (May 2024) (https://hapsalliance.org/publications/)
[189] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0095/ from Amazon, United States
[190] https://www.itu.int/dms_pub/itu-d/oth/07/31/D07310000040036PDFE.pdf
[191] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0241/ from Brazil

radio and antenna towers, as well as microwave links, for example near government buildings on secure campuses. Policymakers could also permit network operators to enter into co-operation agreements, allowing them to share passive infrastructure elements, particularly in sparsely populated and remote areas.

One of the most critical measures to increase complementary access and village connectivity networks is the strategic management and allocation of spectrum through well-defined licensing conditions. As stated by **Ericsson, Huawei, Nokia, and Zte** for the **African Telecommunications Union (ATU)**[192], it is worth considering that spectrum licensing conditions can be tweaked to facilitate and accelerate rural connectivity, including the use of technology neutral spectrum, making spectrum bands available for microwave backhaul, voluntary spectrum trading between market actors, promoting the coexistence and cooperation of terrestrial and multiorbital infrastructure, and consideration of specific spectrum licensing conditions with obligations to drive rural network deployment. Affordable broadband connectivity can also be achieved by leveraging unlicensed spectrum, such as unused TV VHF/UHF bands, while improving energy efficiency to reduce infrastructure costs. Lower-band spectrum, including unlicensed sub-1GHz and unused TV channels, is particularly well-suited for rural and remote areas due to its ability to cover vast distances in sparsely populated regions.

Policymakers in different countries have used imaginative approaches to encourage and improve rural coverage in licensed spectrum:

- In **Kenya**, the formula for payment of usage fees for spectrum used for backhaul includes a 50 per cent discount for sites in remote areas (north of a specific marked line.)
- In **Romania**, a variant of the clock auction procedure for the 800/900/1 800/2 600 MHz spectrum has been used. Obligations were put in place to cover hundreds of rural regions divided-up amongst the 800/900 MHz winners, based on the number of blocks won. Some scope was provided for winners to choose coverage regions, provided that none were ultimately excluded.
- In **Federal Republic of Germany**, the 800/2 100/2 600 MHz auction restricted the use of 800 MHz blocks in urban areas until coverage obligations in rural areas were fully met. The 800 MHz operators shared the rural rollout obligations.
- In **Republic of Colombia**[193], Anditel received strong support from the ICT Ministry and the national spectrum regulator, ANE, which put in place a regulatory framework to enable unlicensed, secondary access to vacant TV channels in the UHF band, known as television white space (TVWS). Using this TVWS technology, Anditel offers a cost-effective last mile connectivity solution that can provide long-range coverage in rural and remote areas.
- In **Brazil**[194], obligations related to the 5G frequencies auction, which took the form of a non-fundraising auction were imposed. It is expected that a total of 5.7 million people will gain access to mobile communications.

Another innovative use of spectrum involves fixed wireless access (FWA). FWA delivered over 4G or 5G is an increasingly cost-efficient broadband alternative in areas with limited availability of fixed services such as digital subscriber line (DSL), cable, or optical fibre. The increased capacity, made possible by larger spectrum allocations and advancements in 4G and 5G technologies, enhances network efficiency, and reduces the cost per gigabyte. For instance, in 2019, MTN

192 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0010/ from Ericsson
193 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France
194 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0241/ from Brazil

South Africa[195], in partnership with Ericsson, launched an FWA service to complement its fibre-optic offering, that was sold through MTN commercial channels and external ISPs.

In **Madagascar**, the 800 MHz frequency band will be used to deploy 4G in rural areas. This frequency band is particularly well suited for rural coverage due to its ability to cover greater distances. This makes it ideal for reaching remote villages, which can be spread over more than a dozen kilometres.

Additionally, the regulator adopted a new policy of allowing all operators to deploy optical fibre for their transmission network. This will help to increase the bit rate and thus improve the quality of service provided to users. The regulator is also considering several options, including:

- Expansion of authorized services for operators through the creation of a "GLOBAL" licence that will allow operators to offer other services, and further boost competition that will be beneficial for rural areas.
- The ongoing improvement of the use of the Telecommunication/ICT Development Fund, this time by introducing a "Pay or Play" mechanism for operators. Two per cent of their turnover is collected to finance this fund. The project consists in either paying operators to deploy sites, or they themselves deploy the sites identified by the administration, and the contributions they would otherwise pay to the fund are waived.[196]

Community networks (CNs) leverage various technologies to establish local Internet conditions, with equipment generally more affordable that that used by commercial Internet service providers (ISPs). This affordability, combined with the smaller scale and local nature of CNs, makes them economically sustainable. They also often use renewable energy, such as solar power, enhancing their environmental sustainability. However, CNs face some barriers such as access to funding mechanisms, to appropriate licensing, and to spectrum. In **Georgia**[197], the Tusheti region is connected to a CN that provides an unprecedented level of connectivity. The ISOC 2018 report, "Connecting Tusheti" details how an enabling regulatory environment was key to the CN's success. The Tusheti project benefits from a liberal communications environment and variety of state support mechanisms. It does not need a licence to use wireless spectrum, and does not need any permissions to set up a community Wi-Fi network, or to operate as an Internet service provider (ISP). A simple online "general authorization" is all that is required.

In **Brazil**, to address the lack of backhaul connectivity, ANATEL has employed two regulatory strategies: "obligations to do" and "universalization credits" held by public switched telephone network (PSTN) incumbents in accordance with the "General Plan of Universalization Goals for Fixed Switched Telephone Service Provided in the Public Regime (PGMU)". These strategies aim to connect 2 188 rural communities, potentially benefiting a total of 5.2 million people when fully implemented.

- Obligations to Do are sanctioning measures that may be applied alongside or independently of fines when the competent authority deems that enforcing or refraining from a certain action will better serve the public interest.
- PGMU universalization credits are a set of obligations negotiated with service providers in exchange for other types of mandatory regulatory dispositions. For example, the latest PGMU established by Decree no. 10 610/2021 consists in the obligation of fixed telephony concessionaires to implement a fibre-optic transport network (backhaul) in

[195] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0078/ from International Chamber of Commerce, France
[196] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0029/ from Madagascar
[197] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0094/ from Internet Society

municipalities, villages, isolated urban areas, and rural agglomerations that do not yet have such infrastructure until 31 December 2024, in exchange of lifting other outdated obligations

4.3 Affordability of services/devices for rural and remote areas

There are significant challenges in providing broadband access in rural and remote areas because of the low average revenue per user, high capital costs, and operation expenditures.

As stated by **Ericsson, Huawei, Nokia** and **Zte**, rural connectivity faces two main challenges: high deployment and maintenance costs, and low average revenue per user (ARPU). To address these issues, cost-efficient solutions are essential. Utilizing existing mobile network infrastructure and assets can help reduce costs. Economies of scale from global standards also lower coverage expenses and mobile device costs, while promoting roaming benefits across rural and urban areas.

The cost of smartphone devices has fallen significant. However, as reported by Sonatel[198], in **Africa**, prices of 5G terminals remain prohibitively high, and availability is insufficient to develop a true ecosystem despite the launch of pilot projects in several countries. In eight of the twelve countries surveyed by the GSMA, handset cost was the single most important reason preventing respondents from adopting mobile Internet. Along with the handset costs, other costs such as fees and taxes directly impact the final price. For example, the Government of **Republic of Rwanda**[199] offers tax exemptions on low-cost handsets in an effort to drive device affordability. In Africa and in the Middle East region, Orange has worked with Google to commercialize the Sanza Touch phone, sold for the equivalent of USD 30.

Morey, a **Republic of Zambia**[200]-based initiative, aims to make smartphones and laptops more accessible and affordable for low-income individuals, especially those in rural areas. By partnering with Chinese manufacturers and offering flexible payment options such as "Buy Now, Pay Later" (BNPL) and government-backed credit lines, Morey enhances access to essential technology, supporting education, entrepreneurship, and digital inclusion. Morey seeks to reduce device costs by 30 per cent, establish local assembly plants, and aims to expand to 500 retail stores by 2025, ultimately driving economic growth and digital accessibility across Zambia and beyond.

Device financing is also gaining traction, particularly in the Sub-Sahara Africa region, bringing together mobile operators, finance providers, remote locking technology companies, and others. For example, Safaricom in Kenya[201], in partnership with Google, was the first operator to scale with its Lipa Mdogo financing scheme, and now has 500 000 active customers paying for their handsets in instalments.

In **Uganda**[202] there is a proposal to develop a coordination mechanism between government, the private sector, and civil society organizations to provide ICT devices.

198 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0016/ from ITU-T SG3
199 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0203/ from GSMA and Orange
200 ITU-D Document https://www.itu.int/md/D22-SG01-C-0416/ from Huawei Technologies, China
201 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0203/ from GSMA and Orange
202 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0043/ from Uganda

Some efforts, such as infrastructure sharing, are directly undertaken by the industry to reduce deployment costs. **GSMA**[203] highlights the success of Internet para Todos in Peru (IpT), a wholesale network operator backed by Telefónica del Perú, Meta, BID Invest, and CAF to connect rural towns in **Peru** with 4G mobile Internet. IpT uses an open and innovative model with radio access network (RAN) sharing, network virtualization, and automation to provide wholesale rural broadband infrastructure.

There is a correlation between passive infrastructure sharing and 4G coverage. In **Zimbabwe**[204], operators, in order to extend reach, and save costs, increasingly share towers through swap arrangements and leasing. A total of 1 058 towers are shared.

In **Zimbabwe**, the increased construction of ICT community information centres in all provinces, is being carried out to help marginalised members of communities to access ICT services. To date, 169 such centres, have been set up to meet the needs of communities in order to access both social and commercial services, as well as to market their goods and services.

4.4 Effective use of universal service funds

Many governments the use universal service funds to expand telecommunication networks, into underserved and rural areas.

In **Argentina**[205], ENACOM utilizes the Universal Service Trust Fund to approve projects aimed at reducing the digital divide by deploying infrastructure in unprofitable areas for licensees. The Mobile Communication Services Access Network Deployment Programme was established to finance mobile network deployment in regions where fixed networks are inefficient. This approach offers cost-effective and widespread coverage in remote areas. An innovative aspect of the programme allows companies to finance their projects by deducting costs from their monthly contributions to ENACOM. Additionally, project awardees must provide automatic roaming for voice and data to other ICT licensees, at no extra charge for two years. The programme initially targeted localities with up to 500 inhabitants, not covered by existing mobile service obligations.

In **Tanzania**[206], there are two main models where USF are used:

- provisioning of smart subsidies, which is normally done for construction of telecommunication towers where the fund covers up to 40 per cent of the operator's CAPEX, and
- financing of a specific project as well as coverage for operations costs for a stated period, for example in the case of a project allowing users free Wi-Fi for an initial 30 minutes with the user required to top-up using their own money after expiry of the initial 30 minutes.

In 2021, the Government of **Egypt**[207] launched the Decent Life initiative for rural and remote areas, and comprising approximately 5 000 villages, which committed under the initiative to be connected through fixed, wireless broadband within three phases from 2021 to 2024. The project aims to serve more than 4 500 villages, representing 99 per cent of rural area, with broadband based on fibre to the home (FTTH) technologies that can offer suitable telecommunications

[203] ITU-D Document https://www.itu.int/md/D22-SG01-C-0327/ from GSMA and Telefonica, Spain
[204] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0034/ from Zimbabwe
[205] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0076/ from Argentina
[206] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0085/ from Tanzania
[207] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0018/ from Egypt

services in the short and medium terms. The required financial investments are expected to be comprised of EGP 24 billion from government funds, EGP 6 billion from universal service funds, and EGP 30 billion from private capital and revenue-based financing sources.

In **Ghana**[208], the Electronic Communications Act, (Act 775) 2008, gave legal backing for the establishment of the Ghana Investment Fund for Electronic Communications (GIFEC), as an agency under the Ministry of Communications, to facilitate the provision of universal access to basic telephony for the unserved and underserved communities in the country. The scope of operations of GIFEC, as enshrined in section 32 of Act 775, mandates the organisation to facilitate the implementation of universal access to electronic communication, and the provision of Internet points of presence in underserved and unserved communities, to facilitate capacity building programmes and the promotion of ICT inclusion in the unserved and underserved communities, and the deployment of ICT equipment to educational, vocational, and other training institutions. Ghana has committed EUR 155 million to supplement universal service funds to boost voice and data services in rural areas and reduce the digital divide.

Some countries have incorporated mechanisms into their USF frameworks to promote the development of CNs and improve connectivity in underserved areas. **Argentina**,[209] has adopted a framework which created USF mechanisms to incentivize the adoption of a community network licence, and with the use of the fund to help establish connectivity providers in underserved communities. Similarly in **Kenya**[210], where a community network operators licence was recently created by the national regulatory authority, the USF strategy 2022-2026, is now looking into financing mechanisms to support these networks and other complementary connectivity providers

In **Zimbabwe**[211] the USF has expanded its scope through the Universal Service Fund Trust innovation programme, known as the "Innovation Drive." This initiative aims to identify, support, and empower ICT innovators in Zimbabwe, helping them turn their ideas into viable solutions for both local and global markets. The Innovation Drive provides funding for the procurement of tools and equipment for "Innovation Hubs" in government and public institutions. Notably, hackathons held in 2022, have generated several promising solutions.

In **India**[212], various projects have been funded through the USF, such as the BharatNet project which involved the deployment of undersea cable to provide high speed network connectivity along the islands of Andaman and Nicobar and the Lakshadweep archipelagos, installation of mobile towers and satellite connections to ensure last mile connectivity in the uncovered remote regions and villages of the islands, and financial support to promote an ecosystem for research and design in the telecommunications field.

In **Algeria**,[213] in 2022, a programme was established to conduct a nationwide census, covering all areas, including those classified as white zones with no telephone or Internet network coverage, or with only 2G mobile network coverage, and with populations of less than 2 000. This programme resulted in the identification of a list of 1 400 areas across the country for the provision of mobile network coverage under the universal service programme.

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208 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0027/ from Ghana
209 https://enacom.gob.ar/multimedia/noticias/archivos/202106/archivo_20210625022117_4017.pdf
210 https://www.ca.go.ke/sites/default/files/CA/Universal%20Access/Draft-USF-Strategic-Plan-2022-2026-.pdf
211 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0041/ from Zimbabwe
212 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0206/ from India
213 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0160/ from Algeria

In **Uganda**[214], the Uganda Communications Commission's Universal Service and Access Fund subsidy programme aims to expand broadband connectivity in underserved and unserved areas by supporting telecommunication infrastructure development. By subsidizing tower construction costs for tower companies, the programme reduces financial barriers for mobile network operators (MNOs), encouraging them to extend coverage to economically unviable regions, aligning with the Uganda National Vision 2040, and serving as a model for similar global initiatives.

By implementing universal telecommunications services, **China**[215] has made significant progress in rural information infrastructure, with 5G coverage in every county, and broadband access surpassing urban levels in some areas. By the end of 2023, rural Internet users reached 326 million, with a penetration rate of 66.5 per cent, while rural broadband users grew by 8.8 per cent to 192 million, outpacing urban growth. Expanding rural network applications, including e-commerce and 5G-powered smart tourism, is boosting the rural economy, exemplified by Xijiang Qianhu Miao Village, which saw a 532.5 per cent increase in tourism revenue during the 2023 Spring Festival.

In **Brazil**[216], FWA deployment could be encouraged through local funding, such as the Telecommunications Services Universalization Fund (FUST), and through investment coverage obligations from a 5G auction. Potential FWA projects could, for instance, leverage up to USD 860 million in loans from the Universalization Fund by 2026, for connectivity projects in rural regions or shanty towns (favelas) covering infrastructure and FWA customer premises equipment (CPE).

214 ITU-D Document https://www.itu.int/md/D22-SG01-C-0430/ from Uganda
215 ITU-D Document https://www.itu.int/md/D22-SG01-C-0407/ from China
216 ITU-D Document https://www.itu.int/md/D22-SG01-C-0426/ from Ericsson, Sweden

Chapter 5 – Integration and promotion of Internet applications for rural and remote areas

As the Report on Question 5/1 for the 2018-2021 study period highlighted, e-applications and e-services for rural and remote areas are key for development, as they give people in these areas access to numerous services, including social, agricultural, health, financial, and government services.

This chapter will provide examples of such applications, focusing on their relevance to rural and remote communities, and on their use and accessibility, and also discusses recent developments and challenges.

As discussed in the preceding chapters of this report, the success of digital services depends to a large extent on investments in the ICT sector,[217] and the provision of robust and reliable broadband connectivity, coupled with reliable and affordable last-mile access.

Relevant e-applications and e-services discussed in this chapters include:

- e-commerce applications (section 5.1)
- e-agriculture applications (section 5.2)
- e-learning applications (section 5.3)
- e-health applications (section 5.4)
- Detailed e-applications (section 5.5)

5.1 E-commerce

E-commerce applications form part of the foundation of a digital economy, together with digital financial services, and e-government services.[218]

E-commerce applications allow people living in rural and remote areas to gain access to markets at local, national and regional level. Internet and phone applications also give producers direct access to customers, without having to remunerate intermediaries. E-commerce applications also stimulate the income growth of rural users by creating new sources of revenues. Thanks to e-commerce applications in rural areas, the total retail sales of rural online sales in **China** have grown from CNY 353 billion in 2015, to CNY 2.17 trillion in 2022. In order to make applications more relevant for inhabitants of rural and remote areas, China has conducted an in-depth analysis of different online communities' characteristics and demands, and then developed and promoted Internet applications that are suitable for them.[219]

E-commerce applications can benefit a diverse range of enterprises and public institutions. The integrated e-commerce platform Tradata, developed in a hackathon supported by

[217] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0018/ from Egypt
[218] Ibid.
[219] ITU-D SG1 Documents https://www.itu.int/md/D22-SG01-C-0223/ and https://www.itu.int/md/D22-SG01-C-0407/ from China

the **Zimbabwe** universal service fund, is currently developing a business to business (B2B) procure-to-pay service that drives cost savings by digitizing, streamlining, and optimizing the procurement, supply, and logistics for enterprises, government, and small and medium enterprises (SMEs).[220]

The development of e-commerce applications requires a sound legal basis and the digitalisation of the financial sector. The **World Bank** Digital Development Global Practice, aids countries with their digital transitions, supporting regulatory reforms for the development of digital economy enablers. In Kingdom of Eswatini, for example, the World Bank has supported efforts by the Government to strengthen the legal foundations and institutional framework to facilitate electronic transactions, strengthen online consumer protection, and to enable digital and contactless payments.[221]

5.2 E-agriculture

In rural and remote communities, the agricultural sector employs a large majority of the population, mostly smallholder farmers.[222] 80 per cent of the world's poor live in rural areas, and work mainly in farming, and as the World Bank notes: for them agriculture is essential to raise income, improve food security and reduce poverty. Agriculture can impact the gross domestic product (GDP) of countries by to up to 25 per cent. At the same time, agriculture is vulnerable to climate change, and is responsible for about 25 per cent of greenhouse gas emissions. Digitisation is thus key for farmers to react, adapt and survive in an increasingly complex world, enhancing their productivity, making them more competitive and ultimately making the entire food system more resilient.[223]

The Government of **Kenya**, through its national USF is working to facilitate accessibility and inclusivity through availing of e-agriculture content, and leveraging on the existing digital infrastructure. The initiative currently targets, youth and persons living with disabilities. Though intended to be a national-wide programme, priority has been given to the rural areas.[224]

A report from **Haiti** about a successful pilot project conducted in 2020, in two municipalities described the establishing of multimedia centres in a pilot project (in 2020). These "BIEN centres" (*bornes d'inclusion à l'economie numérique*, or digital economy inclusion centres), facilitate access to essential services for inhabitants of rural and remote areas. BIEN centres also offered a platform where the inhabitants of rural and remote areas could commercialise their agricultural goods and services, receiving payment through MonCash, a mobile banking application supported by Digicel and Sogebank. Due to the security situation, the pilot project had to be discontinued, although the BIEN centres proved useful to the inhabitants and improved their economic and financial situation.[225]

Haiti has also shown that ICTs are a vital part of online trade, and contribute to strengthening the economy for women in rural and remote areas.[226] This has been illustrated through specific case studies of individual women.

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220 ITU-D SG1 Document https://www.itu.int/md/D22-SG01.RGQ-C-0041/ from Zimbabwe
221 ITU-D Document https://www.itu.int/md/D22-SG01-C-0070/ from the World Bank
222 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0043/ from Uganda
223 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0111/ from GSOA
224 ITU-D Document https://www.itu.int/md/D22-SG01-C-0316/ from Kenya
225 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0023/ from Haiti
226 ITU-D Document https://www.itu.int/md/D22-SG01-C-0306/ from Haiti

The **Azerbaijan** Rural Women's Association (ARWA) has organised basic ICT skills training for rural women farmers and entrepreneurs since 2021, focusing on practical skills that are immediately applicable, such as accessing the Internet, using smartphone applications, advertising on social media, etc. Currently, 66 per cent of ARWA members possess digital skills and are actively mentoring other rural women. To date, 520 rural women have been trained. An assessment conducted by the project revealed that the groups empowered through this campaign have on average registered a 30 per cent increase in sales and a 20 per cent rise in profits.[227]

Uganda launched a nationwide e-agriculture portal for rural economic and social development, and specifically targeted smallholder famers in unserved and underserved communities[228]. At the centre of this portal, an integrated decision-enhancement service platform addressed the lack of decision-enhancement services along agriculture value chains. To ensure content quality, contents are validated and certified before they are distributed.

The platform is accessible through various channels and formats including through the web, as a mobile app, or through a toll-free number in five languages (English, Luganda, Runyakitara, Luo, and Swahili). Studies had shown that farmers had a preference for multi-formatted content in their local languages. A vocal platform provides for inclusive access by persons with disabilities, and people using 2G phones.

The experience in Uganda with the launch of an e-agriculture portal shows that:

- a coordinated approach among a variety stakeholders is necessary: the Ugandan platform was successful, as it managed to mobilize and address various actors including farmers, policymakers, extension workers, logistics providers, academia, and processors among others;
- there is a need for continuous capacity building among farmers and other value-chain actors: the lack of digital skills remains a challenge to the use of many e-agriculture services, and it continues to be necessary to use traditional media channels, such as TV and radio for awareness-raising, and digital interactive voice recording (IVR) call centres for training;
- there is a need to enhance farmers' access to smartphones, and to raise awareness about data security, as fears relating to cyber security can prevent users from using e-services; and
- there is a need to enhance the development of localised content in local languages.[229]

The e-agriculture services launched by **Orange** in eight African countries (Mali, Madagascar, Burkina Faso, Côte d'Ivoire, Republic of Botswana, Senegal, Republic of Guinea, and Dem. Rep. of the Congo) are examples of multi-partner approaches. These services, developed with NGOs, startups, and State partners, have attracted 800 000 active mobile users, and can even be accessed from low-cost feature phones with no Internet connection. The services help farmers to increase their income by reducing intermediaries, to sell products more easily via online marketplaces, to receive accurate weather forecasts and insure against climate risks, to receive orders and payments via their mobile phones, and to increase their productivity through advice on agricultural techniques[230].

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227 ITU-D Document https://www.itu.int/md/D22-SG01-C-0362/ from Azerbaijan
228 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0043/ from Uganda
229 Ibid.
230 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0203/ from GSMA and Orange, France

Results from **Cameroon** confirm how ICT tools contribute to improving agricultural knowledge and thus productivity. Mobile phones, community radios, and Web 2.0 applications were made available to over 300 farmers through the Nda'a Agricultural Days project. The initiative involved surveys to identify farmer needs, capacity-building workshops, and the dissemination of agricultural information. Results showed improved agricultural practices, greater adoption of organic fertilizers, enhanced knowledge sharing among farmers, and strengthened community engagement[231].

In order to function, e-agriculture services need at least basic connectivity, though broadband connectivity is obviously preferable. Cooperation between satellite operators and MNOs, as is the case, for example, in **Chad**, can help to provide digital agriculture services, including in remote rural areas.[232]

As the Global Satellite Operator's Association (**GSOA**) underlines, satellite connectivity can help to connect farmers in mountainous, rural and/or remote areas, and allow them to collect data gathered with mobile devices or Internet of things (IoT). Applications using these real-time data enable a better use of resources and fertilisers, a better monitoring of crops, disease and pest control, and better maintenance of agricultural vehicles, etc.[233]

The impact of satellite connectivity is evident in the use in **Bhutan** of the South Asia Satellite (SAS) to address two critical needs: (1) providing national TV and radio services to rural areas with no access to cable infrastructure, and (2) ensuring communications during disasters. The SAS network has been successfully leveraged for broadcasting, and in recent upgrades, TV and radio channels have been enhanced to high definition (HD). Additionally, SAS has been integrated into disaster management systems, with the ability to rapidly deploy communication services in rural and remote areas.[234]

There is a gap in the use of advanced digital technologies for agriculture or "Agriculture 4.0", as such technologies are mainly used on large farms.[235] However, improved connectivity, and access to agricultural and weather information can also benefit smallholder farmers.[236]

With increasing population coverage, and the decreasing costs of fixed broadband services in recent years, the contribution from **China** shows how rural digital applications are becoming increasingly diverse, with e-commerce (see section 5.1), and e-agriculture applications allowing integrated management of agricultural products, as well as smart monitoring, smart irrigation, and digital management of production equipment.[237]

A hackathon supported by the universal service fund[238] in **Zimbabwe**, demonstrated the diversity of digital agricultural solutions and their complexity, with platforms assisting farmers through the farming cycle, and providing crop-growing advice and tools to manage inputs, equipment, and finances, as well as crop disease diagnosis, soil diagnosis, and yield trackers. Intelligent e-agriculture equipment such as smart egg hatchers or automation solutions for greenhouse operations, were also considered.

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231 ITU-D Document https://www.itu.int/md/D22-SG01-C-0377/ from RIFEN
232 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0112/ from GSOA
233 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0111/ from GSOA
234 ITU-D Document https://www.itu.int/md/D22-SG01-C-0349/ from Bhutan
235 ITU-D Documents https://www.itu.int/md/D22-SG01.RGQ-C-0111/ and https://www.itu.int/md/D22-SG01.RGQ-C-0112/ from GSOA
236 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0112/ from GSOA
237 ITU-D Document https://www.itu.int/md/D22-SG01-C-0223/ from China
238 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0041/ from Zimbabwe

5.3 E-learning

E-learning breaks down time and space constraints, making it possible to learn anytime, anywhere, without being constrained by geographic location or time, which greatly improves the flexibility and convenience of education. In addition, e-learning also breaks down age limit concerns, so that people of different ages now have the opportunity to receive education. In this way e-learning can meet the diversified educational needs of society, and make the distribution of educational resources more equitable.

To ensure sufficient ICT services in rural areas, the Ministry of Communication, Information Technology and Media of **Burundi** launched a project to establish ICT clubs in schools. In addition to the usual ICT-related classroom learning, students participating in such clubs also have the opportunity to further their learning outside the classroom, which in turn they pass on to their households.[239]

China expanded the demand for digital applications in rural markets through in-depth analysis of the characteristics and needs of rural residents. E-learning services have been continuously extended to rural areas. As of June 2023, the number of rural e-learning users in China reached 67.87 million, with a penetration rate of 22.5 per cent.[240]

GSOA stressed the importance of satellite Internet in delivering high speed broadband to students and schools. E-learning allows students to catch up on missed classes when sick, or when they are unable to be present in the classroom due to lengthy commuting times, transport disruptions, etc. The greatest benefits from satellite broadband use in e-education are being observed in the Africa, the Middle East, and Asia-Pacific regions. The populations of these regions are young and are set to increase rapidly over the next decade. Moreover, in the Sub-Sahara Africa region, 60 per cent of the population remain unconnected (compared to 10 per cent in Europe). Considering the vast landmass of the Africa continent and the thousands of islands in Asia-Pacific, satellite is indispensable to the bridging of this connectivity gap.[241]

Intel Corporation (United States) highlighted the importance of broadband and digital programmes for education. According to UNESCO[242], digitally-based distance-learning is used to ensure educational continuity in most countries, and is also essential for the realization of all SDGs. Students need computers and broadband in schools, universities and homes for their education and digital skills. The contribution also provides examples of computer and broadband programmes for students and education (cf. Annex A).[243]

Kamaleon (Mozambique) highlights that e-learning enhances learning efficiency. Researchers conducted a comparative experiment where children between 10 to 16 years of age were provided with a school curriculum that was converted into digital format. When comparing this group to a similar age group of students that continued with the same school curriculum using the traditional teaching format, it was clear that students with access to e-learning learned much faster with digital tutorials. Digital tutorials can also be adapted to the needs of persons with disabilities, making learning experiences more inclusive.[244]

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239 ITU-D Document https://www.itu.int/md/D22-SG01-C-0054/ from Burundi
240 ITU-D Document https://www.itu.int/md/D22-SG01-C-0223/ from China
241 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0108/ from GSOA
242 https://www.unesco.org/en/articles/startling-digital-divides-distance-learning-emerge
243 ITU-D Document https://www.itu.int/md/D22-SG01-C-0076/ from Intel, United States
244 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0007/ from Kamaleon, Mozambique

The **Government of Tanzania**, established a stand-alone USF called the Universal Communication Service Access Fund (UCSAF) in 2009, and to date the UCSAF programme has implemented several projects with investments totalling USD 100.3 million. The UCSAF initiative procures ICT equipment for public schools, and pays for their Internet connectivity for a two-year period. Tanzania Rural Connectivity projects for telecommunications and Internet, have established over 1 200 towers providing coverage for more than 15 million people, and construction of another 800 towers over the next two years is underway. These projects will provide network connectivity to 950 schools, and specialized ICT learning equipment to eight schools with special needs.[245]

The **United States** have made great progress over the years in connecting millions to telecommunication and Internet services. The Federal Communications Commission (FCC) conducted the E-Rate programme which focused on providing support and assistance to educational institutions. The E-Rate programme provides discounted communications services to eligible schools and libraries. For example, when a service, normally priced at USD 100, is provided at a 10 per cent discount, USAC compensates the provider for the discounted amount, which in this example, is USD 10. Additionally, providers can submit an invoice to USAC for reimbursement of the costs for any equipment supplied to schools and libraries for connectivity. In 2022, the E-Rate programme approved funding to connect over 128 500 schools, school facilities, and libraries.[246]

Zimbabwe has implemented a number of information and communication technology programmes in health, business, education, and commercial services. Of note is the E-Learning Programme, which has seen 1 376 schools getting connected to the Internet in 2021 and 2022, with an additional 750 schools expected to be connected in 2023.[247]

Other modes of online learning have been imagined by start-ups such as AURA in **Kingdom of Cambodia**, which provides not only online access to a community platform with learning resources for students with disabilities, but also a gamified learning environment where students can earn tokens and/or money by performing tasks adapted to their capacities. AURA has been supported by the Generation Connect Young Leadership Programme by ITU and Huawei.[248]

5.4 E-health

Digital solutions can not only facilitate access to e-health services but also contribute to behaviour change, which is essential for prevention of diseases and epidemics. In **Mozambique**, the organization Kamaleon used interactive mobile digital units (IMDU) and video broadcasts, to carry out digital campaigns in rural areas that were experiencing growing cholera rates, to raise awareness on how to treat water, and to teach communities basic hygiene methods to protect themselves and their families from cholera. Six months after the campaigns, the affected communities reported a significant drop in cholera cases as a result of their improved hygiene and water treatment practices. Similar digital campaigns provided information about COVID-19, and led to an immediate change in behaviour, with inhabitants of extremely rural communities, previously disconnected from ICT or TV services, being more committed to avoiding the spread of the virus, and more willing to cover their nose and mouth in public spaces.[249]

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245 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0085/ from Tanzania
246 ITU-D Document https://www.itu.int/md/D22-SG01-C-0168/ from United States
247 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0034/ from Zimbabwe
248 ITU-D Document https://www.itu.int/md/D22-SG01-C-0416/ from Huawei, China
249 ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0007/ from Kamaleon, Mozambique

In rural and remote areas with less access to health centres, vaccine reminders and treatments monitoring can be facilitated by digital devices such as mobile phones. In **Côte d'Ivoire**, Orange has joined forces with the Ministry of Health, and international partners, to design and develop two distinct mobile health services that operate on basic feature phones. The first, in partnership with the Global Fund, makes it easier to monitor HIV patients, and collect data to better analyse and improve treatments, while the second, M-Vaccine, is deployed in collaboration with the GAVI Vaccine Alliance, and offers a digitized immunization records to monitor mothers and children, and raise community awareness to improve vaccine coverage in regions of low uptake[250].

A contribution from **Zimbabwe**, shared that ICT needs for rural and remote area inhabitants have changed drastically in the post-COVID-19 era. In fact, the gap in needs between persons living in rural and remote areas and those living in urban areas, has narrowed significantly, and the same change has been seen in the gap in needs between developed and developing countries. Video conferencing tools led to a digital revolution and made remote health delivery possible, which saw patients consulting online, and ordering medicines online, including in rural areas. This capacity however is dependent on the deployment of high-speed broadband[251].

Giving patients access to services is only possible when healthcare centres are adequately equipped. In **Thailand**, the National Broadcasting and Telecommunications Commission has set up Wi-Fi for small hospitals in approximately 180 rural and remote locations in order to increase the access to medical services, and the efficiency and performance of small hospitals. In addition, a telehealth pilot project targets patients with diabetes and blood pressure issues which have a high mortality rate, and with skin and eye diseases, for which there is a lack of qualified medical personnel. Telehealth reduces travel time to the hospital, as well as costs, energy consumption, and the number of people who consult in hospitals, and more importantly allows all people country-wide to access healthcare treatments. The project has already served more than 50 000 people over the past few years. One of the main challenges is the integration of the telehealth project's patient database with the Ministry of Health database[252].

As a part of the national economic strategy in **Tanzania**, for the expansion of rural and remote infrastructure to bridge the digital divide using a universal service fund mechanism, the Telemedicine project is an example of a fully funded project, through which regional hospitals are connected to referral hospitals, to enable specialized doctors in the referral hospitals, to share their expert opinion through ICT media with their counterparts in the regional hospitals.[253]

5.5 E -applications for different Sectors

E-service applications have been developed for a wide range of sectors including, government, health, education, commerce, agriculture and fisheries, banking and finance, entertainment, transportation and utility sectors. An expanded, but not exhaustive list of e-service applications according to sector includes:

E-Government comprising among others, e-visa, e-voting, e-licensing, tax filing (e-file), public service portals, Government-to-citizen (G2C) services, and others.

[250] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0203/ from GSMA and Orange, France
[251] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0034/ from Zimbabwe
[252] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0186/ from Thailand
[253] ITU-D Document https://www.itu.int/md/D22-SG01.RGQ-C-0085/ from Tanzania

E-Health which includes, telemedicine, electronic health records (EHR), e-prescription, e-appointment scheduling and reminders, e-vaccine records and reminders, and e-medical billing.

E-Education comprising among others, online courses and degree programmes, learning management systems (LMS), and virtual classrooms.

E-Banking which involves online banking and mobile banking services, as well as mobile payments and transfers, loan and (micro)credit applications, and cryptocurrency exchange and blockchain-based financial services.

E-Entertainment comprising streaming services (music, video, games), digital media distribution, virtual events and ticketing, social-media and community platforms, digital art and design, virtual reality (VR) and augmented reality (AR), and e-sports and competitive gaming.

E-Transportation including ride-hailing and taxi services, public transportation systems, traffic management systems, vehicle tracking and fleet management, and driverless vehicles.

E-Utility comprising utilities such as electricity, gas, and water billing, and pre-paid (solar) energy services.

E-Agriculture and e-Fisheries which involve agricultural/fishery information services, including meteorological information services.

E-Environment which includes environmental monitoring such as air quality, and water quality and quantity monitoring.

Chapter 6 – Conclusions and guidelines

6.1 Conclusions

During the current ITU-D Study Group 1 study period (2022-2025), there have been notable efforts to advance connectivity in rural and remote areas. The following key conclusions can be drawn from the study:

- Despite significant technological advancements and global connectivity initiatives, approximately 2.7 billion people worldwide, remain unconnected, with the majority residing in rural and remote areas of developing countries, particularly least developed countries (LDCs), landlocked developing countries (LLDCs), and small island developing states (SIDS). Even where connectivity exists, it often fails to provide speeds that enable meaningful access to digital services.
- This study period has built upon previous findings while incorporating new trends, challenges, and solutions that have emerged in recent years. The COVID-19 pandemic particularly highlighted the critical importance of connectivity, as it demonstrated how digital access directly impacts education, healthcare, commerce, and public services, while also revealing the stark consequences of the digital divide.

Several key conclusions have emerged from the contributions and case studies analysed:

- **Multidimensional approach required**: Bridging the digital divide requires addressing both supply-side factors (infrastructure, technology, financing) and demand-side factors (affordability, digital literacy, relevant content). Neither aspect alone, is sufficient to achieve meaningful connectivity.
- **Technological diversity**: No single technological solution can address all connectivity challenges in rural and remote areas. A bouquet of technologies including fibre-optics, mobile networks, satellite communications, Wi-Fi solutions, and emerging innovations, must be deployed based on local contexts, geographical realities, population density, and economic viability.
- **Sustainable business models**: Traditional market-driven approaches often fail in rural and remote areas due to lower population density, challenging geography, and lower ARPU. Innovative business models, public-private partnerships, infrastructure sharing, and complementary access solutions, have demonstrated success in various contexts.
- **Universal service funds**: While USFs remain a critical financing mechanism, their effectiveness varies significantly across countries. Success depends on transparent governance, clear objectives, efficient allocation processes, and flexibility to support diverse connectivity solutions beyond traditional telecommunications infrastructure.
- **Local empowerment**: The most successful rural connectivity initiatives involve local communities in planning, implementation, and operation. Community networks (CNs) and locally driven solutions have proven particularly effective in ensuring sustainability and adoption.
- **Integrated applications**: Connectivity infrastructure alone is insufficient; e-applications in areas such as agriculture, education, healthcare, commerce, and government services, drive adoption and create tangible benefits for rural communities.
- **Enabling regulatory environments**: Policy and regulatory frameworks significantly impact rural connectivity. Spectrum allocation, licensing requirements, infrastructure

sharing policies, and quality of service standards, all affect the economic viability of rural deployment.

- **Digital inclusion requires accessibility**: Meaningful connectivity must include provisions for indigenous communities, persons with disabilities, women, and other potentially marginalized groups through localized content, appropriate technologies, and targeted digital literacy programmes.
- **Energy solutions**: Power supply remains a fundamental challenge for rural connectivity. Renewable energy solutions, energy-efficient technologies, and innovative power systems are essential components of sustainable rural ICT deployment.
- **Emerging technologies**: Technologies such as 5G, low earth orbit (LEO) satellites, high altitude platform stations (HAPS), and AI-based network optimization offer new possibilities for cost-effective rural connectivity but require appropriate regulatory frameworks and business models.

The digital divide between urban and rural areas remains significant but can be substantially reduced through coordinated efforts involving governments, the private sector, international organizations, civil society, and local communities. The experiences documented in this study period demonstrate that, with appropriate technologies, policies, financing mechanisms, and local engagement, meaningful connectivity can be extended to rural and remote areas, in a sustainable manner.

6.2 Guidelines

Based on the findings of this study, the following guidelines are provided to assist Member States in developing and implementing strategies to improve telecommunications/ICTs in rural and remote areas:

6.2.1 Infrastructure development and technology selection

- **Adopt technology-neutral approaches**: Regulatory frameworks should be technology-neutral, allowing for the most appropriate technologies to be deployed, based on local conditions rather than mandating specific solutions.
- **Promote infrastructure sharing**: Develop regulatory frameworks that encourage or mandate passive and active infrastructure sharing to reduce deployment costs and improve economic viability in rural areas.
- **Leverage complementary technologies**: Implement a mix of technologies, combining terrestrial networks (fixed and mobile), satellite communications, and other innovative solutions such as HAPS, to optimize coverage, reliability, and cost-effectiveness.
- **Prioritize energy solutions**: Integrate sustainable power solutions, including solar, wind, and hybrid systems, as fundamental components of rural connectivity planning, considering both initial deployment and long-term operational sustainability.
- **Support open standards and interoperability**: Encourage the adoption of open standards and interoperable technologies to reduce costs, prevent vendor lock-in, and facilitate future technological evolution.

6.2.2 Financing and business models

- **Reform universal service funds**: Ensure that USFs are transparent, technology-neutral, and support a wide range of connectivity solutions, including CNs and small-scale providers. Implement mechanisms to measure effectiveness and prevent underutilization of funds.

- **Develop blended financing mechanisms**: Combine public funding, private investment, development assistance, and community resources, to create sustainable financing models for rural connectivity.
- **Implement smart subsidies**: Design subsidy mechanisms that incentivize initial deployment while encouraging long-term sustainability, such as results-based financing, voucher schemes, and graduated support models.
- **Support CNs**: Create specific regulatory and financial mechanisms to enable community-owned and operated networks, including simplified licensing procedures, access to spectrum, and dedicated funding streams.
- **Facilitate public-private partnerships**: Develop frameworks for effective public-private partnerships (PPPs) that clearly define roles, responsibilities, and risk-sharing arrangements, to leverage private sector efficiency, while ensuring public interest objectives.

6.2.3 Regulatory and policy frameworks

- **Simplify licensing processes**: Streamline authorization and licensing procedures for rural service providers, with reduced fees, reporting requirements, and administrative burdens for small-scale and community-based operators.
- **Optimize spectrum management**: Implement innovative spectrum allocation approaches, including set-asides for rural deployment, geographic coverage obligations, use of TV white spaces, and dynamic spectrum sharing, to maximize efficient use of this limited resource.
- **Establish appropriate quality of service standards**: Develop QoS frameworks that balance the need for adequate service quality with the practical challenges of rural deployment, including provisions for monitoring and enforcement.
- **Coordinate across public institutions**: Establish mechanisms for coordination between telecommunications regulators and other relevant public agencies (energy, transportation, education, health, agriculture; including at national, sub-national, and local levels) to develop integrated approaches to rural development.
- **Harmonize regional policies**: Collaborate with neighbouring countries to harmonize spectrum policies, equipment standards, and cross-border connectivity to create economies of scale and facilitate regional solutions.

6.2.4 Digital skills, adoption, and applications

- **Develop digital literacy programmes**: Implement targeted digital literacy initiatives for rural communities, integrating ICT skills development into formal education and providing informal learning opportunities for adults.
- **Promote relevant local content**: Support the development of content and applications in local languages that address specific needs of rural communities, particularly in agriculture, healthcare, education, and local commerce.
- **Enable e-government services**: Prioritize the digitization of government services that are particularly relevant for rural communities, creating incentives for connectivity adoption.
- **Support local innovation ecosystems**: Establish innovation hubs, incubators, and capacity building programmes in rural areas to foster local technological solutions to local challenges.
- **Prioritize inclusivity**: Ensure that connectivity initiatives explicitly address the needs of potentially marginalized groups, including women, persons with disabilities, indigenous communities, and the elderly.

6.2.5 Monitoring, evaluation, and knowledge sharing

- **Establish baseline data**: This includes existing infrastructure, connectivity gaps, and demographic information to inform targeted interventions and measure progress.
- **Develop monitoring frameworks:** This involves regularly assessing the impact of connectivity initiatives, including quantitative metrics (coverage, adoption, QoS, etc.) and qualitative factors (socioeconomic benefits, user satisfaction, etc.).
- **Document and share best practices**: Systematically collect and disseminate case studies.
- **Engage in international cooperation**: Actively participate in international forums for knowledge exchange, capacity building, and coordinated action on rural connectivity.
- **Anticipate technological evolution:** Implement frameworks that accommodate emerging technologies and evolving service needs.

By implementing these guidelines in a manner tailored to their specific national contexts, Member States can accelerate progress toward bridging the digital divide and ensuring that everyone, regardless of location, can benefit from meaningful connectivity and the opportunities that connectivity enables.

6.3 The future of Question 5/1

Previous studies under Question 5/1 on ICTs for rural and remote areas, have come up with various useful recommendations over the years. During the current study period, very important aspects have been studied and chief among them, the role and contribution made by the universal service funds in connecting rural and remote areas, and ensuring that inhabitants of rural and remote areas get not only as much access to ICTS as possible, but also that they make effective use of ICTs.

6.3.1 Need for further studies

It became clear during the study, that some of the aspects under study, require further study, while gaps requiring fresh studies were noted. The combined aspects requiring study include the following:

- Harnessing the complementarity of terrestrial and non-terrestrial networks.
- Modern technologies designed to lower infrastructure capital and operating costs, and support convergence between services and applications.
- How artificial intelligence (AI) can improve rural infrastructure and access.
- Challenges in creating or building broadband digital infrastructure in rural and remote areas.
- Needs and policies, mechanisms, and regulatory initiatives to reduce the digital divide between rural and urban areas by increasing broadband digital access.
- The benefits of AI, and challenges of AI adoption in rural and remote areas.
- Harnessing AI to enhance digital literacy and skills in rural communities.
- Improvement of quality of the services in rural and remote areas.
- Implementation of ICT services in rural and remote areas, including new and emerging technologies.
- Policies relating to, and development of local content.

6.3.2 Proposal

The aspects listed in section 6.3.1, as factored into the terms of reference for Question 5/1 and comprised in **Annex A**, will be discussed, refined and adopted as a preliminary draft text for the future of Question 5/1 for the next study cycle.

Annex A – Summary of contributions

Document 1/31 **(Comoros)** shared information on Comoros practices to improve access and connectivity with a view to reducing the gap between rural and urban areas. The document highlighted that the Union of the Comoros, an essentially rural country, has in recent years embarked on a policy aimed at promoting the large-scale use of ICT services, by facilitating access to networks, through a steady reduction in voice and data tariffs, investments, and the deployment by operators of new technologies, resulting in an explosion in the total number of mobile subscribers and accounts for e-money services and the reinstatement of the Universal Service Fund through legislation. Kenya, commenting on Comoros' contribution stressed the importance of digital skilling, which was noted. Mali encouraged the Question 5/1 team to look into the question on how Universal Access Funds are managed and used in different countries. Further interventions including from Brazil, Côte d'Ivoire, Uganda and Kuwait, were noted as the contribution generated a lot of interest.

Document 1/39 **(Madagascar)** highlighted how Madagascar through its strategies and policies, had done everything possible to expand broadband access to benefit the entire population, including by capping prices for use of the national backbone network.

Document 1/41 **(China)** shared positive results achieved by China in universal telecommunication services, as well as the experience and steps for promoting broadband development and application in rural areas in order to solve the communication difficulties for people in administrative villages in poor mountainous areas and remote areas

Document 1/48 (**Bhutan**) shared information on the importance of the development ICT infrastructure to improve network connectivity access and adoptions of ICT services. It also provided the strategies adopted by Ministry of Information and Communications of Bhutan to deploy dedicated high-speed broadband connectivity in Bhutan. The document highlighted that the ICT sector in Bhutan has experienced rapid growth in the past two decades, fostering economic activity in the form of productivity gains and generation of significant consumer benefits within the country.

Document 1/54 **(Burundi)** (case study) shared the policies and strategies to connect rural areas to prevent the further concentration of networks and infrastructure in economically profitable areas such as Bujumbura and other urban zones, and will enable the population to flourish economically and socially.

Document 1/56 **(Comoros)** (case study) highlighted that the structural and regulatory reforms of the ICT sector of Comoros, carefully carried out under the Regional Communications Infrastructure Programme Phase 4 (RCIP4) of the World Bank, with the involvement of the National Regulatory Authority for Information and Communication of the Comoros (ANRTIC), resulted in the expansion and consolidation of the supply of ICT products and services.

Document 1/68 (**Russian Federation**) shared information regarding an autonomous complex developed by the institute for providing cellular connectivity in remote areas of the Russian Federation, including those associated with harsh weather conditions. A wind/solar-powered self-sustaining autonomous complex has low operating costs and can, in addition to supporting cellular connectivity, also support ecological and meteorological monitoring. The document outlined that this contribution was prepared to familiarize meeting participants with the practices

of the Russian Federation, on providing communications for remote areas, as well as to its materials included in the final report on Question 5/1. Togo requested of the Russian Federation to provide an insight into the investment concerned so that Member States would have an idea of the costs involved. The Russian Federation informed participants that feedback would be given in future contributions, but not necessarily for the meeting of May 2023.

Document 1/72 **(Rep. of Korea)** (case study) shared the case of Korean (UAV/UAS) on using unmanned aerial vehicle (UAV) technology in rural and remote areas. The document highlighted that unmanned aerial vehicle (UAV) or drone technology is now undergoing experimentation, and is being used in different rural and remote area settings around the world. From humanitarian aid, environment monitoring, and medical supplies to usage in agriculture, commercial logistics, and the security sector, UAVs and unmanned aircraft systems (UASs) are used to overcome unique challenges faced due to difficult terrain. UAVs pose several advantages over other technologies such as low deployment costs, high manoeuvrability, and the ability to operate in hazardous environments.

Document 1/85 (**Argentina)** shared some highlights of the regulatory framework in Argentina to allow CNs to obtain an ICT licence and provide Internet access services in rural, remote, unserved, or underserved areas. The document outlined the lessons learned and suggested best-practices. It was noted to be mindful with the use of the term CNs in the final report so as not to open discussions that had been resolved by WTDC-22 and the Plenipotentiary Conference 2022. Study Group 1 Chair gave guidance on the approach to be taken on the issue.

Document 1/36 **(SUP'PTIC, Cameroon)** (case study), highlighted how the country intends to convert rural areas into smart cities and communities, with the support of telecommunication operators and ministries and agencies responsible for local development, in order to respond to evolutions in digital technologies (the financial cost of the project amounts to USD 500 million).

Document 1/70 **(World Bank)** shared information about the World Bank Digital Development (DDG) Global Practice that seeks to help developing countries build sustainable digital economies. The practice helps advance global knowledge around key digital development topics that help countries define and implement their vision for digital transformation. The World Bank DDG practice provides financing to governments in the form of grants, loans and guarantees, to support digital investment projects and to implement policy reforms. Additionally, it provides advisory services, such as policy guidance, technical assistance, capacity building, and knowledge products, such as data and diagnostics for actionable insights. It also brings together key public and private sector stakeholders involved in advancing global digital development. The aim of the World Bank DDG practice is to help the development of digital and connectivity infrastructure through investment in broadband connectivity, and the ICT industry, and to foster a culture of data consumption through improved digital literacy and affordable access to devices and services.

Document 1/76 **(Intel Corporation)** provides information on the importance of computer and broadband connectivity programmes for households, students, and education. The contribution further provides examples of computer and broadband programmes for students and education. In Costa Rica, the Connected Homes programme has launched the "Bicentennial Educational Network" for creating a broadband network throughout the country to serve all public schools and high schools. In the United States, the Affordable Connectivity Programme provides affordable broadband, to ensure the need of schools, etc. In Malaysia, the universal service provision fund, utilised for the provision of 1 668 772 netbooks to underserved communities and

the Cerdik project, provided 150 000 devices, and data connectivity to underprivileged students from low-income families, for information technology education. In Republic of Singapore, the NEU PC PLUS programme provides financial assistance for subsidized personal computers (PCs) and free broadband connectivity to full-time students from low-income households. In Italy, European Union State Aid provides EUR 325 million in public support to connect 12 000 schools in Italy to very high-speed Internet. In Kenya, education programmes implemented the Digital Literacy programme (laptop project) and 1.2 million devices (including wireless routers) were distributed to 22 891 public primary schools, and the National Education Management Information System (NEMIS) to manage information on schools and candidates, has been implemented. In Republic of Croatia, the CROATIA e-schools project implemented ICT infrastructure, and developed educational software for public primary and secondary schools, to improve teaching, learning and administration in the country.

Document 1/91 **(ITU-APT Foundation, India)** shared information regarding strategies used to increase the deployment of broadband in India using Wi-Fi connectivity through Public Data Office (PDO), popularly known in India as the Wi-Fi Access Network Interface, and anyone, whether business person, resident, student, small grocery/tea shop owner, or restaurant owner can function as a PDO.

Document 1/60 **(BDT Focal Points)** provided the ITU membership with information on work by BDT in the area of ICT Infrastructure activities, which has been developed since the last ITU-D Study Groups meetings. ITU-D Study Group members were invited to raise awareness and share the information received during the meeting within their work environments, as well as with their national and regional interested stakeholders, in order to leverage local, national and regional knowledge and accelerate related implementation, as well as contribute to achievement of the overarching goal of building inclusive digital societies globally.

Document SG1RGQ/107 **(Brazil)** detailed how the National Telecommunications Agency (ANATEL) in Brazil, had successfully used crowdsourcing and data analytics to identify the connectivity gap and enable planning to bring broadband connectivity to unconnected areas. The use of crowdsourcing and data analytics as a formal tool for planning and policy purposes was first deployed by ANATEL with the purpose of mapping the existing connectivity infrastructure and the digital gaps in the country. The tool has helped the agency to analyse billions of updated empirical observations, organizing them into millions of geographic grid quadrants and pinpoints with great precision areas with unmet demand for broadband services. The tool has also been used to map public schools and health facilities in Brazil that do not have access to broadband Internet, and in the design of a public policy strategy for public facilities in the cities and in the outskirts of the big urban centres.

Document SG1RGQ/18+Annex **(Egypt)** outlined the National Broadband Strategy for 2022-2025, aimed at improving the overall broadband ecosystem of Egypt. The contribution highlighted that the country's investment in broadband is expected to reach USD 2 billion by 2025. This is expected to boost the growth of digital services and e-government services, and the digital economy as a whole. Egypt informed the meeting that the content of this document would be suitable for chapters 3 and 4 of the final report.

Document SG1RGQ/23(Rev.1) **(Haiti)** shared the use of BIEN (multimedia digital economy inclusion centres), to facilitate access to ICTs, and economic development of rural and remote areas. Pilot projects had been conducted since 2017, and these had enabled inhabitants of rural and remote areas to market and sell their produce, receive payment through mobile banking

applications, access systems for e-education, e-agriculture, financial inclusion (online banking), and e-health thus improving their livelihoods. The contribution elaborated the high level social and economic needs, and the demand for multimedia services, content, and applications. It also proposed a reflection on technologies for rural and remote areas, as well as financing mechanisms and partnerships. One obstacle faced by the BIEN centres is security as some centres have been vandalized and taken over by armed groups. Kenya asked whether there were strategies for sustainability and for the security of the infrastructure. Haiti responded that efforts to continuously improve implementation were being made.

Document SG1RGQ/26 **(Rep. of Korea)** shared the case of the rural mobile infrastructure operator (RMIO) model in Peru. Korea Information Society Development Institute (KISDI) has worked with the Government of Peru to assess the RMIO model, in providing coverage to rural, and preferred social interest locations. RMIOs have contracts with mobile network operators (MNOs) to provide last-mile connectivity to end users, where the return on investment (RoI) is low and long-term. As of 2021, there were seven main RMIOs in Peru, which had wholesale service agreements with one or two MNOs. The contribution detailed the extent of RMIOs in Peru, the technologies used, and challenges faced, as well as the network topology and CAPEX/OPEX features.

Document SG1RGQ/27 **(Ghana)** shared the strategy of Ghana to extend basic telephone voice and data connectivity to underserved and unserved communities. In order to boost voice and data services and reduce the urban-rural digital divide, Ghana has committed EUR 155 million to supplement its universal service fund. The universal service fund (the Ghana Investment Fund for Electronic Communications, GIFEC), was established by the Electronic Communications Act (Act 775) 2008. In a tripartite co-operation between the GIFEC, MNOs and private investors, Ghana has deployed 500 rural sites with UMTS 900 rural star technology over three years and plans to deploy 2 016 sites by 2023, to provide coverage to 3.4 million Ghanaians. The sites are solar, and electrical grid powered. Community Information Centres have also been established to provide access to government information and services, and to provide ICT training for schools.

Document SG1RGQ/29 **(Madagascar)** detailed how the regulator in Madagascar has championed digital inclusion through authorization of the use of the 800 MHz frequency band, for the deployment of 4G in rural areas, as this band can cover great distances (Decision No. 2022/001-ARTEC/DG/L of 10 May 2022). An appropriate spectrum allocation price was negotiated with the operators, who are encouraged to share their infrastructure. In addition to this, the regulator adopted a new policy of allowing all operators to deploy optical fibre for their transmission network. The regulator is also considering further measures, including the creation of a "GLOBAL" licence to allow operators to deploy further services. Intel Corporation intervened to ask whether there were any plans to introduce 5G in Madagascar. Madagascar responded that 5G was still only in the experimental stage in in Madagascar but plans to introduce it in the future were in the offing.

Document SG1RGQ/30 **(Kenya)** highlighted need to secure base transmitter stations (BTS) in northern regions of Kenya from militants and criminals, by using promotion of community ownership, robust design and construction of the BTS sites, drone technology, and air patrols. Liberia asked what strategies Kenya was using to protect its infrastructure from militants. Kenya responded that in addition to the already highlighted strategies, they were using trusted partnerships. The issue of security was discussed at length with Mali and Côte d'Ivoire intervening. The Chairman also highlighted that insurance should be included as part of the strategies.

Document SG1RGQ/34 **(Zimbabwe)** highlighted the convergence of the ICT needs of rural and remote communities, with those of their urban counterparts in the post COVID-19 era, thereby necessitating the acceleration of broadband connectivity in rural and remote areas in Zimbabwe. Various programmes have been implemented including infrastructure sharing by operators, increased construction of ICT community information centres, the E-Learning Programme, the E-Health Programme, the E-Government Programme, and the Accessibility programme to meet the increased demand for broadband services in rural and remote areas. Questions from the floor from South Africa, Liberia, and Kenya were raised on how Zimbabwe had implemented infrastructure sharing, whether literacy was a problem with regards to rural and remote inhabitants, and how rural and remote people got connectivity to use conferencing applications such as Zoom.

Zimbabwe responded that the village community information centres were being used as a solution where there was no last mile connectivity to the home. Infrastructure sharing was implemented through the passing of a law which governs sharing on a voluntary basis. It was also highlighted that while Zimbabwe is a highly literate country, ICT skills training was being rolled out in the community information centres. On whether it was not costly to construct community information centres across the country, and employ people to run them, Zimbabwe informed the meeting that the universal service fund had partnered with the main postal service operator that has premises suitable for use all over the country, including in rural areas, and that the postal service operator also employed local people to run the community information centres.

Document SG1RGQ/41 **(Zimbabwe)** detailed the involvement of the universal service fund in financing innovation. The contribution summarised digital solutions created by young innovators during hackathons sponsored by the universal service fund of Zimbabwe, resulting in practical solutions to help Zimbabwe achieve the SDGs. The solutions include applications in agriculture (digital agriculture platforms, farm managing and automation platforms, smart egg incubators), e-commerce, healthcare (tele-healthcare), and security (biometric identification). Questions asked by South Africa, Ericsson, Kenya, and Liberia centred on whether it was appropriate to use the universal service fund to fund development of solutions for SDGs. Zimbabwe responded that it was high time that people stopped thinking that connecting the rural areas is the sum of all the efforts that we need to make, because connectivity without use is meaningless unless there is development of local practical solutions that rural communities can use. The purpose of USFs should be diversified, at least to kick start innovation.

Document SG1RGQ/43 **(Uganda)** shared information about the implementation strategy, adoption, and outcomes of e-agriculture, in rural, unserved, and underserved communities in Uganda. The document highlighted the main outcomes of the project to accelerate uptake of ICT4Agric innovations, including increased consumption of ICT services by farmers and other stakeholders, the establishment of a framework for content development, certification, and delivery, and the enhancement of the digital skills of farmers and value chain actors. Some of the challenges highlighted include uncoordinated agriculture content development and distribution to farmers, the accessibility of the content which was mostly text based and in English, network access issues, and difficulties in the acquisition of smart phone devices.

Document SG1RGQ/47 **(Burundi)** presented the national policy, regulations and strategy of Burundi to provide telecommunications/ICT access in rural and remote areas. The National ICT Development Policy (PNDTIC 2011-2025) comprises 10 axis strategic elements, designed to achieve universal access to ICTs in order to accelerate economic growth, so that Burundi can become a centre of excellence, and a regional reference point in the ICT sector by 2025.

Document SG1RGQ/52 **(Burkina Faso)** highlights current experience of Burkina Faso in providing communication services to consumers, in areas and localities affected by insecurity and terrorist groups. These issues were also introduced under Q3/1. Specifically, it presents the mechanisms implemented by Burkina Faso, to restore telecommunication infrastructure that was destroyed or vandalized by armed terrorist groups. The measures involved the re-establishment of destroyed sites to restore electronic communications in the affected areas and thereby ensure the availability and accessibility of digital services.

Document SG1RGQ/72 **(South Africa)** outlined the South African .za Domain Name Authority (ZADNA) training programmes on the domain name system (DNS), and other skills for rural and remote communities. In order to bridge the digital divide and promote inclusive development in rural areas, ZADNA has implemented the ZA Schools Digitisation Programme (ensuring schools have domain names, websites, and email addresses for educators); the. za education and awareness programme (promoting. za domain name registrations and online safety); "Alternative Dispute Resolution" workshops (educating participants on preventing and mitigating DNS abuse); and registrar reseller training. As a not-for-profit entity established under the Electronic Communications and Transactions Act 25 of 2002, ZADNA ensures a secure namespace, safeguarding the rights and interests of users in South Africa, while promoting the growth and use of the namespace. ZADNA also hosts domain name system (DNS) training courses, in order to familiarize selected communities and stakeholders with DNS, with a focus on women, youth, and people with disabilities. As elaborated in detail in the contribution, this training also addresses the shortage of DNS skills in South Africa. It was proposed to incorporate the content of the document in Chapter 3 (3.1, 3.2, and 3.4) of the report.

Document SG1RGQ/76+Annex **(Argentina)** presented the universal service fund (USF) programme of Argentina for the deployment of access networks to mobile communications services, in cities with up to 500 inhabitants, which is funded by the USF. The programme was designed to finance the deployment of access networks in localities and geographical areas where the implementation of fixed networks is not efficient. An innovative feature of the programme enabled companies that were awarded projects, to finance the deployment work by deducting costs from their monthly contributions to the universal service fund that they are obliged to make to ENACOM. The annex to the contribution provides details on the project deployment in specific towns such as Coomé (Salta), Pichi Huinca (La Pampa) and General Urquiza (Misiones).

Document SG1RGQ/84 **(Rep. of Korea)** presented general information on the universal service system in Rep. of Korea, which was introduced in 1998, and that has undergone several revisions in response to changes in the telecommunications market environment, and technological advances. The document highlights the basic structure of the universal service system, the designation of universal service providers, and the universal service cost calculation method and settlement system, as well as future development directions. The contribution was submitted following a Q5/1 Co-rapporteur's request during the previous meeting for Member States to submit cases on financial mechanisms related to the universal service fund (USF), and this contribution will be included in the annual deliverables for a joint workshop between Q4/1 and Q5/1.

Document SG1RGQ/85 **(Tanzania)** highlighted the national economic strategies on expansion of rural and remote infrastructure, to bridge the digital divide, using universal service fund mechanisms. The document shared sustainable and cost-effective solutions to enhance the availability of broadband Internet in rural areas through universal service funding. Tanzania

established a stand-alone universal service fund in 2009, and has already implemented several projects with investments of USD 100.3 million, such as providing ICT equipment and Internet connectivity in rural areas, telemedicine, and community radio projects. Best practices in deploying broadband Internet in rural areas include collaborating with all stakeholders, designing digital strategies and national broadband plans using a whole of Government approach, lowering deployment costs to stimulate competition, and encouraging demand for broadband by making it more affordable, relevant, usable and safer for everyone. Comments from the flow raised the need for Tanzania to explain how operators who are to benefit from allocation of USF funds are selected.

Document SG1RGQ/98 **(Mexico)** shared how the National Institute of Indigenous Peoples (INPI), has carried out diagnoses of mobile coverage (2G, 3G and 4G) in localities of the country, where indigenous people reside in order to assist efforts to improve and expand the coverage and use of telecommunications/ICTs among indigenous people. On average, 80 per cent of the indigenous population has mobile service coverage in at least one technology (2G, 3G or 4G). Although the study notes improvements in coverage over the last five years, there are also localities in which the coverage is non-existent. The study, therefore, opened new scenarios to improve and expand the coverage and use of telecommunications/ICTs among indigenous people. This contribution has been proposed to be included in Chapter 3 of the final report.

Document SG1RGQ/101 **(Mexico)** highlighted how the Mexican telecommunications regulatory body, the Federal Telecommunications Institute, promoted the generation of content in indigenous languages through translation workshops. The workshops have translated more than 500 materials into 40 indigenous languages, related to the rights of users and the mechanisms to present complaints, information tools, and cybersecurity.

Document SG1RGQ/104 **(State of Palestine)** highlighted recent initiatives and projects for broadband connectivity in the State of Palestine, launched by the Ministry of Telecommunications and Information Technology, to ensure equitable access to Internet and e-service in rural and remote areas, as well as for vulnerable people. This was designed to ensure equitable access to Internet and e-services in rural and remote areas, as well as for vulnerable people. Digital access points in post offices have been treated as good practice to ensure equitable access to services by the poor and vulnerable, including persons with disabilities.

Document SG1RGQ/105 **(State of Palestine)** shared information about the roll out of fibre to the home (FTTH) connections in the State of Palestine, and the challenges in the expansion of FTTH connections, including restrictions on building infrastructure, spectrum allocation for 3G/4G and 5G mobile broadband, ICT equipment imports, and deployment. The document recommended adoption of flexible policies for technology selection (e.g., aerial cables, micro-ducting, etc.) for the success of FTTH roll out. Subsequent to the decision of the Ministry of Telecommunications and Information Technology to liberalise the sector and open the market for all Internet service providers (ISPs), a total of 7 185 kilometres of fibre-optic networks had been laid, and a total of 53 724 FTTH connections were provided, until the end of 2022.

Document SG1RGQ/115 **(South Africa)** shared experience from South Africa on the licensing process for international mobile telecommunications (IMT), in respect of the provision of mobile broadband wireless access services for urban and rural areas, using the complementary bands, IMT700, IMT800, IMT2600 AND IMT3500 provided by the Independent Communications Authority of South Africa (ICASA). Some lessons learned from the experience were that the auction is a great milestone that could lead to lower communication costs, expanded network

reach to rural and outlying areas, improved network quality and enhanced competition. The regulatory authority has social obligations for telecommunications operators to connect 18 520 schools, 5 731 clinics and hospitals, 8 241 traditional authority offices, and 949 libraries and government service centres. While the revenue collected from the auction will go to support national priorities, the allocation of the high-demand spectrum will speed up the roll-out of new technologies, such as fifth generation (5G), reduce the cost of mobile data, and ensure greater Internet connectivity. The allocation of the spectrum will also enable the roll-out of 5G networks, which will accelerate the process towards universal connectivity, and the deployment of the digital technologies and services that are driving the fourth industrial revolution. This contribution is considered for Chapter 3 of the final report.

Document SG1RGQ/8 **(Intel Corporation, United States)** updated information on the global status of 5G which included updated information on 5G networks status, the growth rate of 5G, and a comparison with previous generations of cellular technologies, as well as 5G device status. It stressed that 5G is a key technology for high-speed broadband digital infrastructure, digital economy, and enhancing the quality of life of people, that the most important factor for the timely introduction of commercial 5G services, is to assign 5G related low-mid-high frequency bands to operators, and that sound policies and regulations will accelerate the deployment of 5G in developing countries. This contribution was also presented for Question 1/1.

Document SG1RGQ/9 **(Intel Corporation, United States)** shared updated information on the global status of Wi-Fi 6, including Wi-Fi 6E, and how Wi-Fi 6 and 5G are two complementary technologies from which developing countries should be able to achieve maximum benefit, as these are advanced high-speed wireless broadband technologies for the digital economy.

Document SG1RGQ/93+Annex **(Intel Corporation, United States)** presented the WBA white paper on rural Wi-Fi connectivity. The white paper focuses on the critical factors applicable to Wi-Fi networks in rural areas, including broadband deployment challenges, relevant use cases, best practices, real-world case studies, and business models from different regions. The white paper also focuses on the importance of unlicensed spectrum for Wi-Fi to connect the unconnected. This contribution was also presented for Question 1/1.

Document SG1RGQ/10+Annex **(Ericsson, Sweden)** shared its recommendations on rural connectivity and drew attention to the useful annex, jointly submitted by mobile infrastructure vendors Ericsson, Huawei, Nokia and ZTE to the African Telecommunications Union (ATU) Task Group on Rural Connectivity. This document was submitted because it offers recommendations that should further the cause of rural connectivity, and of bridging the digital divide. It was also intended to draw the attention of the rapporteurs and vice-rapporteurs of Study Group 1 Questions 1/1 and 5/1, to the work being done in this policy space by the African Telecommunications Union through its task group. While the document was written with African countries in mind, Ericsson believes the arguments and the recommendations equally apply to developing countries everywhere. This contribution was introduced in Q1/1.

Document SG1RGQ/114+Annex **(Ericsson, Sweden)** shared the Ericsson Mobility Report of February 2023. The report and annex shares data and insights on the mobile industry's development, discussing key trends and disruptive events that continue to impact and shape the industry, as well as the technology forecast. It specifically discusses 5G and fixed wireless access (FWA), and the related cost advantages.

Document SG1RGQ/109+Annex **(GSOA)** shared information on satellite communications and their role in enabling 6G. The contribution provides information on global coverage, sustainability, reliability, resilience, security and authentication, meeting capacity requirements and positioning, and timing services. This contribution was discussed in Q1/1 and Q4/1.

Document SG1RGQ/111+Annex **(GSOA)** shared a contribution on satellite communications in the field of agriculture. It explained the role of satellite communications to support the agri-food system, in order to achieve the SDG on "zero hunger" by 2030.

The document highlighted that satellite communications along with other digital technologies can play a role in changing consumer preferences, e-commerce, climate change, and other factors, and enables farmers to react, adapt, and survive in an increasingly complex world, by enhancing their productivity, making them more competitive, and ultimately making the entire food system more resilient. This contribution was introduced in Q1/1.

Document SG1RGQ/112+Annex **(GSOA)** detailed the impact of satellite communications technology with its potential to help bring the remaining 2.7 billion unconnected people online. The evolution of satellite communications (Satcoms) spans from the increasing capabilities of technological solutions, to the progress made in developing standards around non-terrestrial networks which is contributing to connecting everyone, everywhere. This contribution was introduced also for Q1/1.

Document SG1RGQ/7 **(Kamaleon**, **Mozambique)** (also for Q7/1) shared information about an audiovisual and interactive mobile digital unit (IMDU), developed by Kamaleon, a non-profit organization, in partnership with the Government of Mozambique, to promote broadcasting on digital literacy, capacity building, and empowerment, using a realistic digital learning format adapted to the adversities of underdeveloped communities, and inclusive to persons with disabilities. The document highlighted various advantages of the IMDU as compared to the conventional methods of information sharing and learning, including, e-learning in schools, commerce, and agriculture, spreading awareness about cholera and COVID-19, financial education, and youth empowerment.

Document SG1RGQ/49+Annex **(SBA Communications**, **Brazil)** highlighted the need to develop an independent, vibrant, and sustainable tower industry, which is critical for the future development of mobile telecommunications. Various causality factors were highlighted in relation to the tower industry and the development of mobile industry, including, higher 4G coverage, faster wireless broadband speed, lower mobile broadband prices, higher mobile broadband adoption, higher competition in the mobile industry, and better provisioning of services by telecommunications operators. The document proposed that public policies and regulatory frameworks, that encourage sharing and the orderly and efficient deployment of passive infrastructure, be given due consideration by governments and regulators. This contribution was considered for Chapter 3 and Chapter 4 of the final report.

Document SG1RGQ/71+Annex **(APC)** highlighted that the community connectivity providers struggle to access capital, and discussed the regulatory barriers faced by them. The document shared information about a report published by APC and partners, on financing and business models which aim to address information gaps, and guide funding strategies for small scale networks. This contribution was introduced during the joint workshop between Q4/1 and Q5/1.

Document SG1RGQ/78 **(International Chamber of Commerce (ICC))** presented a white paper on "Delivering universal meaningful connectivity", which showcases how an interoperable,

seamless ICT ecosystem is crucial to help populations reap the benefits of ICT and development opportunities, particularly in developing countries. The document encouraged policymakers to facilitate investment, competition, and innovation throughout this ICT ecosystem: in broadband services and connectivity devices to make them accessible and affordable; in the development of content, applications and services that helps drive and sustain adoption; as well as in digital literacy and skills development. Partnership models which bring together the private sector and public sector, investment banks and local non-governmental organizations (NGOs) have proven successful in ensuring delivery and maintenance of networks in rural, sparsely populated, remote or hard-to-reach areas, where the return on investment (RoI) is uncertain. Effective spectrum management was also mentioned as a key to leverage shared and unlicensed spectrum resources such as TV white spaces and fixed-wireless access. Finally, policymaking and regulation were encouraged to be grounded in evidence and data, transparent, inclusive of all interested stakeholders, and aimed at improving the ease and predictability of doing business. This contribution was also introduced to Q1/1.

Document SG1RGQ/94 **(Internet Society)** highlighted the importance of creating an enabling regulatory environment for "complementary connectivity and access solutions," and Internet exchange points (IXPs). As complementary connectivity and access solutions are a key infrastructure component of connectivity ecosystems, they help connect the unconnected in under-connected areas, and are a complementary solution for connecting rural, remote, and underserved areas in an affordable manner. In addition to improving affordability and connectivity, these networks bring digital skills and tools to rural, remote, and underserved areas. Governments can foster enabling environments for deployment and financing of "complementary connectivity and access solutions." Once connectivity is established, IXPs improve traffic flow and help people get cheaper, faster, and better Internet service. IXPs help create shorter, more direct routes for Internet traffic. They provide a more affordable alternative to sending local Internet traffic abroad, only to have to return that same traffic via an international link, which can be an expensive business. Keeping traffic local is key to developing a sustainable connectivity environment in developing countries. The Internet Society has been helping to address connectivity gaps for many years, by building complementary connectivity and access solutions and by building and supporting IXPs. This document provides information relevant to Q1/1 and Q5/1.

Document SG1RGQ/95 **(Amazon)** shared details on bridging the digital divide through advances in satellite technology. It highlighted how satellites that operate in low earth orbit (LEO) offer underserved communities around the world, the high-speed, high-quality broadband network connectivity they need to participate in the modern digital era. The document highlighted that LEO satellites can offer several critical benefits including the power to connect the unconnected, support for disaster response and network resiliency, and valuable new business models in conjunction with incumbent network operators. Further development of policies and regulatory regimes, and alignment among countries, can help support the deployment of LEO satellite networks, and the expansion of broadband connectivity in underserved communities around the world. Recommendations were made such as simplifying the regulatory processes and procedures for obtaining authorizations to provide NGSO satellite services, and adoption of general authorization and blanket licensing regimes to expedite practical, widespread, and economical deployment of customer terminals and network gateways, creating and safeguarding transparent and predictable regulatory regimes, including the preservation of spectrum allocations to the fixed satellite service (FSS) and mobile-satellite service (MSS), and

adopting satellite regulations that promote competition and technology neutrality, etc. This contribution was also submitted to Q1/1.

Document SG1RGQ/108+Annex **(GSOA)** presented a study by VVA and LSTelcom. The purpose of the study, conducted for the Global Satellite Operators Association (GSOA), is to assess the socio-economic benefits of satellite communications (satcoms), in different use cases across the globe, given the physical and geographical limitations that impact on terrestrial infrastructure. It also highlighted that satellites offer a cost-effective means to cover large swaths of the earth's surface, reaching people where terrestrial networks are unavailable, and generating substantial direct and indirect social and economic benefits.

Document SG1RGQ/81 **(BDT focal point)** (also for Q1/1, Q2/1, Q4/2, Q7/2) shared the BDT report on "Future Networks and Digital Infrastructure", including resources, and activities and work undertaken since the last ITU-D Study Group meetings.

These include the following; "From electricity grid to broadband Internet: Sustainable and innovative power solutions for rural connectivity", "ICT infrastructure business planning toolkit 5G networks 2023 edition", "ICT Business Planning Toolkit training" (in Spanish). Updates on the national broadband mapping systems, work on development of future networks and spectrum management in Asia and the Pacific, last mile connectivity toolkit, ICT infrastructure mapping, satellite communications workshop, and the Giga infrastructure toolkit.

Document 1/135 **(Question 4/1 and 5/1 Workshop Report)** shares the report of the joint workshop with Question 5/1 entitled "Challenges and opportunities of the use of USF for bridging the digital divide" held on 15 May 2023, the programme for which is available at: https://www.itu.int/en/ITU-D/Study-Groups/2022-2025/Pages/meetings/joint-session-Q4-1-Q5-1-may23.aspx

The content of the report as well as the presentations and documents shared were utilised for the joint deliverable and the final output report of Question 4/1 and Question 5/1, as applicable.

Document 1/167 **(Central African Rep.)** discusses how the Central African Republic is deploying optical fibre, using grants from the European Union and the African Union. Broadband access and the digital divide are a challenge for many developing countries. The Central African Republic is instituting strategies and policies to do everything possible to universalize broadband access, and ensure that no one is left behind. This includes connecting unserved and underserved segments of the population in rural and urban areas, and keeping prices on the national backbone affordable.

Document 1/170 **(Burundi)** highlights efforts in Burundi to review policies for deployment of ICT infrastructure in order to increase network coverage and decrease the digital divide, especially in rural and remote areas. The digitalisation of public services will be the intended consequence of proper planning of the deployment and sharing of ICT infrastructures.

Document 1/173 **(Burkina Faso)** highlights the adoption of Law No. 061-2008/AN of 27 November 2008, on the general regulation of electronic communications networks and services in Burkina Faso, and Decree No. 2011-093/PRES/PM/MPTIC/MI of 28 February 2011, which defines the modalities for the implementation of universal access and service for electronic communications and the modalities for the management of the fund for universal access and service for communications.

Document 1/175 **(State of Palestine)** proposes the need for quality of service (QoS) and quality of experience (QoE) KPI thresholds and values, and recommends an international benchmarking report on the main QoE and QoS KPIs.

Document 1/178 **(Argentina)** provides insights into the Plan Conectar, managed by Arsat, the state-owned satellite solutions company, focusing on public investments in connectivity. There are four pillars to the Plan Conectar:

- Reactivation of the Argentine satellite system, with the construction of the ARSAT-SG1 satellite to provide connectivity to homes in rural areas and neighbouring countries;
- Update and expansion of the Federal Fibre-Optic Network, with the goal of building and illuminating 4 408 kilometres of fibre-optic network;
- Enhancement of the National Data Centre, including the expansion of cloud services, updating of backup systems, and contingency policies;
- Recovery of the Open Digital Television, with the updating and recovery of transmission stations, renewal of the platform and strengthening of the equipment.

Document 1/180 **(Argentina)** presents the Mi Pueblo Conectado Programme, carried out by the Secretariat of Public Innovation of the Chief of Cabinet of Ministers' Office in Argentina, which seeks to promote the digital development of provincial and municipal government, improving public services, and reducing the digital divide in 377 locations. The plan includes satellite connectivity provided by Arsat, the state-owned satellite services company, and government financing Internet services for 12 months, in various provinces.

Document 1/185 **(Burkina Faso**) shares details of the implementation of digital boxes in rural and isolated areas or white areas of Burkina Faso.

Document 1/195 **(Indonesia**) details how, due to limited communications resources while at sea, Indonesian fishermen with non-SOLAS fishing vessels, had been using radio communications frequencies incorrectly, including the Aeronautical Mobile Service frequencies. As a result of fishermens' unauthorised usage of Aeronautical Mobile Service frequencies, Indonesian aviation, during the period 2014-2021, suffered from interference. This long-standing problem affected other neighbouring countries and therefore required special attention and action from the Government. As a response, the Ministry of Communication and Information of Indonesia (MCI), conducted an "Inclusive Communication for Fishermen" programme in 2019, to solve this issue. This initiative has been effective in reducing interference to the Aeronautical Mobile Service, and in boosting the productivity of the fisheries sector by increasing fish yields, and providing a useful aid for their economic viability.

Document 1/223 **(China)** introduces universal service policies and practices in China, summarizes the latest developments of telecommunications infrastructure in rural areas, and the actions taken to improve mechanisms and enrich rural Internet applications. The experience and practices accumulated by China are of great practical significance in promoting the inclusive development of global digital technology and hopefully will provide useful a reference for relevant countries and regions.

Document 1/246 **(United Kingdom)** summarises the experience to date with the United Kingdom Gigabit Broadband Voucher Scheme, a part of the Government's Project Gigabit programme. The Gigabit Broadband Voucher Scheme, pools demand among homes and businesses in eligible rural areas, to help cover the cost of deploying gigabit-capable broadband

infrastructure, in areas where there is no entitlement to a Gigabit Infrastructure Subsidy (GIS) procurement.

Document 1/259 **(Australia)** details how the Government of Australia funds delivery of basic publicly accessible telecommunications services, in approximately 457 small remote First Nations (indigenous) communities under the Remote Indigenous Telecommunications (RICT) programme. Under this programme, First Nations communities have access to free public telephone and Internet services (including community telephones, Wi-Fi hubs, and Wi-Fi telephones). The National Indigenous Australians Agency (NIAA) has a contract with a telecommunications provider for the monitoring, maintenance, and delivery of these services.

Document 1/147 **(Kamaleon, Mozambique)** discusses strategies to limit barriers and harness the power of digital technologies to build inclusive digital societies in developing countries. This requires a multidimensional and versatile approach to digital inclusion. The interactive mobile digital unit (IMDU) was developed to overcome accessibility challenges of rural areas, and enable inclusion of persons with disabilities and with specific needs, and to also to meet requirements to deliver a wide range of digital services, from e-education and e-health, to rural banking or e-government, enhancing socio-economic development and civic participation of the most vulnerable communities. This will contribute to more inclusive and participative societies as result of the positive impact of digital transformation in developing countries.

Document 1/199 **(Intel Corporation, United States)** provides updated information from Wi-Fi Alliance and Wireless Broadband Alliance on the progress and global status of Wi-Fi technology including Wi-Fi 6E, Wi-Fi 7, and the benefits to countries.

Document 1/200 **(Intel Corporation, United States)** updates information from Wi-Fi Alliance and Wireless Broadband Alliance on the progress and global status of Wi-Fi technology including Wi-Fi 6E, Wi-Fi 7 and benefits to countries.

Document 1/204 **(GSOA)** presents the proposal and concept for a joint Q1/1, Q3/1 and Q5/1 workshop. This workshop was proposed to be held over one day within the time management plan of the 2024 Rapporteur Group meetings of ITU-D SG1 to support Q1/1, Q5/1 and 3/1 The goal is to support administrations in building their national digital strategies and to advance each countrys' connectivity goals by identifying challenges and potential collaborations to achieve meaningful connectivity, with the objective to provide connectivity to all, provide regulatory and business best practices, and to showcase the key role of satellite services in day to day situations, as well as in disaster situations.

Document 1/235 **(Deloitte**, **France**) highlights the need to have a national network coverage policy, and a comprehensive vision of the different areas for intervention and their profitability. This step is crucial to define the Universal Service policy. This contribution proposes some methods from Deloitte's experience to calculate amounts and financing mechanisms (private or public via USF) to allocate to each area.

Document 1/238+Annex **(Ericsson**, **Sweden)** provides a brief overview of satellite systems, delineates the use cases and business models that inform the ongoing paradigm shift in the space industry, and details the 3GPP initiative on non-terrestrial networks (NTNs) along with the NTN standardization timeline in various working groups of the 3GPP. The paper posits that a 3GPP-compliant NTN solution would, in contrast to the bulky and expensive terminals used in non-3GPP-based legacy-MSS systems, provide immediate compatibility with mass-market smartphones, allowing terrestrial operators to boost their geographical coverage, and close the

connectivity gap with respect to voice and data coverage in sparsely populated areas, including rural settings, while serving new use cases such as maritime coverage.

Document 1/239 **(Association for Progressive Communications)** highlights that community Internet networks (CNs) in Argentina, have played a key role in the search for greater digital inclusion and in bridging the digital divide, especially in the most underserved areas of the country. With more than a decade of existence and more than six years of active collaboration and clear communication with ENACOM, as well as with other autonomous agencies and governmental bodies, these CNs have achieved remarkable progress in local connectivity and community empowerment. From this accumulated experience, valuable analyses and proposals can be drawn, that go beyond the simple expansion of connectivity services, or the delivery of devices. The key to addressing digital inclusion, especially in areas where the digital divide is most pronounced, lies in the creation of creative proposals and models. These models must include the active participation of people and territorial organisations that do not yet enjoy significant connectivity and digitisation, but have the capacity to advocate for it. Technological appropriation should be promoted in a way that has a positive impact on daily life, on production and marketing systems, on access to rights, on the production and dissemination of local culture, on the right to access information and communication, as well as on the capacity to decide and create their own way of communicating and cohabiting on the Internet.

Document 1/251+Annex* **(GSOA)** details how satellite technology plays a crucial role in advancing the United Nations SDGs in various ways.

Document 1/261* **(BDT Focal Points)** provides insight into how digital technologies and connectivity are key to achieving the United Nations sustainable development goals (SDGs). Satellite technology plays a crucial role in advancing the SDGs in various ways. Please see the annex on satellite technology for SDGs, for more information.

SG1RGQ/149 **(Senegal)** outlines how the fisheries industry in Senegal has benefitted from the Wireless Solutions for Fisheries in Senegal (WISE) project. The project provides users with access to meteorological and maritime resources, current market prices for fresh and processed fish, affordable loans and mobile financial services, best practices for fish processing, and hygiene and health education in multimedia formats.

SG1RGQ/160 **(Algeria)** detailed how through the universal service fund, Algeria is implementing various network connection and coverage projects to ensure universal telecommunication service. The meeting noted the document.

SG1RGQ/165 **(Haiti)** presents the final report on the resilience assessment for ICT networks and infrastructure, initiated by the International Telecommunication Union, and supported by the National Telecommunication Council (*Conseil National des Télécommunications*, CONATEL) of Haiti. The meeting noted the document.

SG1RGQ/166+Annex **(Dominican Rep.)** details how Indotel is implementing a plan for the expansion of connectivity for digital transformation in the country, with USD 115 million in financing from IDB.

SG1RGQ/167+Annex **(Dominican Rep.)** highlights how the Biennial Project Plan of the Telecommunications Development Fund of INDOTEL-RD for 2021-2022, "Connecting the Unconnected", has executed an "Access and Infrastructure" component to bring connectivity to small and isolated rural communities, and mountainous and unserved regions, through the

installation of nine Internet satellite kits for eight communities located in three of the poorest, least developed provinces of the country.

SG1RGQ/170+Annex **(Syria)** (also for Q3/1) proposes measures for the deployment of universal service in the telecommunication and information and communication technology (ICT) sector in rural areas, with the aim of improving development indicators and the accessibility of telecommunication and ICTs.

SG1RGQ/180 **(Côte d'Ivoire)** shared key issues to be considered for implementing a telecommunication/ICT accessibility policy and regulatory framework, for persons with disabilities and persons with specific needs in all countries.

SG1RGQ/185 **(Mexico)** shared a study on "Inequality and its impact on access to information technologies", prepared by the Federal Telecommunications Institute of Mexico.

SG1RGQ/186 **(Thailand)** covers the benefits of projects that have provided an opportunity for people, residing in remote, areas, low-income persons, disabled persons, children, the elderly, and underprivileged persons to access and engage in basic telecommunication services.

SG1RGQ/187 **(Burundi)** highlights efforts by Burundi with the assistance of ITU, to establish a National Digital Inclusion and Accessibility Strategy.

SG1RGQ/189 **(Central African Rep.)** outlines how Central African Republic, faced with the challenge of implementing high-speed and digital communications is publicising the use of high-speed broadband and regulating national backbone price caps, while integrating and implementing ICT services, including new and emerging technologies.

SG1RGQ/199 **(Syria)** highlights how Syria is developing a set of strategies for digital development, through the Ministry of Communications and Technology, with the assistance of other government agencies and their affiliated bodies.

SG1RGQ/206 **(India)** (also for Q1/1) presents the role of the Universal Service Obligation Fund (USOF) in India, in enabling non-discriminatory access to good quality, reliable and affordable telecommunication services. It updates the status of the expenditure and various projects being undertaken under USOF.

SG1RGQ/210 **(Burundi)** details the Government of Burundi project (PAFEN 2022-2027) to support the foundation of the digital economy, and fill existing gaps in network coverage on the supply side, by prioritizing unserved rural groupings and strategic sectors.

SG1RGQ/224 **(Saudi Arabia)** highlights how innovative spectrum management and licensing methods, alongside satellite connectivity, emerge as crucial strategies for rural connectivity. The document generated a lot of interest and was noted with appreciation.

SG1RGQ/230 **(Rep. of Korea)** details the project to look into the current digital divide in the north-western region of Guatemala, which was conducted in 2022, by the Government of Rep. of Korea and the Government of Guatemala, with assistance from the Inter-American Development Bank (IDB). The jointly coordinated project is expected to assist Guatemala with ICT policies relating to rural and remote areas, as well as strengthening cooperation between the two countries. This sharing of knowledge and practices assists in reducing the digital divide in rural and remote areas of Guatemala.

SG1RGQ/241 **(Brazil)** presents recent actions taken by the telecommunications regulator of Brazil to foster infrastructure expansion towards rural areas and communities.

SG1RGQ/245 **(Zimbabwe)** highlights the impact of having content on the Internet and other electronic platforms only in major languages. It explores the need for creating local content and the availability of content in indigenous languages. It also recommends deliberate programmes to encourage the creation of local content, and content in indigenous languages.

SG1RGQ/246 **(Uganda) covers** the Uganda Communications Commission pilot project in 2020, for providing rural households with communication devices.

SG1RGQ/247 **(United States)** describes the ongoing experiences of the United States National Telecommunications and Information Administration (NTIA), during the 2022-25 Study Cycle with broadband connectivity, adoption, digital inclusion, and equity, especially through the Internet for All initiative. This includes the Broadband Equity, Access, and Deployment (BEAD) programme, the Tribal Broadband Connectivity programme, and three new Digital Equity programmes.

SG1RGQ/249 **(South Africa)** highlights how integrating new technologies, implementing supportive policies, and fostering cooperation and the widespread availability of high-speed broadband infrastructure in rural areas, can be achieved, thereby improving access to essential e-services and enhancing the quality of life for inhabitants.

SG1RGQ/159 **(SUP'PTIC**, **Cameroon)** (also for Q6/1 & Q7/1) highlights how technological aids for people with disabilities, brought in from other countries, continue to require tropicalization and contextualization to improve inclusion for the population of persons with disabilities in Cameroon.

SG1RGQ/195 **(RIFEN)** (also for Q6/1,Q7/1 & Q5/2) draws attention to the need to design ICT connectivity for women and girls in a manner that seamlessly and meaningfully integrates digital skills and ICTs into their lives, bringing manifold benefits and positive and sustained multiplier effects in the concerned community.

SG1RGQ/203 **(GSMA & Orange**, **France)** highlights the technological innovations and partnerships that mobile network operators (MNOs) have funded to address the digital divide, in particular the usage gap, by improving affordability and digital skills, and creating more meaningful and relevant digital ecosystems.

SG1RGQ/205 **(Softbank Corporation**, **Japan)** provides an overview of high altitude platform station (HAPS) systems, emphasizing the stability, coverage capabilities, and spectrum expansion achieved through international agreements.

SG1RGQ/209 **(Broadband India Forum)** provides a presentation on the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISA), a digital literacy mission of the Government of India launched in 2019, with the main objective being to impart digital literacy training to one person per household.

SG1RGQ/215+Annex **(GSOA)** (also for Q1/1) highlights how satellite networks operating in mobile satellite services with allocated bands, have provided ubiquitous global connectivity to users on land, sea, and in the air.

Document 1/303 **(Chad)** highlights how Chad faces significant challenges in its digital development due to infrastructural weaknesses, limited resources, and a reliance on neighbouring countries for connectivity. The Government has prioritized ICT development as part of its national development plan, aiming to integrate the country into the international broadband network, and promote digital inclusion, especially in rural areas. Efforts include deploying a fibre-optic network, expanding 4G coverage, and creating community telecentres. Despite progress, issues such as low Internet penetration, regulatory gaps, and inadequate basic infrastructure hinder progress. Chad envisions leveraging digitalization to modernize public services, enhance e-governance, and stimulate economic growth, aiming to become a regional ICT hub by 2030.

Document 1/304 **(Bulgaria)** aims to expand high-capacity digital networks, including 5G, to underserved rural and remote areas, in order to enhance socio-economic development, and reduce the digital divide. With a focus on fibre-optic networks and universal mobile access, the project targets connectivity for over 200 000 households and emphasizes training, remote work, and access to essential services such as education, healthcare, and e-governance. Private investment challenges in low-density areas are addressed through public funding, with a total budget of EUR 240.25 million. Scheduled from November 2023 to August 2026, the project envisions a dynamic, inclusive economy powered by widespread digital connectivity.

Document 1/306 **(Haiti)** shows that ICTs have significantly impacted the commercial activities of Haitian women in rural areas, who play a critical role in the local economy despite facing challenges including limited resources, inadequate training, and economic vulnerability. Women engage in diverse activities such as farming, livestock rearing, and small-scale trading, contributing up to 50 per cent of agricultural production. ICTs have improved business efficiency by enabling online sales, better communication, and informed decision-making through access to information. Women now use tools such as online platforms, mobile payment apps, and messaging services to expand markets, reduce risks, and lower costs. However, access to ICTs remains limited, hindering progress. Proposed strategies include promoting climate-resilient agricultural technologies, providing better access to microfinance, and enhancing digital education, all aimed at empowering women economically and improving their livelihoods in rural Haiti.

Document 1/369 **(Haiti)** has made significant strides in implementing electronic signatures, a digital equivalent of handwritten signatures, to integrate into the digital economy and ensure document authenticity and integrity. Governed by legislation passed in 2014, and reinforced by subsequent decrees, the National Telecommunications Council (CONATEL) is tasked with implementing the law, and managing the associated technical and regulatory frameworks. Key advancements include signing agreements to establish an object identifier (OID) registration authority, recognized by international bodies such as ITU and ISO, and promoting awareness through workshops and training for stakeholders. Despite progress, challenges remain, including finalizing a draft implementing decree, defining regulations for electronic document admissibility, and establishing a public key infrastructure. Efforts by CONATEL, in collaboration with the Haitian Standardization Bureau (BHN) and the National Electrotechnical Committee (CEN), aim to address these issues and ensure widespread adoption of electronic signatures across Haiti.

Document 1/316 **(Kenya)**. The e-Agriculture initiative in Kenya is a pivotal effort to bridge the digital divide and achieve meaningful connectivity for rural and marginalized communities. Aligned with global goals such as the United Nations SDGs and Kenya's Vision 2030, the project

focuses on digitizing agricultural content, translating it into local languages, and disseminating it through ICT infrastructure to empower women, youth, and persons with disabilities. The initiative leverages partnerships between government agencies, such as the Communications Authority, ICT Authority, and Kenya Agricultural Livestock and Research Organization (KALRO), with the support of the USF. The first phase, implemented in six rural counties, has successfully digitized content for 16 agricultural value chains in nine local languages, improving farm productivity and socio-economic development. However, challenges including limited broadband penetration, resource constraints, and digital skills gaps persist, underscoring the need for sustainable strategies, including public-private partnerships, diverse financing mechanisms, and global collaboration, to enhance digital inclusivity and reduce the "usage gap" for marginalized groups.

Document 1/349 **(Bhutan)**. The experience of Bhutan with the South Asia Satellite (SAS) showcases the transformative role of satellite communication in addressing connectivity challenges in rural areas and enhancing disaster resilience. The SAS network bridges the digital divide by providing high-definition (HD) broadcasting services to unserved regions, ensuring equitable access to information and entertainment. It also plays a pivotal role in disaster communication, maintaining reliable emergency communication when conventional systems fail. The dual-use infrastructure of Bhutan, combining broadcasting and disaster response, demonstrates efficient resource utilization and resilience. By sharing lessons learned, including the importance of stakeholder collaboration and upgrading rural broadcasting services, Bhutan aims to inspire similar initiatives globally while advocating for ITU support in satellite communication research and capacity building.

Document 1/358 **(Colombia**, **United States).** The ProICT programme, part of the Digital Connectivity and Cybersecurity Partnership of the United States Government, collaborated with Colombian MinTIC and ANE, to design an innovative 5G spectrum auction in 2023. The auction, held on December 2023, was groundbreaking in its approach, incorporating in-kind obligations that secured new fixed Internet connections for nearly 1 200 schools benefiting around 73 000 children, and expanded 4G coverage along 700 kilometres of roadways. The multi-stage auction allowed the entry of a new operator and awarded 83 per cent of available spectrum for COP 1.5 billion, with successful bidders beginning 5G infrastructure rollout in February 2024. This collaborative effort demonstrated a successful international partnership in digital transformation, combining global best practices with local regulatory knowledge to achieve significant connectivity improvements, including faster Internet speeds, expanded network coverage, and multiple potential socioeconomic benefits for Colombia.

Document 1/423 **(United States).** USAID's Digital Invest programme demonstrates an innovative approach to expanding digital access in emerging markets through blended finance and strategic co-creation with private sector partners. By leveraging an initial USD 8.45 million in United States Government funding, the programme has helped mobilize an estimated USD 500 million in investment capital, with partners raising over USD 300 million and investing in 68 Internet service providers (ISPs) and fintech companies across 40 countries, leading to an additional USD 1.2 billion in external financing. The programme's success is built on its collaborative approach, where USAID engages in extensive co-creation activities with funding recipients, to design customized solutions for expanding broadband Internet and digital financial services to underserved populations. This is exemplified in successful partnerships such as Roke Telkom in Uganda, which now provides Internet coverage to over 200 000 people including residents of the Bidi Bidi refugee settlement, and Lendable's MSME Fintech Credit Fund, which has raised over USD 110 million in debt financing for fintech companies serving

micro, small, and medium enterprises across 15 countries. Through these initiatives, the Digital Invest programme has demonstrated how public-private partnerships can effectively bridge digital divides, and promote responsible technology use while working toward achieving the United Nations' sustainable development goals (SDGs).

Document 1/362 **(Azerbaijan)**. The Azerbaijan Rural Women's Association (ARWA) launched the Digital Empowerment Campaign in 2021, to address the digital divide facing rural women, who comprise nearly half of the rural population of 4.6 million in Azerbaijan. Initially sparked by COVID-19 restrictions, the campaign has evolved through strategic partnerships with organizations such as FAO, T-Mobile USA, Samsung, USAID, and UNDP, providing essential digital resources and training to rural women farmers and entrepreneurs. The programme focuses on practical ICT skills, including smartphone usage, video creation, social media marketing, and virtual meeting platforms, enabling participants to better access markets and knowledge. Through this initiative, 520 rural women have been trained, with 66 per cent of ARWA members now digitally skilled and actively mentoring others. The impact has been significant, with participating groups reporting an average 30 per cent increase in sales and 20 per cent rise in profits. The success of the programme, which operates through 54 Women Development and Enterprise Groups (WDEGs) and 14 Women's Cooperatives, demonstrates how targeted digital literacy initiatives can effectively empower rural communities, and create sustainable economic growth, particularly in addressing the challenges faced by women in remote areas who previously had limited access to smart devices and digital skills training.

Document 1/380 **(Rep. of Congo).** The COVID-19 pandemic has significantly impacted Africa's digital infrastructure development, where an estimated 900 million people still lack Internet access and only 0.4 per cent of the population subscribes to fixed broadband services. The pandemic caused delays in the deployment of advanced telecommunications infrastructure through factory closures, travel restrictions, and supply chain disruptions, resulting in slower 5G network deployment, and increased equipment costs. In response, the European Union has launched the "Global Gateway" strategy, mobilizing EUR 300 billion between 2021-2027, to support connectivity projects. Mobile technology has become Africa's primary telecommunications infrastructure, with some markets having up to 99 per cent of connections through mobile networks. While 5G deployment is underway in some countries such as South Africa, offering opportunities for remote monitoring and smart agriculture, its implementation requires significant additional investment due to technical requirements. The European Investment Bank, through the Digital4Development platform, is addressing these challenges by using blended finance mechanisms to reduce investment risks, attract private sector investors, and promote infrastructure sharing to increase rural connectivity. This comprehensive approach aims to accelerate Africa's digital transition and ensure inclusive access to digital services, particularly crucial after the COVID-19 pandemic highlighted how lack of Internet connectivity affected access to healthcare, education, and overall productivity.

Document 1/392 **(Senegal).** Senegal has made notable progress in digital connectivity, aiming to become a digital hub in Africa, yet challenges such as rural coverage gaps, high connectivity costs for disadvantaged populations, and a persistent digital divide remain. To address these, the Regulatory Authority for Telecommunications and Posts (ARTP) in Senegal initiated in 2024, a consultation on "Enhancing Digital Inclusion," focusing on affordability, universal access, and equitable digital participation. Recommendations include reducing connectivity costs, improving rural and gender-specific access, expanding public Wi-Fi, ensuring emergency network coverage, and enhancing service quality. A clear national strategy emphasizing training,

affordability, and infrastructure deployment, alongside transparency in the use of universal service funds, is essential. Greater partnerships between stakeholders, and innovative regulatory frameworks are also critical to fostering digital inclusion. By addressing these priorities, Senegal can leverage digital technology for economic growth, social integration, and improved public services, such as education and healthcare, particularly in underserved regions.

Document 1/393 **(India).** The document explores international best practices and initiatives in India for connecting rural and remote areas, emphasizing a balance between long-term and short-term approaches. Long-term strategies focus on sustainable infrastructure development, such as the BharatNet and submarine cable projects, which ensure future readiness and extended service life. Short-term strategies prioritize immediate support through subsidies, device provisioning, and welfare schemes for underserved populations. India has demonstrated significant progress through its Universal Service Obligation Fund (USOF), now expanded as Digital Bharat Nidhi (DBN), collecting USD 1.5 billion annually to fund telecommunications initiatives. Notable projects include extending 4G mobile connectivity, funding R&D for indigenous telecommunicaations technologies, and providing affordable broadband access in remote areas. India seeks to collaborate with other nations by sharing its experiences, learning from their initiatives, and addressing connectivity challenges collectively.

Document 1/407 **(China).** China has prioritized universal telecommunications services in rural areas, focusing on broadband infrastructure development and digital villages as strategic goals. Through policies such as the Universal Telecommunications Service Mechanism, significant advancements have been achieved in bridging the digital divide, with broadband and 5G networks reaching all administrative villages and border regions. The "5G Application Sailing Action Plan" integrates 5G with agriculture, governance, and public services, while initiatives such as the "Broadband Frontier" policy enhance connectivity in remote areas. By 2024, China had over 4 million 5G base stations, achieving "5G in every county," and rural Internet penetration had reached 66.5 per cent. Digital applications have transformed rural agriculture, governance, and e-commerce, driving economic growth and innovation. Examples include precision farming with digital tools in Nanjing, the integration of rural e-commerce platforms boosting agricultural sales, and digital governance models improving administrative efficiency. Moving forward, China aims to strengthen universal telecommunications services and foster a resilient digital society.

Document 1/430 **(Uganda).** In Uganda the Vision 2040 policy emphasizes the development of robust communication infrastructure to drive socio-economic growth and bridge the digital divide, with a focus on underserved and unserved areas. In line with this, the Uganda Communications Commission leverages subsidy financing through its universal service fund (USF) to support tower companies in constructing passive telecommunications infrastructure. This model promotes infrastructure sharing, reduces costs for mobile network operators (MNOs), and enhances broadband coverage. The programme involves identifying coverage gaps, providing financial incentives, fostering public-private partnerships, and ensuring minimum 3G coverage in targeted areas. Despite challenges such as high deployment costs, low population density, and alignment issues between stakeholders, the initiative aims to improve access to digital services, foster economic growth, and strengthen public-private collaboration. Community engagement and a robust monitoring framework ensure sustainability, with expected outcomes including increased connectivity, social inclusion, and job creation. The project serves as a model for addressing digital infrastructure gaps in similar regions globally.

Document 1/327 **(GSMA**, **Telefonica S.A).** At the end of 2023, approximately 350 million people (4 per cent of the global population) remained without mobile broadband coverage, predominantly in rural, poor, and sparsely populated areas. To address this coverage gap, which requires an estimated USD 430 billion investment by 2030, voluntary infrastructure sharing between telecommunications providers has emerged as an effective solution. This approach is exemplified by Internet para Todos (IpT) in Peru, a collaborative initiative established in 2019, by Telefónica, Meta, BID Invest, and CAF. Through shared infrastructure agreements and network virtualization, IpT has successfully connected over 18 000 rural population centres to 4G, benefiting more than 3.6 million people, with particularly positive impacts on traditionally underserved communities including women, rural populations, and those with limited education. While infrastructure sharing (both active and passive) has shown promising results in expanding coverage and reducing costs, the implementation remains limited globally, with regulatory frameworks often not reflecting the consensus on its benefits. The success of IpT demonstrates that voluntary, market-driven infrastructure sharing agreements, supported by appropriate regulatory frameworks, can effectively address the digital divide, while promoting efficient network deployment, and economic growth in underserved areas.

Document 1/399 **(GSMA).** The mobile industry continues to be a significant driver of sustainable development, achieving 58 per cent of its potential contribution to the SDGs in 2023, up from 31 per cent in 2015. The industry's most substantial impact was on SDG 9 (Industry, Innovation and Infrastructure), with mobile broadband coverage reaching 96 per cent of the global population, leaving only 350 million people (4 per cent) without coverage, while 4.6 billion people (57 per cent) actively used mobile Internet. Mobile financial services played a crucial role, with 3 billion people (54 per cent of mobile subscribers) using these services in 2023, contributing to multiple SDGs including poverty reduction and economic growth. Despite widespread coverage, the industry faces a significant usage gap, with many people living within coverage areas but unable to connect due to barriers such as affordability, digital literacy, and relevance. To address these challenges, operators have implemented various initiatives, including smartphone financing options, digital skills training, and relevant content development. Rural connectivity has shown notable progress, with mobile Internet adoption reaching 41 per cent (1.4 billion people) by the end of 2023, representing an increase of 420 million users since 2015, supported by innovations such as Nokia Rural Connect for reliable rural coverage deployment.

Document 1/418 **(GSMA).** The GSMA 2024 State of Mobile Internet Connectivity Report reveals that while mobile Internet connectivity continues to grow, reaching 57 per cent of the global population (4.6 billion people) by the end of 2023, the growth rate has plateaued with only 160 million new users added in 2023. The digital divide remains significant, with 3.45 billion people still unconnected to mobile Internet. This divide is manifested in two ways: a 'coverage gap' affecting 350 million people (4 per cent of global population) who live in areas without mobile broadband coverage, predominantly in least developed, landlocked, or small island developing states; and a much larger 'usage gap' affecting 3.1 billion people (39 per cent of global population) who live within coverage areas but face adoption barriers. The report identifies handset affordability as the primary barrier to adoption, alongside literacy and digital skills challenges, particularly in low- and middle-income countries (LMICs) where 95 per cent of the unconnected population resides. The comprehensive analysis includes detailed findings on global and regional connectivity figures, rural-urban disparities, device ownership, network coverage and quality, usage patterns, and specific barriers to adoption, concluding with policy recommendations focused on expanding digital skills initiatives and improving device affordability through financing options.

Document 1/371 **(RIFEN).** The International Network of Women Digital Experts (RIFEN) and Smart Africa Digital Academy (SADA), collaborated to deliver an intensive cybersecurity training programme aimed at enhancing digital security awareness and skills among African youth. The comprehensive programme consisted of fourteen modules covering essential topics including cybersecurity fundamentals, data protection, network security infrastructure, and operating systems such as Windows and Linux. The training successfully equipped participants with practical knowledge to identify and address cybersecurity threats, vulnerabilities, and attacks, while also developing crucial skills in teaching, teamwork, problem-solving, and technical communication. Participants gained Support Technician Cybersecurity certification, improving their job prospects in the cybersecurity sector, and were able to mentor other young talents, creating a ripple effect of knowledge sharing. The initiative, which reached over a thousand participants, emphasizes the importance of cultural shift in cybersecurity awareness and highlights the need for collaboration at government, business, and societal levels within an African Cybersecurity Awareness Framework. The success of the programme demonstrates its effectiveness in building a new generation of cybersecurity professionals capable of protecting African digital infrastructure, and contributing to the development of the continent through enhanced cyber resilience.

Document 1/374 **(RIFEN)**. The use of the Internet in Burundi has significantly impacted daily life, education, and economic activities, though challenges persist. Stable and affordable Internet access is essential for productivity, yet many face barriers due to high costs, inadequate infrastructure, and digital illiteracy. While mobile technologies have driven increased Internet penetration, disparities between urban and rural areas remain pronounced. The Internet supports education, entrepreneurship, and access to information, but its potential is hindered by the digital divide. Regulatory bodies and telecommunications operators must improve infrastructure, reduce costs, and ensure service reliability. Digital education and targeted training programmes can enhance user skills, while promoting local innovation and supporting tech startups is vital for economic growth. By fostering an inclusive digital environment, prioritizing cybersecurity, and enacting data-driven public policies, Burundi can leverage the Internet as a catalyst for socio-economic development, ensuring broader benefits for its population.

Document 1/377(Rev.1) **(RIFEN)**. The study explores how Information and Communication Technologies (ICTs) can promote sustainable agriculture in rural Cameroon, focusing on the Nda'a community in the Western Region. Agriculture, critical to the economy of Cameroon, faces challenges including low productivity, poor access to improved inputs, and limited technical knowledge. ICT tools such as mobile phones, community radios, and Web 2.0 applications were integrated through the Nda'a Agricultural Days project to address these issues. The initiative involved surveys to identify the needs of farmers, capacity-building workshops, and the dissemination of agricultural information. Results showed improved agricultural practices, greater adoption of organic fertilizers, enhanced knowledge sharing among farmers, and strengthened community engagement. The project reached over 300 farmers, organized workshops, and mobilized resources for sustainable agricultural development, highlighting the potential of ICTs in transforming rural livelihoods.

Document 1/396 **(RIFEN)**. Digital connectivity is a key driver of socio-economic development in Africa, yet significant gender gaps persist in access to and usage of technology, particularly in rural areas. Women in the Sub-Sahara Africa region are disproportionately affected by digital exclusion, facing barriers such as lower income, limited educational opportunities, social norms, and high costs of digital devices. Despite improvements in mobile Internet coverage, usage

gaps remain, with women lagging behind men in smartphone ownership and digital literacy. To bridge this gap, it is crucial to ensure affordable and accessible digital technologies, invest in digital skills development, and promote digital financial inclusion. Organizations such as the International Network of Women Digital Experts (RIFEN) are making efforts to empower women through digital skilling programmes and entrepreneurship initiatives. Recommendations to address these issues include fostering public-private partnerships, leveraging universal service funds for empowerment of women, and encouraging policies that promote women's access to digital content and leadership roles in the tech space. These efforts aim to reduce the gender digital divide and enhance the participation of women in digital socio-economic activities across Africa.

Document 1/401 **(Access Partnerships**, **United Kingdom).** The digital divide continues to hinder global progress, particularly for small and medium enterprises (SMEs) in underserved areas, with limited access to technology and the Internet. To address this, governments and organizations are implementing policies and initiatives to enhance digital infrastructure, optimize network and security management, and promote equitable access. Solutions such as routed optical networking, and software-defined wide area networks (SD-WAN) help SMEs lower costs, improve connectivity, and strengthen cybersecurity, empowering them to adopt digital tools. Case studies from Ethiopia and the Asia-Pacific region demonstrate the benefits of these technologies in reducing operational expenses and enhancing network resilience. Policy recommendations, including workforce training, public-private partnerships, and regulatory sandboxes, are essential to enable SMEs to thrive and bridge the digital divide. These efforts are critical for empowering SMEs to access the digital tools and resources necessary for success in the digital economy.

Document 1/402 **(SoftBank Corp.**, **Japan).** This contribution, developed by the HAPS Alliance Telecom WG and submitted by SoftBank Corp., highlights the significance of high altitude platform stations (HAPS) as a key component of modern 3D telecommunication infrastructure, alongside satellite constellations and terrestrial networks. HAPS offer telecommunications providers and governments a solution to address coverage challenges in underserved areas and provide rapid response during natural disasters, offering advantages such as faster connection speeds, lower latency, better indoor penetration, and higher network capacity compared to satellites. The contribution includes two key deliverables: Attachment 1, outlines the mission, vision, and technological advancements of HAPS towards commercialization, while Attachment 2, presents regulatory recommendations to enable HAPS deployment, including recent developments such as the WRC-23 expansion of HAPS service-link frequencies, to guide governments in creating effective national regulations for HAPS implementation.

Document 1/416 **(Huawei).** The Generation Connect Young Leaders Programme (GCYLP) youth projects emphasize closing digital divides globally through innovative approaches. In Zambia, the Morey initiative focuses on making essential electronic devices affordable via partnerships and flexible financing, targeting rural populations. In Pakistan, the DIGITAL ROHI project aims to connect remote areas such as the Cholistan Desert, using solar-powered Internet stations and locally tailored solutions. In Cambodia, the AURA project empowers persons with disabilities by leveraging Web3 and GameFi technologies to provide digital inclusion and passive income. These projects align with multiple sustainable development goals (SDGs), such as reducing inequalities, and fostering sustainable innovation, offering scalable models to promote inclusive socioeconomic growth across underserved regions.

Document 1/426 **(Ericsson).** The FWA Handbook 2024, offers six actionable insights for leveraging 5G technology to extend rural connectivity, with global fixed wireless access (FWA) service provider adoption reaching 80 per cent. It highlights the growing momentum of 5G FWA, with 121 providers offering services and 30per cent adopting speed-based tariffs. The handbook explores value creation through revenue growth, operational efficiencies, and shared CAPEX strategies, while emphasizing the potential of FWA to bridge the digital divide by extending urban investments into suburban and rural areas. It outlines strategies to accelerate FWA uptake by integrating it into existing business processes, and evaluates the evolving customer premises equipment (CPE) ecosystem for performance and profitability. Lastly, it details steps for network evolution to ensure FWA growth and sustainability over time.

Document 1/427 **(Ericsson)**. The Ericsson Mobility Report 2024, provides industry-leading analyses and projections on mobile industry trends, including 5G, mobile subscriptions, data traffic, FWA, and Internet of things (IoT). Since 2011, the report has been a key resource for understanding telecommunications developments, offering insights into current market dynamics and future forecasts validated by extensive network measurements. This edition highlights the continued global expansion of 5G, with nearly 600 million new 5G subscriptions expected in 2024, driven by deployments in India, and North America. However, only 25 per cent of global sites outside China have adopted mid-band 5G, despite its significant user experience benefits. The report also explores the potential of high-performing, open 5G standalone networks for service innovation and performance-based business models. Additionally, it emphasizes FWA as a crucial 5G use case, especially in regions such as the Middle East region and Africa, where it enables service providers to monetize networks, and bridge connectivity gaps in areas with limited landline access. Insights on 5G FWA and its monetization potential are integrated throughout the report.

Document 1/428 **(GSOA)**. The GSR24 Outcomes and the GSOA Contribution highlight the critical role of satellite technology in addressing the digital divide, connecting 2.6 billion unconnected individuals, and advancing global digitalization. With demand for ubiquitous and reliable connectivity rising, satellites, and particularly in non-terrestrial networks (NTNs), offer transformative solutions for rural and underserved areas. Key advancements in satellite and antenna technologies enable cost-effective broadband services, including residential, business to business (B2B), and direct-to-device offerings, driving socio-economic development. Policymakers face challenges in leveraging these technologies effectively, such as fostering inclusivity, regulatory certainty, and global standards. Recommendations emphasize creating a predictable regulatory environment, encouraging public-private partnerships, reducing barriers such as spectrum costs and licensing restrictions, and aligning with international standards to promote innovation and investment. These measures, combined with collaborative efforts between terrestrial and non-terrestrial service providers, are vital to achieving global connectivity goals, and ensuring the inclusive adoption of transformative technologies for a sustainable digital future.

Document 1/435 **(ITU APT foundation of India).** Broadband connectivity in rural and remote areas can transform lifestyles, improve business opportunities, and bridge the digital divide. Broadband connectivity enables advancements in healthcare, education, agriculture, and employment through technologies such as distance learning, e-agriculture, and weather forecasting. However, rural areas face challenges including low population density, poor infrastructure, and high deployment costs, leaving them largely underserved. Emerging technologies, such as non-terrestrial networks (NTN), cognitive radios, dynamic spectrum

access, and renewable energy, offer sustainable solutions. The integration of terrestrial and non-terrestrial networks, leveraging standards such as IEEE 802.22 WRAN, IEEE 802.11af White-Fi, and IEEE 802.11ah WiFi HaLow can ensure affordable and efficient broadband access. These technologies utilize unused spectrum (e.g., TV White Spaces) and are designed for energy efficiency, long-range connectivity, and low operational costs. Governments, regulatory bodies, and local micro-operators must collaborate to address challenges, promote digital literacy, and develop sustainable business models. By adopting these approaches, broadband access can be extended to underserved areas, fostering economic and societal benefits while supporting the United Nations sustainable development goals (SDGs).

Document 1/452 **(Deloitte).** The study, "Building a Digital Inclusion Index: The Case of Tunisia", aligns with the Digital Strategy 2021-2025 in Tunisia, which aims to position the country as a leader in digital communications technology by leveraging ICTs for social and economic development. Acknowledging the importance of digital inclusion, and ensuring equitable access to the internet and related skills, the study evaluates disparities across demographics and regions through a customized "Digital Inclusion Index". This multidimensional index measures three key areas: access (availability of infrastructure and affordability), aptitude (technical skills and socio-cultural mindset), and usage (intensity and diversity of Internet use). Drawing from international frameworks and tailored to the context of Tunisia, the analysis, conducted in collaboration with key national institutions, identifies priorities to guide public policies for improving digital inclusion and bridging the digital divide.

Document 1/454 **(GSOA).** Innovative satellite technologies, including multi-orbit networks, inter-satellite links, software-defined satellites, and in-orbit servicing, are revolutionizing global connectivity. Satellites have long supported critical services such as Internet access, remote sensing, weather forecasting, and positioning, navigation, and timing (PNT) bridging gaps for remote regions and disaster-stricken areas. The integration of non-terrestrial networks (NTNs) into 5G and 6G ecosystems is further enhancing connectivity, enabling seamless communication through small antennas on smartphones, vehicles, and fixed terminals. These advancements highlight the role of the satellite industry in providing scalable, cost-effective, and reliable solutions to meet growing global demands for connectivity, fostering inclusivity and bridging the digital divide.

Document 1/455 **(GSOA).** The emergence of satellite direct-to-device (D2D) connectivity represents a significant advancement in satellite communications, offering consumers seamless and ubiquitous connectivity using their existing devices. This paper explores two key variants: D2D in mobile-satellite service (MSS) bands, which leverages spectrum already allocated to mobile-satellite services for seamless integration with 3GPP NTN standards, and D2D in MS bands, which uses mobile service (MS) spectrum to extend connectivity to commercial mobile devices. While D2D in MSS bands benefits from established protocols and minimal regulatory challenges, D2D in MS bands presents technical and regulatory hurdles, but provides a complementary solution to terrestrial networks in underserved areas. Realizing the full potential of satellite D2D connectivity requires collaboration among satellite operators, mobile network operators (MNOs), and regulatory bodies to address challenges and unlock new opportunities in global communication.

Document 1/446 **(BDT).** The "Giga Barbados and OECS Connectivity to Community Programme" is an ITU-UNICEF pilot project in Barbados aimed at enhancing Internet access in schools and community centres, while promoting child online safety in countries of the Organisation of Eastern Caribbean States (OECS). With a budget of USD 178 000, the programme upgraded

broadband infrastructure in 27 schools, benefiting over 18 000 students and 1 300 teachers, and in two community centres, where Internet speeds increased to 250 Mbit/s, and IT equipment was installed. Over 200 community members registered for digital skills training, with 55 completing the programme. Despite improved network performance, challenges with Internet reliability and funding remain, highlighting the need for additional investments in bandwidth, ICT policy, and curriculum reform. The proposal to establish Barbados as a "Digital Transformation Centre" offers a potential pathway to sustain and expand digital skills development.

Document 1/346 **(Rapporteurs for Q1/1, Q3/1 & Q5/1).** The "Transformative Connectivity: Satellite Workshop" highlighted the rapid innovation in the satellite industry and its potential to bridge the digital divide, especially in underserved and remote areas. The workshop, structured into four sessions, addressed key themes including affordability, sustainable business models, regulatory frameworks, and the integration of non-terrestrial networks (NTNs) with terrestrial technologies. Discussions emphasized the role of satellites in delivering broadband connectivity, supporting disaster mitigation and recovery, and enabling services in education, healthcare, and agriculture. Success stories of LEO constellations and initiatives such as "Early Warnings for All" were shared, alongside challenges such as affordability and regulatory complexities. The integration of NTNs with 5G and future 6G ecosystems was recognized as pivotal for seamless global connectivity. Stakeholder collaboration, effective spectrum management, and user-centric approaches were deemed essential for leveraging satellite technologies to create a more connected, resilient world. The outcomes of the workshop will contribute to further discussions and reports.

Document 1/334 **(BDT Focal Points).** The BDT report highlights significant progress in ICT infrastructure development since the last ITU-D Study Group meeting, focusing on geospatial tools, training programmes, and business planning initiatives to bridge digital divides. Efforts include broadband mapping projects such as Africa-BB-Maps, which aims to boost digital transformation in 11 African nations with EUR 15 million funding, and specialized training programmes on ICT infrastructure planning, including 5G deployment strategies. The ICT Infrastructure Business Planning Toolkit has been updated to support sustainable 5G rollouts, offering training sessions globally. The report also covers emerging technologies, with a project led by MSIT/Rep. of Korea and ITU promoting capacity building in AI, data, and cloud technologies to foster digital prosperity. Additionally, technical assistance has been provided to countries including Republic of the Gambia, Republic of Djibouti, and Islamic Republic of Mauritania, focusing on spectrum management, digital television transitions, and infrastructure mapping to enhance affordable and modern connectivity solutions.

Annex B – List of lessons learned

Web	Received	Source	Title
1/455	2024-10-22	Global Satellite Operators' Association (GSOA)	The future of satellite connectivity: Various approaches to direct-to-device services

The advent of satellite direct-to-device connectivity heralds an exciting era for the telecommunications industry. Introducing novel services that offer consumers ubiquitous connectivity benefits, this paper examines two variants of satellite direct-to-device (D2D) applications, focusing on their significance within the satellite communication market.

Satellite D2D service presents both promising opportunities alongside some challenges. Exploring the two variants, D2D in mobile-satellite service (MSS) bands and D2D in MS bands, underscores the innovative landscape of satellite communications.

Collaboration between satellite operators, MNOs, and regulatory bodies is indispensable to realize the full potential of satellite D2D connectivity and usher in a new era of ubiquitous and seamless communications.

Web	Received	Source	Title
1/454	2024-10-22	Global Satellite Operators' Association (GSOA)	New satellite technologies for transformative connectivity

The paper highlights the importance of integrating non-terrestrial networks (NTN) with terrestrial systems, using multi-orbit satellites and software-defined architectures for scalable, affordable and reliable connectivity. Artificial intelligence, machine learning, and quantum technologies are recommended for optimizing operations and improving security, while inter-satellite links enhance real-time data transfer. Best practices include leveraging these advancements to meet growing global demand for secure, high-capacity communications and ensuring seamless, efficient, and resilient connectivity by adopting a unified, software-driven, and multi-layered satellite approach.

Web	Received	Source	Title
1/452 +Ann.1	2024-10-31	Deloitte Risk Advisory S.r.l., France	Construction of a digital inclusion index: The case of Tunisia

Developing countries need to adopt a more comprehensive vision of digitalisation. This does not simply mean accelerating access, but also taking into account other dimensions of digital inclusion, such as intensity of use and diversification of uses. (Original in French)

Web	Received	Source	Title
1/448	2024-10-29	Global Satellite Operators' Association (GSOA)	GSOA comments to Question 5/1 Report Draft

Improving this report now is essential, providing ample time to refine and enhance its accuracy, coherence, and impact before WTDC25 and ensuring that it is future proof. By addressing gaps, clarifying points, and ensuring alignment a strong foundation is set for the final stages of the report.

Web	Received	Source	Title
1/435	2024-10-22	ITU-APT Foundation of India	Minimum basic broadband services for rural and remote areas in developing countries

This contribution draws attention to the provision of broadband service for rural and remote areas, to reduce the digital divide in developing countries with the help of reliable mobile and non-terrestrial network technology, which can provide coverage in rural and remote areas and connect millions of unconnected or under-connected people. With high quality broadband connectivity for humans and machines, Internet of things (IoT) can revolutionize business processes bringing new opportunities for both people and businesses.

Web	Received	Source	Title
1/430	2024-10-22	Uganda	Expansion of mobile network infrastructure in underserved and unserved areas through subsidy financing to tower companies

1) Regulations need to be put in place to ensure that mobile operators must take up sites where subsidies have been provided by the regulator to tower companies to expand mobile coverage.
2) The parties (the regulator, the mobile network operators (MNOs) and the tower companies) must discuss and collaborate before agreeing on which unserved and underserved areas require subsidy intervention, as one way of trying to align with their rollout plans.
3) Enhance community engagement: Involve the local communities throughout the project lifecycle to inform communities about the benefits of improved connectivity while overcoming any community resistance to tower installations due to health or aesthetic concerns.
4) Streamlined regulatory processes: Advocating for simplified regulatory frameworks and faster permitting processes which can facilitate faster infrastructure deployment.
5) Holistic infrastructure development plans: Investing in complementary infrastructure, such as roads and power supply, can address logistical challenges associated with project implementation.
6) The low penetration rate of digital devices in most unserved and underserved areas makes mobile network operators hesitant to enter into rental agreements with the tower companies, as they believe that even though the rental costs are subsidized, the average revenue per user (ARPU) will be low. There is a need for a sustainable strategy on ways to increase the penetration of digital devices in unserved and underserved areas which includes undertaking other programmes such as digital skills training.

Web	Received	Source	Title
1/428	2024-10-22	Global Satellite Operators' Association (GSOA)	GSR24 Outcomes and GSOA Contribution

GSOA would like to bring to the attention of the administrations their contribution submitted to the ITU consultation on GSR24 Best Practice Guidelines, "Charting the Course of Transformative Technologies for Positive Impact" that we consider relevant to the ITU-D reports and specially in building for the preparatory work for WTDC25. Equally, this document highlights the outcomes concluded during the industry meeting IAGDI-CRO for the consideration of the meeting.

Web	Received	Source	Title
1/399	2024-10-21	GSM Association	2024 mobile industry impact Report: Sustainable development goals

1) A case study discussing the Data Insights for Social & Humanitarian Action (DISHA) a platform for planning disaster response deployment and observing the medium/long-term impact of poverty alleviation programs is provided. The solution uses anonymized mobile phone data from telecommunication companies and aggregates them to detect major population movement across target areas. It also correlates utilization of the telecommunication association's products with historical census poverty data to estimate how poverty rates change over time.
2) A case study showcasing Nokia Rural Connect, a solution enabling operators to provide reliable rural coverage quickly, with a secure power supply, is presented.
3) The report contains insights on the work of Bharti Airtel to improve knowledge and skills in India. It also includes a spotlight on the Whiz Kids Project, conducted by Turkcell in collaboration with the Ministry of National Education, aims to introduce talented students in Türkiye to technology, and develop their technical abilities at an early age. The objective is to foster a generation aged 8-18 who not only consume technology but also contribute to its development.
4) Case studies showcasing solutions of Ericsson and Kiona to save energy and decarbonize residential homes, and work of Reliance Jio to improve the energy efficiency of mobile networks are presented.
5) The report presents the case study of IoT solutions from Telia to improve health outcomes for older populations.

Web	Received	Source	Title
1/358	2024-09-19	Colombia, United States	Spectrum auctions with in-kind payment obligations, cross-country digital transformation collaboration and lessons learned

The partnership between Colombia and the United States described in this contribution represents a positive example of cross-country collaboration on 5G radio spectrum auction design and implementation. Among other benefits, the work undertaken as part of this collaboration supports digital transformation to achieve SDGs, and ongoing efforts to provide access and connectivity to all.

Traditional auction processes can be tailored to achieve specific infrastructure requirements of unserved or underserved regions. For example, "in-kind" payment obligations, which allow operators to provide connectivity to underserved or unserved locations in lieu of some portion of licensing fees can be included in auction design to increase competitive bidding.

To achieve a successful outcome, specific market attributes and market maturity must be taken into consideration. Adequate stakeholder consultation is essential for assessing market specificities.

Developing trusted relationships between the policy advisors and host government counterparts is vitally important. Sustained engagement over a number of months increased the ability of partner teams (ProICT and MinTIC) to achieve consensus on project design and goals, proving pivotal to the project's success.

Web	Received	Source	Title
1/327	2024-09-18	GSM Association	Advancing digital inclusion through infrastructure sharing

Regulators dealing with the issue of extending coverage to remote and rural areas should facilitate and encourage infrastructure sharing models which, by generating operational and financial efficiencies in the deployment of networks in rural areas, can help lower the cost of extending coverage to these areas.

Network sharing can be less appealing to operators in markets, particularly in emerging economies which consider coverage to be a competitive advantage. In cases such as these, compelling market actors to enter infrastructure sharing agreements may reduce their incentives to invest and expand to new areas. In order not to disincentivize investment, sharing agreements should therefore be driven by market considerations, and should not be made mandatory. Operators' use of network sharing agreements is therefore likely to facilitate a faster and more efficient rollout in congested urban areas as well.

Web	Received	Source	Title
1/306	2024-09-11	Haiti	Impact of ICTs on the commercial activities of Haitian women in rural areas

ICTs are a vital part of online trade and contribute to strengthening the economy for women in rural and remote areas.

Web	Received	Source	Title
1/304	2024-09-10	Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria

In order to deploy very high capacity networks (VHCN) in many areas of the country, investments need to be made in fibre-optic networks for transmission to remote and sparsely populated locations. Without such investments, telecommunications and other network operators will have no market interest in further investment in VHCN in such locations. Private operators are reluctant to invest in transmission and access networks in these areas due to declining population densities and the relatively low purchasing power of local residents. The State supports the investments in fibre-optic networks for transmission to remote and sparsely populated areas with various projects, such as the project presented in the document.

Web	Received	Source	Title
1/303	2024-09-05	Chad	Assessing the impact of deploying broadband infrastructure for remote areas and digitalizing services

The digitalization of public services requires deploying broadband networks and bridging the digital divide. This poses a major challenge for developing countries: how to extend the network to unserved or underserved areas to interconnect institutions and businesses. Broadband infrastructure, applications and services offer important opportunities for boosting economic growth, enhancing communications, improving energy efficiency, safeguarding the planet and improving people's lives. It should be noted that access to broadband has had a significant impact on the world economy. Rapid evolution and new business opportunities are driving rapid if uneven growth in digital technologies.

Web	Received	Source	Title
1/259 +Ann.1	2023-10-16	Australia	Remote indigenous telecommunications (RICT) programme

- Robust design to protect hardware against harsh environmental conditions has improved overall reliability and longevity of equipment.
- The RICT programme includes a focus on preventative maintenance, with the service provider visiting all sites at least once each year.

Web	Received	Source	Title
1/251 +Ann.1	2023-10-11	Global Satellite Operators' Association	Satellite for SDGs – Transforming lives

Satellite connectivity plays a critical role in connecting the 2.6 billion that remain unconnected. The optimum solution for future connectivity does not lie with one technology alone, but through a combination of multiple technologies, pooling their different strengths to increase cost efficiency, whilst simultaneously working together to deliver the exceptional resilience and greater availability for a much larger number of citizens.

Web	Received	Source	Title
1/246	2023-10-10	United Kingdom	Case Study: Gigabit broadband voucher scheme

This experience helps inform new strategies for pooling resources, identifying gaps in supply versus demand for ICT services, and funding infrastructure rollout in a way that supports market competition by supporting a range of suppliers. For this example, ICT policymakers and regulators should:

- Pool together market demand in rural and remote areas to better encourage investment in underserved areas;
- Define open rules that encourage market competition and support a diverse range of Internet service providers within the market;
- Provide targeted participation materials for different stakeholder groups, such as consumers and service providers of various sizes and business models, as demonstrated in the Gigabit Broadband Voucher Scheme (GBVS) materials; and
- Publish regular programme updates to demonstrate transparency, build accountability, and inform future investments in infrastructure deployment, as demonstrated in the quarterly reports in this contribution.

Web	Received	Source	Title
1/239	2023-10-10	Association for Progressive Communications	Reflections on the status of community networks in Argentina and on the public policies that enhance them

These recommendations can be found in greater context in the text of the document. By way of summary, we can distinguish the following proposals and challenges from the perspective of Argentinean community networks and particularly from the perspective of the AlterMundi Civil Association:

- Need for regulations and programmes to access the long-term universal service fund (USF), with a focus on initial training and capacity building, and with the active participation of the community in decision-making on the management and design of their own telecommunications infrastructure.
- Deepen the communication between community networks, civil society organizations, regulators, and entities that share the objective of fostering more meaningful connectivity, especially in unconnected or underserved territories and social groups.
- Create, maintain, and deepen channels of communication and joint working groups in order to work from the perspective of community networks. Through this communication, improve and adapt regulations and policies to increase their penetration in unconnected territories.
- Diversify connectivity models and digitalization of processes with the aim of improving and dignifying peasant, indigenous and suburban life.
- In particular regarding the Roberto Arias Programme, reallocate funds for its continuity, taking into account the projects already presented that have not yet been approved and those that will be presented during the two years of its extension.
- Protect funds for the deployment of community infrastructure, preventing their use for commercial projects or other purposes, guaranteeing that community networks have the time and tools necessary to access a fund exclusively for them.
- Promote free peering between networks built with public resources and community networks.
- Allow community networks to take advantage of the idle international transit bandwidth available to State entities and agencies.

Web	Received	Source	Title
1/238 +Ann.1	2023-10-10	Ericsson Ltd.	Using 3GPP technology for satellite communication

Satellite connectivity based on open 3rd Generation Partnership Project (3GPP) specifications offers the best opportunity to create a large non-terrestrial network (NTN) ecosystem, enabling connectivity between terrestrial systems and satellite systems on the same mobile platform. As satellite systems will not have the same capacity as terrestrial systems, they should be viewed as complementary rather than competing systems. We expect to see more cooperation between satellite operators and terrestrial communication service providers (CSPs) in the years ahead to achieve mutual benefits in this area.

Web	Received	Source	Title
1/235	2023-10-10	Deloitte	How to identify areas where the universal service fund (USF) should intervene first?

- Universal service policy cannot be separated from a national broadband plan.
- Suitable tools are needed to evaluate demand and potential and deployment costs and explore financing mechanisms.
- An in-depth quantitative analysis of financing needs can enable optimized use of universal service funds.

Web	Received	Source	Title
1/185	2023-10-02	Burkina Faso	Setting up digital boxes for the benefit of populations living in white space areas

The development of broadband connectivity remains a major challenge for Burkina Faso:

- Network extension for unserved areas;
- The price of broadband accessible to the population.

Member States are encouraged to strengthen their regulatory, institutional, and technical capacity as part of the opening-up strategies which today promote the accessibility, availability, and affordability of broadband for a greater number of our fellow citizens.

Web	Received	Source	Title
1/180	2023-09-29	Argentina	Federal ICT training plan

In terms of lessons learned, the importance of reviewing and thinking about the best way to promote the reduction of gender disparity in this type of training is highlighted, taking into account that a great difference continues to be registered in terms of the number of male registrations over those of women.

Web	Received	Source	Title
1/179	2023-09-29	Argentina	Mi Pueblo Conectado Programme

The main lesson learned was to understand the relevance of having specific programmes that contemplate particular situations within the country (geographic, population, productive development, etc.) for the different localities that lack access to connectivity or have very poor access. Its implementation demonstrated and highlighted the need to guarantee the right to connectivity, essential in the era of digital transformation. Likewise, it reinforced the importance of the Government of Argentina, as an active actor to effectively reach all the people who are currently disconnected throughout our country. "Mi Pueblo Conectado" means for many people, the opportunity to access the Internet, digital services, and is a basic right of citizenship.

Another lesson learned was understanding that the implementation of a public policy does not always correspond to its original planning. This happens due to the complexity of achieving clear communication with multiple actors, and the significant deployment throughout the country that this programme required, which required us to adapt to the circumstances and have flexibility in the implementation process, beyond what was planned.

Web	Received	Source	Title
1/178	2023-09-29	Argentina	Plan Conectar

The role of ICT was reinforced during the COVID-19 pandemic. Connectivity became essential for citizens to continue with their jobs, education, communication and entertainment. Without it, people risk being excluded from the digital economy. Providing connectivity to all of Argentina involves thinking about various specific strategies that are integrated into a general strategy.

Through the Conectar Plan, the Government of Argentina has worked to deliver connectivity infrastructure to remote areas so that everyone can participate in digital technologies and take advantage of their full potential. Regarding the Conectar Plan, a lesson learned that stands out, is that it is a public policy that has been sustained over time and that transcends the various administrations that have succeeded each other in the National Executive Branch. In this sense, the connectivity policy that is reflected in the Conectar Plan is a continuation of the different initiatives implemented by the National Government since 2010, in which the Argentina Conectada Plan emerged.

Adopting a personalized approach for each region of our country, considering its singularities, involves providing a digital solution that fits the needs of the region, and providing satellite or fibre-optics according to the characteristics of each region and province. For almost unreachable areas, satellite connectivity worked as an effective solution to connect small towns and cities where it is difficult to deploy fibre-optics. Therefore, it is important to diversify investments in connectivity to effectively connect the unconnected, and strategically allocate public resources.

Web	Received	Source	Title
1/173	2023-09-24	Burkina Faso	Evaluation of the National strategy for the development of access and universal service

Several lessons have been learned from the implementation of the 2017-2021 national access and universal service strategy. We can cite among others:

- The importance of respecting the monitoring and evaluation system, this will make it possible to avoid or minimize errors observed;
- The efficient and effective development and implementation of a strategy, presupposes the existence of a solid and appropriate legal and institutional framework that clearly defines the roles and responsibilities of the different stakeholders involved.

Web	Received	Source	Title
1/170	2023-09-16	Burundi	The impact of the deployment of ICT infrastructures in the digitalization of services

The digitalization of public services requires deployment of broadband networks and efforts to overcome the digital divide. The task of extending network coverage to unserved or underserved areas for the interconnection of institutions and businesses, constitutes a great challenge for developing countries.

Web	Received	Source	Title
1/167	2023-09-07	Central African Republic	Strategy for extending connectivity to unserved and underserved segments of the population in rural and urban areas

Deployment of an optical fibre network remains a major challenge for developing countries. It comprises the challenge of extending the network to reach unserved and underserved areas, and the challenge of keeping the price of broadband access affordable for all.

Member States are encouraged to strengthen their regulatory, institutional and technical capacities, with national strategies and plans for optical fibre deployment, in order to guarantee access to broadband for the broadest possible community of users.

Web	Received	Source	Title
1/153 +Ann.1	2023-09-07	Rep. of Korea	Case studies utilizing TV platform to enable inclusive communication

Through the two projects, it has been proved that TV is one of impactful platforms to deliver social value to the deaf people. The two projects presented in this contribution, funded by Government, are just a starting point as the featured AI-based sign language translation technology is still in an early stage of development. There was a proof of concept (POC) project by two leading TV manufacturers to implement avatar sign language on their user guide. As the technology is evolving, we can expect all contents on TV to be automatically translated into avatar sign language. To make this a practical reality, there needs to be strong support from government on development of AI training datasets (parallel corpus of sign language and spoken language) and on an effective translation engine.

Web	Received	Source	Title
1/147	2023-09-07	Kamaleon, Mozambique	Universal design for inclusive digital societies

The universal design (UD) of the interactive mobile digital unit (IMDU) is further facilitated by the universal design for learning- (UDL)-based communication approach, that uses a combination of various technological and digital tools with different types of "teaching-learning" communication processes. These development initiatives have a multidimensional effect on the cognition of communities, that translates into greater impact of the message delivered, and consequently into social and behavioural changes. This means that the IMDU is well adapted for the promotion of digital inclusion of rural communities in development countries The IMDU is a cross-functional platform that benefits communities in the following ways: (a) allows direct and individual interaction with specialists for; (b) faster comprehension of the message while; (c) ensuring the inclusion of persons with disabilities, with auditory processing disorders, and with visual impairments. The IDMU leads to a more comprehensive approach to attaining global SDGs: the IDMU concept is (i) designed to promote quality education and capacity building (SDG 4); (ii) a green innovation solution using renewable resources and clean energy (SDG 7 and SDG 13) ; (iii) providing inclusive digital tools to remote and hard to reach communities (SDG 10); through which (iv) vocational training for women is delivered (SDG 5); (v) basic services such as healthcare provided (SDG 3); and (vi) effective government-citizen information flow facilitated (SDG 16).

Web	Received	Source	Title
1/85	2022-11-15	Argentina	Regulatory framework to include community networks in the strategy of connecting rural and remote areas in Argentina

- Considers the benefits of including local actors in the connectivity strategies;
- Small and medium sized service providers can play an important role in the deployment of broadband networks, especially in rural and remote areas;
- Providing connectivity in rural, remote, unserved and underserved areas, in which the inhabitants themselves are part of the solution, is a valid alternative;
- Promoting access to telecommunication/ICT services in unserved and underserved areas has proven to be a tool for bridging the digital divide.

Web	Received	Source	Title
1/70	2022-11-14	World Bank	World Bank Study Group 1 Submission: Enabling environment for meaningful connectivity

The World Bank Group stands ready to support its least developed client countries with a special emphasis on fragility, conflict and violence (FCV), and small island developing states (SIDS). Through the analytical work programme and strategic partnerships (e.g., the Digital Development Partnership, including developed countries and private sector donors) the World Bank is working closely with client countries to promote the deployment of low cost advanced technologies and innovative business models to expand access to digital services, not only in rural and remote areas, but also in the peri-urban areas where so many are not able use the Internet productively.

This work will involve piloting new, agile approaches to regulations, open data/standard infrastructure mapping, and new approaches to empowering citizens, small business, schools, and health clinics to acquire the devices and skills they need. The World Bank is also developing tools and approaches to assist client countries ensure that the connectivity that is being provided can be trusted by consumers through safe and private access.

Web	Received	Source	Title
1/56	2022-10-21	Comoros	Project to stimulate demand for ICTs: impact on closing the urban/rural divide

For people-centric ICT projects, in particular in rural areas, several factors need to be taken into account: infrastructure deployment, access, the cost of connectivity, availability of terminal equipment, and access to a stable power supply. Subsequently, an impact assessment should be carried out to determine the real impact of such deployments. If only some of these conditions are met, the project may not survive, or be sustainable. Consequently, there is an urgent need to carry out an assessment for the project, which should be bolstered with complementary means to ensure its sustainability.

Web	Received	Source	Title
1/54	2022-11-13	Burundi	Policy and strategies in place to connect rural and remote areas

- The National ICT Development Policy (2011-2015) covers all socio-economic sectors in the country, given the cross-cutting nature of ICTs. The policy includes measures on rural connectivity and universal access, which are set out in detail in strategic axis No. 7.
- The National Development Programme (2018-2027) focuses in particular on strategic ICT infrastructure development.
- The Ministry of Communication, Information Technology and Media, has adopted a strategy for the sector, which prioritizes broadband development.
- Burundi is working to deploy optical fibre throughout its national territory. The major provincial centres are all connected to optical fibre, and there is political will to extend optical fibre to rural district centres. (Burundi is the first country to establish fibre-optic coverage across distances of multiple kilometres.)
- 2G/3G/4G networks have been deployed throughout the country, with the participation of three operators: Onatel, Econet Leo, and Viettel.
- Community telecentres, connected to optical fibre, have been established in rural and remote areas to give the local population access to ICT-based services and stable connectivity.
- To ensure sufficient ICT services in rural areas, the Ministry of Communication, Information Technology and Media, has launched a project to establish ICT clubs in schools. In addition to the usual ICT-related classroom learning, students participating in such clubs also have the opportunity to further their learning outside the classroom, which in turn they pass on to their households.
- A universal service fund has been established.

Web	Received	Source	Title
1/48	2022-10-13	Bhutan	Strategies: Deployment of broadband in Bhutan

In order to operate and manage the network, it is necessary to involve our stakeholders in ensuring reliable and available service anytime.

Government needs to provide subsidies/incentives to telecommunications operators for development of ICT Infrastructures.

Government developed an infrastructure (fibre-optic network) that was leased to telecommunications operators and initiated a Demand Aggregation Project reducing the tariff to make it affordable for communities.

Web	Received	Source	Title
1/31	2022-10-05	Comoros	The case of the Comoros: practices to improve access and connectivity with a view to reducing the gap between rural, remote and urban areas

Comoros should revitalize its ICT capital goods import policy through preferential customs duties, but should also implement ICT services projects, such as the national digital health strategy or the implementation of a data centre. These are necessary conditions for the efficient use of the country's available capacity (submarine cables).

Web	Received	Source	Title
SG1RGQ/2447	2024-04-02	United States	Programmes that reflect a whole-of-nation approach to high-speed Internet to increase connectivity and digital inclusion

NTIA notes that the *Internet for All* initiative is still ongoing, with some programmes yet to launch. Some preliminary lessons learned include:

- Holding public consultations with the fullest range of stakeholders, is key for digital inclusion and Internet access programmes to ensure inclusive, effective programming. NTIA held national-level public consultations before issuing Notices of Funding Opportunity (NOFO) for these programmes. In addition, the 56 states and territories of the United States also pursued public consultations prior to submission of their BEAD initial proposals.
- Effective broadband grant programmes need broad participation from a variety of providers, as well as safeguards to ensure appropriate use of public funds.
- Maintaining flexibility in administering requirements enables participation from a broader range of providers. For instance, after NTIA received feedback that BEAD's letter of credit requirement could limit participation in the programme, NTIA issued a waiver providing specific alternatives that will encourage participation from a wide range of providers, while still protecting taxpayer dollars.
- Stakeholder engagement during broadband grants proposals development at the state and local level should include:
    - Letting community priorities drive the planning process
    - Encouraging deep community engagement and outreach
    - Cultivating win/win partnerships
    - Leveraging local assets
    - Articulating a broadband vision
- The United States looks forward to sharing additional lessons learned as these critical connectivity programmes are further implemented.

Web	Received	Source	Title
SG1RGQ/246	2024-04-02	Uganda	Impact assessment of rural household devices project by the Uganda Communications Universal Services and Access Fund

- Literacy training programmes – Enhancing literacy levels directly addressed adoption and usage challenges related to low awareness and understanding of the devices and applications. However, there is need for continuous education and training initiatives specifically tailored to the beneficiaries' needs to ensure acquisition of necessary skills by beneficiaries to maximize usage.
- Enhanced sensitization – Increased awareness and understanding of the project's objectives contributed to improved user engagement and participation. Such projects can also be leveraged to create public awareness about the project sponsor and the sponsor's objectives to consumers.
- Multi-stakeholder collaboration – Wider stakeholder engagements ensured inclusion of community leaders, operators, and device manufactures thus fostering a supportive environment for the project to excel.
- Project sustainability – After-sales service is required in each village to ensure sustained usage to maximize the project benefits.
- Impact of cultural norms – The study noted that for highly patriarchal households, device sharing was not feasible with men dominating usage devices. In order to foster sustainability, such family set-ups need more than one device to achieve the desired objective.

Web	Received	Source	Title
SG1RGQ/245	2024-04-02	Zimbabwe	Indigenous languages and access to ICTs by rural and remote communities

Overcoming the language divide with content available in indigenous languages widens access to, and use of ICTs.

Web	Received	Source	Title
SG1RGQ/215	2024-04-01	Global Satellite Operators' Association	Satellite direct-to-device connectivity Bringing connectivity to everyone, everywhere, anytime

Satellite connectivity plays a critical role in connecting the 2.6 billion that remain unconnected. The optimum solution for future connectivity does not lie with one technology alone, but rather through a combination of multiple technologies, pooling their different strengths to increase cost efficiency, whilst simultaneously allowing them to work together to deliver exceptional resilience and greater availability for a much larger number of citizens.

The satellite industry is going through a phase of unprecedented growth and innovation, and is expected to bring an estimated USD 250 billion in social and economic benefits across the world by 2030.

Satellite direct-to-device (D2D) is contributing and will continue to contribute to bridging the digital divide, while improving users' life safety and will open new horizons for connecting everyone. The result is bringing meaningful connectivity to consumers, increased digitalization of services for governments, and new business opportunities for enterprises. The continued development of the global 3GPP defined NTN standard, coupled with a regulatory regime that is transparent, safeguards existing spectrum, enables access to additional harmonized spectrum on a worldwide level, and will ensure that affordable D2D services are available to all.

Web	Received	Source	Title
SG1RGQ/210	2024-03-29	Burundi	Extension of local connectivity in the Digital Economy Support Project in Burundi: Inclusion of areas and populations currently not connected

Introduction

The purpose of this document is to define the framework and steps necessary for the successful implementation of the sub-component "Access to Local Connectivity" within the framework of the Project to Support the Foundations of the Digital Economy (PAFEN) in Burundi. This sub-component, valued at USD 20.1 million, is part of the overall project supported by the Government of Burundi with additional funding of USD 42 million, which is being finalized.

Context and objectives

PaFEN, extending until the end of August 2028, aims to modernize the digital infrastructure of Burundi, and extend access to high-speed connectivity in rural areas. The "Access to Local Connectivity" sub-component specifically targets rural areas where commercial incentives for network expansion are insufficient to stimulate investment.

The main objectives of this sub-component include:

- To stimulate high-speed access in rural areas by filling coverage gaps.
- Promote the modernization of digital infrastructure in underserved areas.
- Promote digital inclusion, particularly with regard to women and youth.
- Mobilize private capital to support the development of connectivity infrastructure.

Steps and tasks

Diagnosis of the high-speed market and roadmap for reforms:

- Evaluation of market structure and value chain.
- Documentary review, interviews with industry stakeholders and field visits.
- Analysis of existing infrastructure and coverage requirements.
- Elaboration of a roadmap for the necessary reforms.
- Mapping and evaluation of network coverage.

Network coverage mapping and assessment:

- Obtain network coverage maps and expansion plans from operators.
- Identify unprofitable areas and evaluate network service coverage.

Analyse the socio-economic indicators used by operators to expand their network.

Web	Received	Source	Title
SG1RGQ/206	2024-03-29	India	Universal Service Obligation Fund (USOF): Promoting access to and delivery of telecommunication services for bridging the digital divide

The broadband connectivity is a pre-requisite for transformation into a digital society. Various e-governance services, banking services, telemedicine, online education, etc., require broadband connectivity. Mobile wireless broadband is one of the most important means of providing broadband Internet access to the general public. The USOF of India has been the force behind establishing of high-quality network infrastructure across the rural and remote areas of the country, enabling non-discriminatory access to good quality reliable and affordable telecommunication services.

Web	Received	Source	Title
SG1RGQ/195	2024-03-22	RIFEN	Women leaders are needed for impactful digital connectivity policies and programmes

The design of programmes that impart digital skills to women, whether they are related to digital literacy or e-services, would benefit much from involving women leaders. The scheme under discussion was a unique policy initiative that involved an expansive interpretation of universal service policy to target rural women in the definition of inclusivity. It was also tailored to ensure the sustained entrenching of digital skills, and digital connectivity benefits seamlessly through careful design, feedback, and course corrections.

Web	Received	Source	Title
SG1RGQ/189	2024-03-06	Central African Republic	Integration and implementation of ICT services in rural and remote areas including new and emerging technologies

Digitization of isolated and underserved areas and deployment of the fibre-optic network remain major challenges for developing countries. These challenges include those of network expansion for unserved or underserved areas, as well as the implementation of high-speed connection prices that are accessible to the entire population.

Member States are encouraged to strengthen their regulatory, institutional and technical capabilities as part of national fibre-optic deployment strategies and plans, ensuring broadband accessibility to as broad a user community as possible.

Web	Received	Source	Title
SG1RGQ/187	2024-03-05	Burundi	Élaboration d'une stratégie nationale pour l'inclusion numérique au Burundi : Orientations de l'UIT pour une transformation holistique et inclusive grâce aux TIC accessibles (*Developing a national strategy for digital inclusion in Burundi: ITU guidelines for holistic and inclusive transformation through accessible ICTs*)

(continued)

Web	Received	Source	Title

As part of current initiatives to lay the foundations for a digital economy, an ongoing project is focusing on the implementation of the sub-component 'Facilitating local access and inclusion'. This sub-component aims to:

- Target priority populations such as persons with disabilities, indigenous peoples, and refugees in order to overcome barriers to digital access.
- Raise awareness of the benefits of accessing and using digital technologies, improve access to broadband-compatible devices, and promote a digital culture for basic use of smart devices and digital applications.
- Structure activities to ensure maximum impact, avoiding social friction and complementing other similar initiatives.
- Test pilot activities in selected communities, with a focus on rural areas and women, paying particular attention to women's associations.

Current efforts aim to address existing demand-side barriers to digital access, focusing on underserved populations, including rural communities, women and girls, and vulnerable subgroups. (Original in French)

Web	Received	Source	Title
SG1RGQ/186	2024-03-04	Thailand	Rural and remote broadband development in Thailand

- Ensure full implementation of regulations.
- Government agencies have to stimulate the digital economies in rural and remote areas with community education efforts and programmes in order for people to understand these new opportunities and the impact of broadband Internet services on individuals, communities, and the economy as a whole.
- Motivations and efforts that promote the user adoption of broadband services, personal and societal benefits, and ICT skills are fundamentally recommended.

Web	Received	Source	Title
SG1RGQ/149	2024-02-18	Senegal	Overview of the Wireless Solutions for Fisheries in Senegal (WISE) project

The WISE project has produced important results for households, by greatly increasing income and the means of livelihood and by providing government bodies with data to improve food security, and prepare for any intervention that might be required. The contribution ends with a strong recommendation to ITU and its partners to support an expansion of the WISE project experience in Senegal, to Africa and developing countries in general.

Web	Received	Source	Title
SG1RGQ/107	2023-04-25	Brazil	Identifying digital gaps with crowd-sourcing data

The use of crowdsourcing and data analytics as a formal tool for planning and policy purposes was first deployed by ANATEL, for the purpose of mapping the existing connectivity infrastructure and the digital gaps in Brazil. The tool has allowed the agency to analyse billions of updated empirical observations, organizing them into millions of geographic grid quadrants of 150 x 150 square metres. The tool allowed the areas with unmet demand for broadband services, to be pinpointed with great precision. This framework became a fundamental reference for public policies design in Brazil, as well as in several ongoing regulatory initiatives. For example, the tool has been used to map public schools and health facilities in Brazil that do not have access to broadband Internet, and in the design of a public policy strategy that uses these public facilities as inducers for the expansion of the broadband infrastructure in the cities of the interior, and in the outskirts of big urban centres.

Web	Received	Source	Title
SG1RGQ/95	2023-04-25	Amazon Corporation	Bridging the digital divide through advances in satellite technology

Further development of policies and regulatory regimes, and alignment among countries, can help support the deployment low earth orbit (LEO) satellite networks and the expansion of broadband connectivity in underserved communities around the world. As a starting point, ITU Member States can work to modernize and harmonize regulations by undertaking the following measures:

- Simplify the regulatory processes and procedures for obtaining authorizations to provide non-geostationary (NGSO) satellite services, and adopt general authorization and blanket licensing regimes to expedite practical, widespread, and economical deployment of customer terminals and network gateways.
- Create and safeguard transparent and predictable regulatory regimes, including the preservation of spectrum allocations to the fixed satellite service (FSS) and mobile-satellite service ("MSS").
- Adopt satellite regulations that promote competition and technology neutrality.
- Adopt a reasonable, administrative fee structure for the issuance of licenses and authorizations for the provision of satellite services.
- License and authorize satellite communications providers and operators on a non-discriminatory basis.
- Adopt spectrum management practices that recognize the value proposition of satellite services and their role in bridging the digital divide.

Web	Received	Source	Title
SG1RGQ/84	2023-04-25	Rep. of Korea	Universal service regime in Rep. of Korea

Introduces the case of the USF in Rep. of Korea in order to share experiences with other Member States on policy direction to bridge the digital divide.

Web	Received	Source	Title
SG1RGQ/78	2023-04-24	International Chamber of Commerce, France	Delivering universal meaningful connectivity

We find that it takes a unique mix of technology, regulatory approaches, and business models to deliver an ICT ecosystem and appropriately respond to the needs of each community. The ICC White Paper on Delivering Universal Meaningful Connectivity paper provides a menu of concrete policy options for decision-makers to consider, combine and adapt to their specific needs, and includes a number of selected examples.

Web	Received	Source	Title
SG1RGQ/76 +Ann.1	2023-04-25	Argentina	Programme for the deployment of access networks to mobile communications services in cities with up to 500 inhabitants

A rapid impact is generated in small towns by bringing mobile connectivity. Connectivity allows the inhabitants of these areas to improve their quality of life by accessing more varied services, more information, and better opportunities for progress.

Web	Received	Source	Title
SG1RGQ/72	2023-04-24	South Africa	DNS skills for rural and remote communities

Historically, the .za namespace in South Africa was not regulated until the ZADNA was formed. ZADNA is entrusted with the critical role of ensuring a secure namespace, particularly for rural and remote areas where access to information and communication technologies may be limited. Through its mandate, ZADNA seeks to promote the growth and use of the .za namespace, while safeguarding the rights and interests of users in South Africa.

In today's rapidly advancing technological era, access to telecommunications and ICTs has become essential for social and economic development. While urban areas have seen a significant increase in connectivity and access to ICTs, rural and remote areas have lagged due to various infrastructural and geographical challenges. This digital divide between urban and rural areas has been recognized as a major hindrance to the country's overall progress and development. ZADNA aims to help bridge the digital divide and promote inclusive growth. The aim is multifaceted, encompassing the licensing and regulation of service providers, the development of infrastructure, the provision of education and training, and the promotion of innovative solutions to overcome the challenges of providing connectivity in remote areas.

ZADNA employs the following methods in its efforts to provide telecommunications and ICTs services in rural and remote areas of South Africa:

– ZADNA ZA Schools Digitisation Programme

The overall objective of this project is to bridge the digital divide between private and public, urban and rural schools by ensuring all learners and educators in basic education have an email address, and their respective schools have a domain name and a website irrespective of their geography or financial standing. This provides a digital identity to the schools, learners, and educators while also providing digital skills to parents.

– za Education and Awareness Programme

The programme is implemented through a combination of face-to-face engagements, and social and traditional media marketing, and occasionally incorporates alternative dispute resolution (ADR) workshops, which are held throughout the country. Its purpose is to equip historically disadvantaged communities with knowledge about the domain name system (DNS) industry, promote the growth of .za domain name registrations, and encourage South Africans to choose .za as their preferred safe online domain. Furthermore, a key objective of the programme is to promote online safety, which is achieved through collaboration with various stakeholders.

This programme reached over 16 million people between 2021-2023, in a country with a population of 62 million people. This figure comprises the domain name registration market (potential and existing users) and an empowered 'communities' market (educational market segments of youth, women, and a number of people with disabilities).

– Alternative dispute resolution (ADR) workshops

The workshops aim to equip South African communities with domain-related knowledge by educating various participants on protecting their rights and interests. The discussions include how to register a domain, prevent and mitigate DNS abuse, protect against domain name-related data breaches, and ensure the secure transfer of domain names. By participating in the ADR workshop, participants discuss best practices and strategies for enhancing their online security posture and minimizing risk. Overall, the workshops help ensure participants are better equipped to navigate the increasingly challenging and dynamic digital landscape.

– ADR regulations

ZADNA currently implements the ADR regulations to address disputes related to abusive or offensive domain name registrations. The ADR regulations provide a clear framework for addressing disputes related to domain registrations, and offer both mediation and arbitration procedures. The ADR regulations also establish procedures for both mediation and arbitration, which ZADNA and the appointed ADR service providers facilitate. These measures help to ensure fair and impartial resolution of disputes promptly and effectively.

Web	Received	Source	Title
SG1RGQ/72	2023-04-24	South Africa (Republic of)	DNS skills for rural and remote communities

Moreover, ZADNA is currently in a process of driving for the promulgation of the registry and registrar licensing regulations and procedures (RRLR&P), intended to establish clear guidelines and procedures for the management of domain name registrations securely and reliably. By implementing these regulations, ZADNA takes concrete steps to prevent and mitigate DNS abuse, which can help to further build confidence in the reliability and security of the namespace. The development of the RRLR&P represents essential steps towards greater online safety and security.

– DNS training course

To further enhance awareness, ZADNA hosts and facilitates empowerment sessions for selected communities and stakeholders to impart skills and knowledge. Promoting a new skills set in the ICT sector involves including women, youth, and people with disabilities within the DNS, and exposing them to the working environment. The training course gives the participants a deeper understanding of DNS and its role in online security. By learning about DNS protocols and standards, participants can better identify potential security risks and vulnerabilities in their network infrastructure and exploit the business opportunities.

Moreover, the course provides insights into best practices for securing domain name registration and management, including choosing strong passwords, implementing two-factor authentication, and keeping DNS records up to date. Participants can also learn about DNS security extensions (DNSSEC) and how they can help prevent DNS-related attacks.

– Registrar-reseller training

A registrar-reseller purchases domain names in bulk from a domain registrar and resells them to end-users, often with added value services such as web hosting, email, and website builders. The registrar reseller training is conducted to promote the transformation of the ISPs environment by upskilling resellers to eventually become fully fledged registrars and access the .za domain namespace market. The training programme is conducted in person and virtually, and targets individuals and small, medium, and micro enterprises (SMME) with the technical knowledge and expertise required to become successful registrar-resellers.

Web	Received	Source	Title
SG1RGQ/71 +Ann.1	2023-04-24	Association for Progressive Communications (APC)	Addressing the financial and regulatory barriers faced by community connectivity providers in supporting deployment of digital infrastructure in developing countries

Small scale community connectivity providers face financing and regulatory barriers that can be addressed through appropriate regulatory change and funding strategies. Best practices in this regard include:

– License exemptions or low-cost licenses that reflect the non-profit and small-scale nature of CCPs
– Reduction of other burdensome license conditions such taxation and reporting
– Provision of access to shared or license-exempt spectrum
– Provision of USF financing and smart subsidies for CCPs
– Provision of blended finance for CCPs from development institutions

Web	Received	Source	Title
SG1RGQ/52	2023-04-02	Burkina Faso	Security crisis in Burkina Faso, strengthening the resilience of consumers in localities affected by insecurity through the restoration of electronic communication infrastructures

Telecommunications infrastructures have become a target of choice for armed groups who try to isolate the populations of the affected localities, and compromise the access of the said populations to communication services. Despite the complexity of the situation, the States where these groups operate must take measures to ensure the provision of communication services. Appropriate technological solutions exist and can be implemented by associating telecommunications operators and the regulatory authority. Financial solutions or mechanisms can be considered by the States. Burkina Faso has set up a Support Fund for the implementation of exceptional measures in the electronic communications sector which makes it possible to finance the restoration of destroyed telecommunications sites.

Web	Received	Source	Title
SG1RGQ/49 +Ann.1	2023-03-29	SBA Communications, Brazil	The sharing of passive infrastructure as a tool for bridging the digital divide and economic and social growth

A review of the research literature and interviews of regulators and policymakers has led to the identification of seven types of initiatives that can contribute to the development and sustainability of an independent tower sector:

- No need for service concession: The construction of a cell tower does not rely on a public good, as is the case of spectrum. Therefore, it should not be ruled by a concessionary framework. Furthermore, the tower industry is not a natural monopoly requiring a concessionary regime, as is the case for power transmission, and railways. This concept supports the need to provide public right of way access at market rates. As a caveat, considering that the tower industry is not unlike other forms of private real estate, regulation should be limited to over-deployment, as determined by environmental reasons (see below).
- Need for fast permit approvals driven by consistent and reasonable timeframes: At present, many municipalities in the Latin America region have constitutional autonomy to grant installation permits for antennas, and rights of way for fibre-optic rollout. Accordingly, they can interfere with the provision of telecommunications/Internet services that are under federal authority. Frequently, and in many countries of the region, local regulations for obtaining municipal permits have been imposed over federal authority, becoming very restrictive, not transparent, bureaucratic, and even irrational. These barriers increase the opportunity cost for deploying passive infrastructure, enhancing the cost of deployment.
- Regulations to prevent over-deployment: Tower over-deployment, in many cases driven by financial speculation, is a frequent feature in the Latin America region. The negative consequences of this situation are environmental and economic. Focusing on the latter, a simplified financial model developed for this study indicates that, on average, unless a single tower is supporting the radios of more than one operator (preferably three), its profitability is questionable, especially in suburban and rural settings over a ten-year time horizon. On this basis, governments should promote policies and regulatory frameworks preventing over-deployment while fostering sharing especially in rural areas.

Web	Received	Source	Title
SG1RGQ/49 +Ann.1	2023-03-29	SBA Communications, Brazil	The sharing of passive infrastructure as a tool for bridging the digital divide and economic and social growth

- Establishment of a cap on fees and taxes, and rights of construction: Fees and taxes, also referred to as the "cost of compliance", have an impact on the tower business case. In general terms, most macroeconomic research literature has found that taxation regimes play an important role in driving capital flows, when controlling for economic development, and currency fluctuations. In this context, tower deployment is affected by the fiscal burden imposed by municipalities, in the form of specific fees with the purpose of either limiting deployment of infrastructure, or of increasing revenues. Sometimes these fees become recurrent and even subject to annual increases defined on an ad-hoc basis. Without making any judgement about the need of municipalities to collect revenues to support the delivery of public services, it is also the case that by increasing the pre-tax cost of tower deployment, local authorities limit the capacity for the wireless industry to support the connectivity needs of their population.
- Implement policies to promote development of infrastructure to be shared for deployment of 5G: The deployment of 5G will require significant expansion of the level of densification of radios and antenna arrangements at street level to achieve useful coverage in some high data traffic spaces. Considering the layered architecture of wireless networks that necessitates both macro sites and small cell sites, it is estimated that by 2030, between two and three times the current number of sites will be required. In the context of these deployments, zoning regulation will become critical to address over-deployment, reduce the permit approval process, and to access to public buildings and right-of-way at market prices.
- Do not impose price regulation of tower company contracts with service providers: In economic terms, price regulation is normally justified when markets fail to produce competitive prices. In the past, price regulation has been applied in the telecommunication sector to meet efficiency (under scarcity conditions) and equity objectives (fair access to an essential service). Similarly, interconnection prices have been regulated at times to ensure anti-competitive behaviour of incumbent carriers at times of market liberalization. None of these conditions apply to contracts between a provider of infrastructure and a service provider. Prices to be charged between an independent tower company and wireless operators should not be regulated because: (i) they reflect contracts between private parties based on agreed upon prices;(ii) they do not reflect excessive or unconscionable pricing of an essential good (also called "price gouging"); and (iii) they would represent a disincentive to invest in infrastructure.
- Define long-term guarantees in regulations and permits: Heavy initial CAPEX for tower deployment should be accompanied by relatively stable and predictable rules to ensure profitability and re-investment. While the financial profile developed in the context of this study is calculated over a ten-year timeframe, stability and predictability of regulatory frameworks are a critical industry requirement.

Web	Received	Source	Title
SG1RGQ/47	2023-03-29	Burundi	National policy, regulations and strategy put in place to provide access to telecommunications/ICTs in rural and remote areas

- Establishment of a national ICT development policy
- National fibre-optic backbone
- Implementation of multipurpose community telecentres in rural areas
- Establishment of ICT clubs in schools

Web	Received	Source	Title
SG1RGQ/43	2023-03-23	Zimbabwe	The evolvement of the Universal Service Fund: Financing innovation

i. ICT capacity building: It was observed that there is need for continuous capacity building training courses among farmers on the use and benefits of ICT.
ii. ICT devices: Due to the observed prominent degree of a lack of smart devices amongst the majority of the farmers, there is a need to develop coordination mechanisms between government, the private sector, and civil society organizations (CSOs) to provide ICT devices to enhance the farmers' knowledge and use of ICT devices either at low cost or for free.
iii. Connectivity: There is need for network connectivity improvement especially in rural areas.
iv. Awareness and sensitization: Most farmers obtain information through the traditional media channels of television and FM radio, thus the need to utilise these channels for more awareness creation and sensitization on the use of ICT4Agric.
v. Extension services: There is need for the establishment of more digital interactive voice recording (IVR) call centres to address the challenges associated with poor extension service delivery by extension workers. This will allow extension workers to provide feedback and guidance to farmers through the established digital IVR call centres within the regions, in local languages that can easily be understood.
vi. Digital localized content: There are issues related to the availability of digital localized content within extension service delivery, the Government of Uganda through the Ministry of Agriculture, Animal Industry and Fisheries, should streamlining of the development of localized content across the agriculture value chain to support extension services, which could then be centralized on the e-agriculture academy.
vii. ICT tools and systems for farmers: Given the significant number of farmers without smart phones and the network related issues, there is need for the Ministry of ICT in partnership with the private sector to develop tools that do not need Internet connectivity.
viii. Cyber security is still a prominent concern especially for the elderly involved in farming, thus the need for strengthening and sensitization on the subject.

Web	Received	Source	Title
SG1RGQ/41	2023-03-23	Zimbabwe	The evolvement of the Universal Service Fund: Financing innovation

Use of universal service funds to fund i-hackathon-based innovations can result in practical solutions.

Web	Received	Source	Title
SG1RGQ/34	2023-03-23	Zimbabwe	The narrowing gap between the needs of rural and remote communities and those of urban communities

There is need to accelerate broadband connectivity in rural and remote areas, as the needs of rural communities are fast converging with those of their urban counterparts.

Web	Received	Source	Title
SG1RGQ/30	2023-03-23	Kenya	The case of Kenya: Managing threats and risks to ICT infrastructure in rural and remote areas

1) Establishment of ICT critical infrastructure (CI) protection and stakeholder forum
2) Resilient designs and constructions
3) Crime prevention and social development
4) Communications strategy
5) Cross-border initiatives

Web	Received	Source	Title
SG1RGQ/26	2023-03-23	Rep. of Korea	The case of the rural mobile infrastructure operator (RMIO) model in Peru - KISDI consultation on network infrastructure sharing policy in Peru

Introduces the RMIO model in Peru that is helping the country to connect rural and remote areas and provide information on how to further improve the model.

Web	Received	Source	Title
SG1RGQ/23 (Rev.1)	2023-03-23	Haiti	BIEN digital economy inclusion centres to facilitate access and economic development of rural and remote areas

Lesson learned: For the success of any project, it is vital to ensure sustainability.

Suggested best practices: Ensure security at each location in rural and remote areas before starting to set up a project.

Web	Received	Source	Title
SG1RGQ/18 +Ann.1	2023-03-16	Egypt	National broadband strategy

A corresponding increase in the supply of broadband connectivity to meet rising demand requires robust investment in telecommunications infrastructure. Broadband connectivity is not only important in its own right; it provides a platform for the growth of digital services including online communication tools, e-commerce, digital financial services, and e-government services, which together make up the foundation of a digital economy.

Digital services are the enablers of a digital economy, and the success of digital economy initiatives largely depends on a robust, reliable, low-latency, and high-speed broadband infrastructure in the country. The growth and competitiveness of economies will increasingly depend on investments in the information and communications technology (ICT) sector.

Web	Received	Source	Title
SG1RGQ/5 +Ann.1	2021-08-24	Kuwait	Access to communication and information technology services by persons with disabilities

Pursuant to the regulation, operators and importers of equipment are required to provide software, user interfaces, and emergency services, in conformity with the Web Content Accessibility Guidelines (WCAG 2.0), through multimedia that are accessible to persons with disabilities. They are also required to provide conversion and communication systems, together with special plans and pricing, for all persons with disabilities, and to offer their services to such persons in an accessible format. Operators are required to coordinate with the competent authorities in providing emergency services, that can be used by persons with disabilities, to request assistance through audio calling, video calling or text messages; and to renovate their service centres and equip them with all necessary facilities and apparatus.

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