1st Annual Conference of ISPs: Practices followed by ISPs in countries with good rural penetration 13 June 2023

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What we do

‘Committed to Connecting the World’

3
Sectors

ITU Radiocommunication

Coordinating radio-frequency spectrum and **assigning** orbital slots for satellites

ITU Standardization

Establishing global standards

ITU Development

Bridging the digital divide

193
MEMBER STATES

+700
INDUSTRY & INTERNATIONAL ORGANIZATIONS

+150
ACADEMIA MEMBERS

MEMBERSHIP

ITU Strategic Plan 2024-2027: Strategic framework visual

Vision

Mission

2030 TARGETS

Strategic Goals

- Universal Connectivity
- Sustainable Digital Transformation

2027 OUTCOMES

Thematic priorities

- Spectrum use for space and terrestrial services
- International telecommunication numbering resources
- Inclusive & secure telecommunication/ICTs infrastructure & services
- Digital applications
- Enabling environment

Product & service offerings

- Development & application of ITU Administrative Regulations
- Allocation & management of resources
- Development of international standards
- Development of policy frameworks & knowledge products
- Provision of data & statistics
- Capacity development
- Provision of technical assistance
- Convening platforms

OUTPUTS

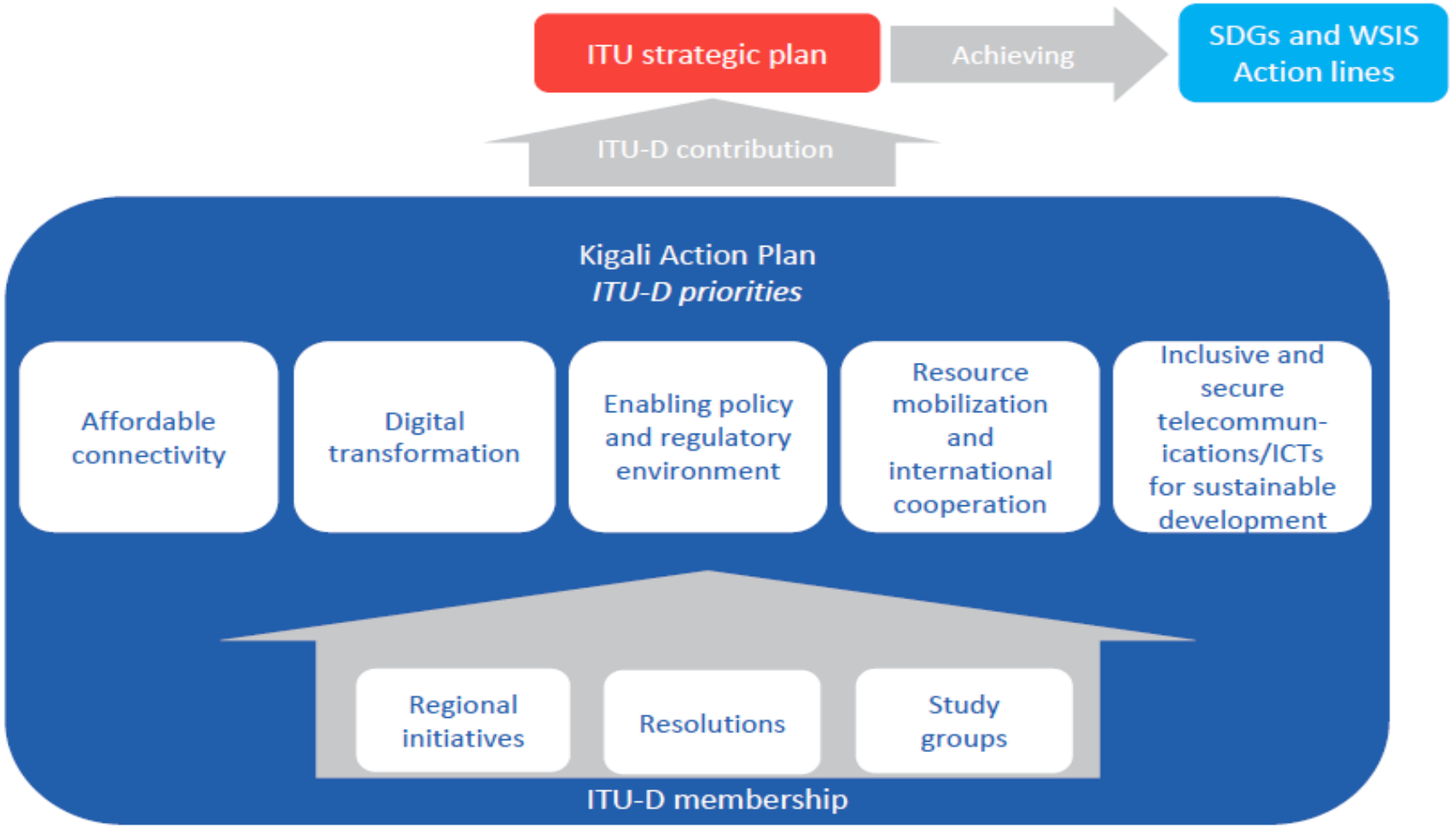
ITU Operational Plans

- ITU-R
- ITU-T
- ITU-D
- General Secretariat

Enablers

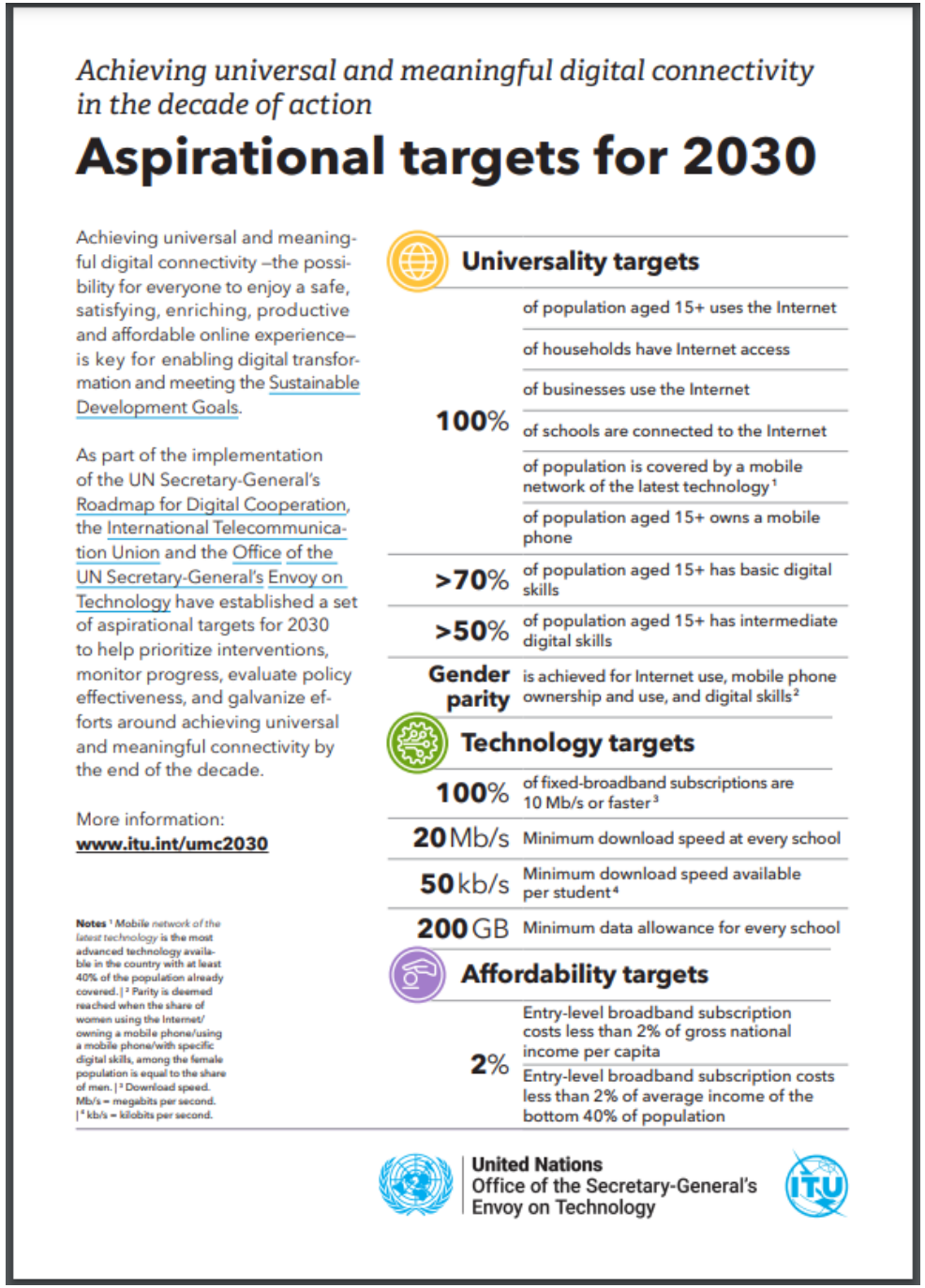
- Membership-driven
- Regional presence
- Diversity & inclusion
- Commitment to environmental sustainability
- Partnerships & international cooperation
- Resource mobilization
- Excellence in human resources & organizational innovation

Kigali Action Plan describes the ITU-D priorities and scope of activities and associated outcomes and outputs for the period 2023-2027



Aspirational Targets for 2030

- ITU and the Office of the UN Secretary-General's Envoy on Technology established a set of aspirational targets for 2030
- To achieve universal and meaningful digital connectivity
- Consists of:
  - Universality targets
  - Technology targets
  - Affordability targets



Achieving universal and meaningful digital connectivity in the decade of action

Aspirational targets for 2030

Achieving universal and meaningful digital connectivity –the possibility for everyone to enjoy a safe, satisfying, enriching, productive and affordable online experience– is key for enabling digital transformation and meeting the Sustainable Development Goals.

As part of the implementation of the UN Secretary-General's Roadmap for Digital Cooperation, the International Telecommunication Union and the Office of the UN Secretary-General's Envoy on Technology have established a set of aspirational targets for 2030 to help prioritize interventions, monitor progress, evaluate policy effectiveness, and galvanize efforts around achieving universal and meaningful connectivity by the end of the decade.

More information:
www.itu.int/umc2030

Universality targets

100%	of population aged 15+ uses the Internet
100%	of households have Internet access
100%	of businesses use the Internet
100%	of schools are connected to the Internet
100%	of population is covered by a mobile network of the latest technology[1]
100%	of population aged 15+ owns a mobile phone
>70%	of population aged 15+ has basic digital skills
>50%	of population aged 15+ has intermediate digital skills
Gender parity	is achieved for Internet use, mobile phone ownership and use, and digital skills[2]

Technology targets

100%	of fixed-broadband subscriptions are 10 Mb/s or faster[3]
20 Mb/s	Minimum download speed at every school
50 kb/s	Minimum download speed available per student[4]
200 GB	Minimum data allowance for every school

Affordability targets

2%	Entry-level broadband subscription costs less than 2% of gross national income per capita
2%	Entry-level broadband subscription costs less than 2% of average income of the bottom 40% of population

Notes [1] *Mobile network of the latest technology* is the most advanced technology available in the country with at least 40% of the population already covered. | [2] Parity is deemed reached when the share of women using the Internet/owning a mobile phone/using a mobile phone/with specific digital skills, among the female population is equal to the share of men. | [3] Download speed. Mb/s = megabits per second. | [4] kb/s = kilobits per second.

United Nations
Office of the Secretary-General's Envoy on Technology

ITU Regional Initiatives 2023-2025

Asia and the Pacific

ASP1

Addressing special needs of least developed countries, small island developing states, including Pacific island countries, and landlocked developing countries

ASP2

Harnessing information and communication technologies to support the digital economy and inclusive digital societies

ASP3

Fostering development of infrastructure to enhance digital connectivity and connecting the unconnected

ASP4

Enabling policy and regulatory environments to accelerate digital transformation

ASP5

Contributing to a secure and resilient ICT environment

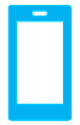
Learn more at
www.itu.int/AsiaPacific

www.itu.int

Lessons learned from COVID-19

COVID-19 and other devastating natural hazards have highlighted the urgency for universal digital connectivity to keep up with the rapid pace of digitalisation.

Fixed broadband: Higher economic impact for developed countries.



Mobile Broadband: Drives economic growth in countries with low fixed penetration.

Connectivity Demand: Increase trend in Internet traffic, demand for digital tools and growth of new technologies such as 5G, Internet of Things, quantum computing, and Artificial Intelligence.

Infrastructure Development Divide: Capital investment and expenditures per capita in developing economies have fallen, or not followed the pace of rapid pace of digitalisation.

Digital Divide: Roughly 34% of world population (2.7 billion) has never used the Internet, while on average only 36% of the population in least developed countries are online.

Affordability Gap: ICT services became more affordable globally in 2022, however remain unaffordable for the poorest 40 per cent of the population in many parts of the world.

Digital divide in Asia-Pacific: Challenges and Opportunities

Internet users:

- World: 5.3 billion people (66% of population)
- Asia-Pacific: 64% of population

Gender gap (2022):

- 61% female Internet users (world: 63%)
- 67% male Internet users (world: 69%)

Generations (2022):

- 73% youth Internet users (world: 75%)
- 63% other age groups of Internet users (world: 65%)

Urban/rural (2022):

- 82% urban Internet users (world: 82%)
- 47% rural Internet users (world: 46%)

Subscriptions per 100 inhabitants (2022):

- Mobile cellular telephone: 111 (world: 108)
- Active mobile-broadband: 89 (world: 87)
- Fixed-cellular telephone: 8 (world: 11)
- Fxed-broadband: 18 (world: 18)

Individuals owning mobile phone (2022);

- 67% (world: 73%)

Population coverage by mobile technology (2022):

- Asia-Pacific: 4G (96%)
- Rural: 4G (92%)
- Urban: 4G (99%)

International bandwidth per Internet user, kbit/s (2022):

- 192 kbit/s (world: 233 kbit/s)

For more information: Facts and Figures 2022

Digital divide: Affordability

More affordable (<2% of average monthly GNI per capita) in 2022:

- Globally as compared during pandemic period (2020-21)
- 103 economies meet target for data-only mobile broadband basket
- 71 economies meet target for fixed-broadband basket
- Only 2 out of 46 LDCs meet target

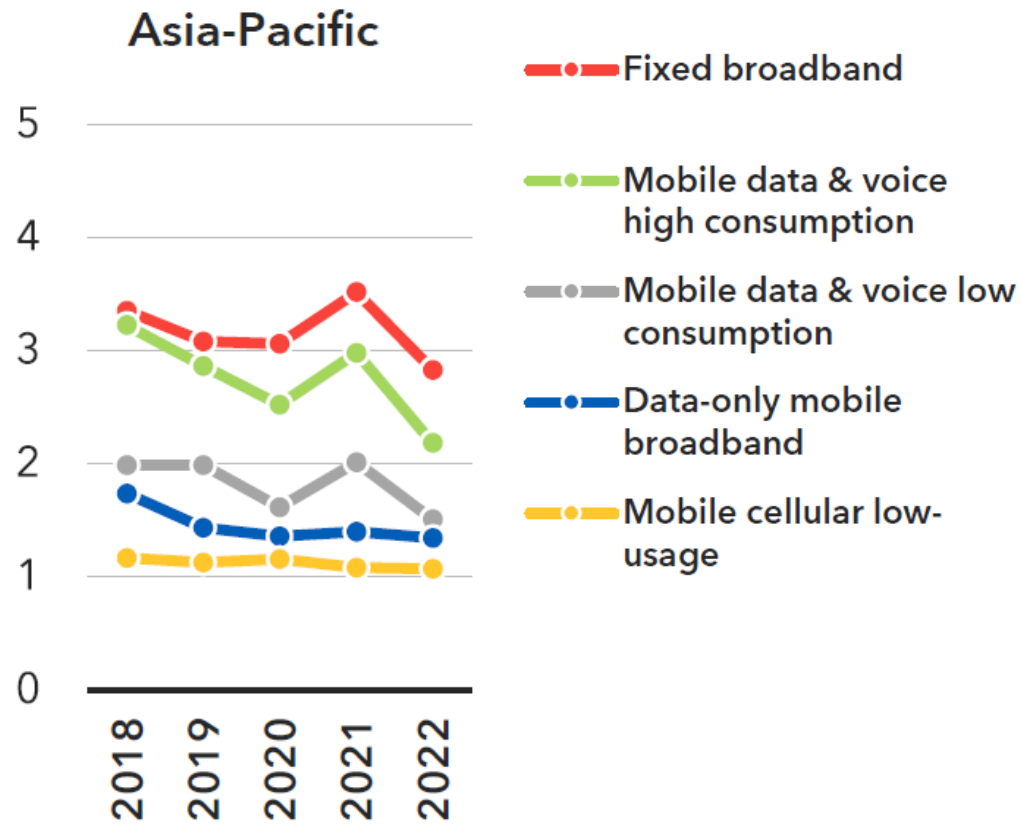
Asia-Pacific:

- Despite the diversity of economies, all price baskets have reduced, despite the temporary increase during the pandemic
- Fixed broadband service prices in many economies of the region remain high, keeping the regional median price above the 2 per cent target.

Affordability gaps within countries:

Due to income disparity, the poorest 40%:

- In low- and middle- income countries may face prices that are 3 times the country average for mobile broadband basket
- In high income economies face prices that are 12.8% of GNI p.c. where fixed-broadband basket is affordable
- In India, whilst mobile broadband basket is affordable for average earners, GNI per capita is 2.2 for the poorest 40%



Affordability is not the only barrier to connectivity:

- Even in countries where mobile broadband basket costs < 2% of GNI, usage can be as low as 21% and as high as 100%

For more information: Policy brief – The affordability of ICT services 2022

India: Digital Development Dashboard

Population coverage:

- Mobile-cellular network (2021): 99%
- At least a 3G mobile network (2021): 99%
- At least a 4G mobile network (2021): 99%

ICT access at home:

- Households with Internet access at home (2018): 24%
- Households with a computer at home (2018): 11%

Telephone subscriptions per 100 inhabitants:

- Mobile cellular subscriptions (2021): 82
- Fixed telephone subscriptions (2021): 2

Broadband subscriptions:

- Active mobile-broadband subscriptions per 100 inhabitants (2021): 54
- Fixed broadband subscriptions per 100 inhabitants (2021): 2
- Fixed broadband (% total) 256kbit/s to <2 Mbit/s (2021): 2
- Fixed broadband (% total) 2 – 10 Mbit/s (2021): 2
- Fixed broadband (% total) > 10 Mbit/s (2021): 90%
- Total fixed broadband subscriptions (2021): 27,560,000
- International bandwidth per Internet user (kbit/s) (2021): 103

Internet use:

- Total individuals (2021): 46%
- Female Internet use as a % of total female population (2018): 15%
- Male Internet use as a % of total male population (2018): 25%

Broadband traffic:

- Average monthly fixed broadband Internet traffic per fixed broadband subscription (MB) (2021): 70422
- Average monthly mobile broadband Internet traffic per mobile broadband subscription (MB) (2021): 14426

ICT prices:

- Fixed broadband basket as % of GNI p.c. (2021): 3.3%
- Mobile data and voice basket (high consumption) as a % of GNI p.c. (2021): 1.1%
- Mobile data and voice basket (low consumption) as a % of GNI p.c. (2021): 1.1%
- Mobile broadband basket as a % of GNI p.c. (2021): 1.1%
- Mobile cellular basket as a % of GNI p.c. (2021): 1.1%

The Connectivity Challenge in Rural and Remote Areas: School

- About **34% of the world population** lacked access to the Internet in 2022, where most live in the **rural and remote areas** of developing economies.
- Traditional telecommunications service providers are reluctant to extend services to rural, remote and/or sparsely dense areas, due to lower return on investment, leaving **broadband infrastructure incomplete**.
- This means that **billions are unconnected** and nearly **half of the 6 million schools** in the world are not connected to the Internet.
- More than **500 million students** have no access to internet.
- Of the estimated **2.7 billion** unconnected people, the majority are women and girls.
- Bridging the digital divide is a social and economic imperative requiring **closing the connectivity gap** and spreading last mile networks and services.

Resolution 87 (Kigali, 2022) on Connecting every school to the Internet and every young person to information and communication technology services of the World Telecommunication Development Conference

Giga, joint ITU-UNICEF project

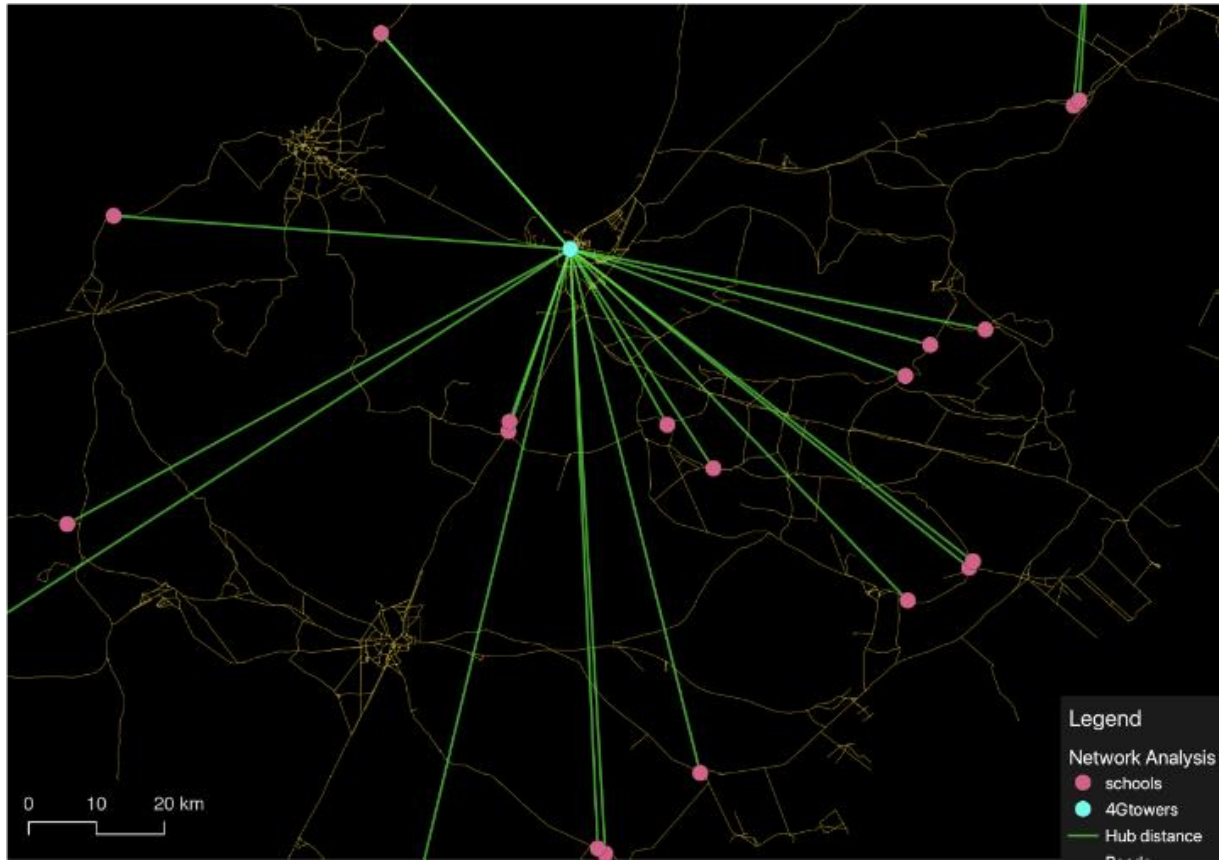
- **Launch**: Giga, a joint ITU-UNICEF project was launched at the 2019 United Nations General Assembly
- **Objective**: To connect every school to the Internet and every young person to information, opportunity, and choice by 2030
- **Brief achievements**:
  - 19 active countries
  - 14 partners
  - 2 host countries – the Government of Switzerland and Spanish Government, Catalonia Regional government and the Barcelona City Council

How Giga works:

- **Map** the location of schools and monitor school connectivity status in real-time
- **Model** the infrastructure, policies, regulations and investments needed to deliver school connectivity
- Help governments to **contract** connectivity for schools

Giga also works to support government in building the right layered financing to pay for school connectivity

Infrastructure Maps



Line-of-sight distances of schools to cell towers to understand how best to connect a school and estimate costs. Similarly, an optimized fiber node distance analysis can also be conducted.

Focus on:

- School connectivity,
- Electricity supply, and
- Distance to infrastructure, telecommunication / ICT networks.

Infrastructure maps help countries to:

- Identify suitable **technology**
- Develop attractive investment cases and donor proposals with **reliable estimates** on capital and operational expenditures
- Support project prioritization and connectivity scaling
- Inform project execution and procurement processes

Benefits of mapping and modelling

(1) Rwanda:

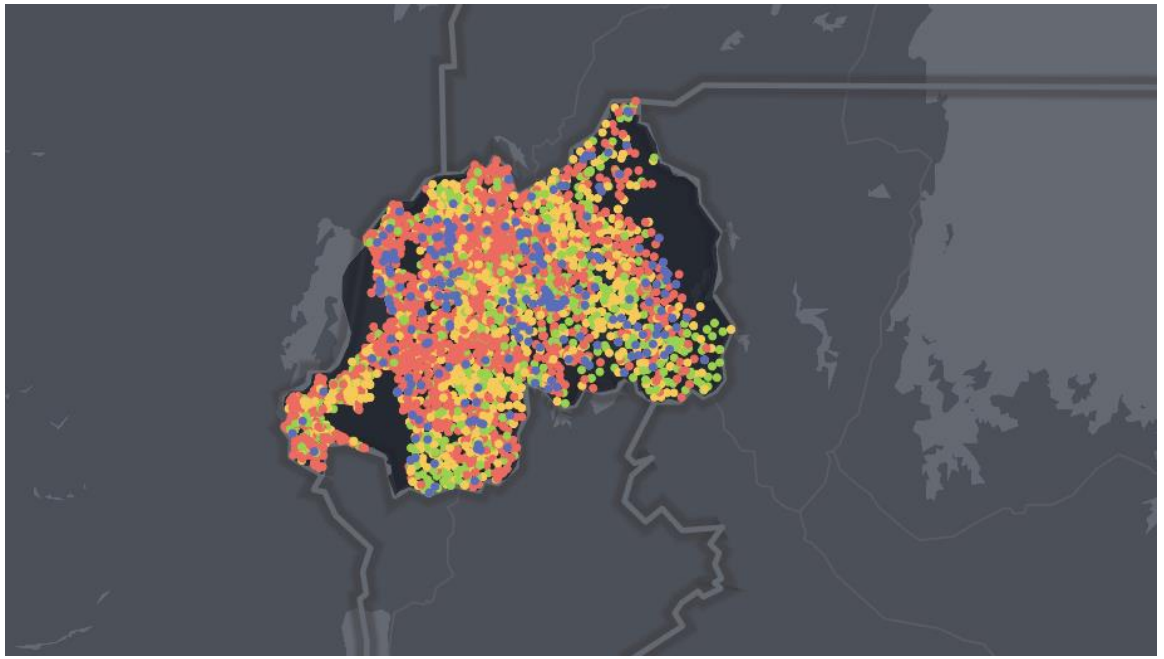
- Giga aggregated demand for connectivity across 63 schools in Rwanda's Eastern Province, including 13 schools without access to electricity, and launched a common bid to connect them to broadband internet.
- Secured **30% to 55% reduction** in the average price per Mb paid by schools in the procurement process.
- School connection through fixed wireless with minimum speeds of 25 Mbps and up to 150 Mbps — an **improvement of 400%**.

(2) Organisation of Eastern Caribbean States:

- Potential to use school mapping for **disaster response planning** through access to location and connectivity status of schools.

(3) Kyrgyzstan:

- Through mapping, the government discovered that many schools that they were paying for were not really connected.
- Through renegotiation of a new contract, the government saved over **40 percent** (~$200k / year) of its education connectivity budget.
- Prices were **lowered to almost half** (from $50/month to $28.5/month) and **speeds almost doubled** (from 2Mbps to 4Mbps).



In brief:

- Show what schools, cities, regions are **leading / lagging** the most
- Inspire a real sense of need by **making the problem concrete**
- **Aggregate market demand** for investors (and businesses
- Show **opportunities** to telcos and startups
- Make **contracting accountable**
- Other potential use for **disaster response planning**

Case studies: Commonwealth of Independent States

Kazakhstan: PPP with ISPs

- In 2018, the Ministry of Digital Development, Innovations and Aerospace Industry (the ICT Ministry) partnered with three major fiber networks ISPs, using a PPP mechanism, and co-financed fibre-optic communication lines (FOCL) deployment to villages with 500+ inhabitants.
- By 2020, the ISPs built more than **20 thousand km** of FOCL and ensured FTTB connectivity of **3,718 public institutions** and budgetary organizations (schools, hospitals, fire and police departments, etc.) in **1,257 villages**.
- This paved the way for deployment of mobile broadband in villages.
- Based on the developed FOCL infrastructure mobile operators and the ICT Ministry signed a Memorandum on the Joint Construction of Cellular Networks in Rural Areas and agreed on the list of 928 villages with 250+ population to be covered by 3G/4G mobile networks by the end of 2020. ISPs engaged in rural connectivity project received 90% discount for the use of radio spectrum.

Uzbekistan: Empowering Communities Through School Connectivity Hubs

- In 2022, two schools located in densely-populated areas of Uzbekistan were used as Internet-hubs to connect surrounding communities.
- According to the contract, ISP should ensure FTTH connectivity of **at least 500 households**.
- Connectivity of 500 households was sponsored by Giga (in the future, could be sponsored by the Government).
- In return, ISP undertook the commitment to return **50% of its annual net profit** coming from the first 500 users to the Government to be used by the government to **expand school connectivity**.

Case studies: Americas

Examples from Brazil:

(1) Universal service funds

- In Brazil, the *Fundo de Universalização do Serviço de Telecomunicações* (FUST) was established in 2000. However, due to restrictive laws, had not disbursed funds for connectivity projects.
- The **reform of FUST** through Bill 172/2020, ensured effective allocation of funds and expansion of telecommunications services.
- The bill also set aside **18% of annual collections** to connect public schools to the Internet, addressing school connectivity challenges.

(2) National Research and Education Network

- Since 1992, the Brazilian National Research and Education Network (RNP), has built and operated the national network for the research and higher education community.
- Over **800 institutions** have been connected, benefitting more than **4 million users**.
- RNP has partnered with ISPs to **expand coverage in the Northeast**.

Examples from Caribbean:

(1) Caribbean IXPs

- 16 Caribbean territories have active IXPs, where most exchange traffic but some host content and services.
- Two incumbent operators (Digicel and Flow) handle close to 80% of interconnection market, and their high tariffs impede competition for ISPs.
- Change is underway due to **universal service laws**, effective **wireless technologies**, **competition** among ISPs, and **free Wi-Fi** hotspots in community centres.

(2) Trinidad and Tobago

- 79% of rural households have Internet access (83%: urban).
- Three fixed ISPs originally operate on a “niche” scale in rural communities. Later, other larger fixed ISPs provide services in rural areas due to presence of **oil and gas industry**.

(3) Jamaica:

- Internet connectivity is readily available in urban areas, rural connectivity still lags and is dependent on fixed telephone lines (dial up).
- A sustainable **Universal Service Order** in the Telecoms Act brings change.

Case studies: Europe and Asia-Pacific

Romania: Design, build, operate model

- RO-NET project to develop backhaul and local access networks
- **400,000 people** provided with access to the internet in primarily rural areas
- Broadband coverage increased by **1.9%**
- Network provided to ISPs and other operators on an **open-access basis**

Indonesia: Joint Service Operation

- The Telecommunication and Information Accessibility Agency (BAKTI) opened a joint service operation (JSO) in June 2021
- Permits use of BAKTI 4G Base Transceiver Station Infrastructure to provide **4G Mobile Services**
- BAKTI is responsible for the infrastructure, including loaning land from the local governments
- Impact is wider network coverage to the regions, while encouraging ISPs to expand into new areas

Australia: Mobile Black Spot Programme

- Government funding of **AUD875** million to address broadband and mobile blackspots and gaps in service
- Focus on areas such as schools, health clinics, indigenous community centres
- Optus participated in the programme and provided coverage to **49,000 homes**
- Optus Small Cells were used to provide coverage in remote communities

Last Mile Connectivity Toolkit

- Last Mile Connectivity Solutions Guide provides ways of identifying the unconnected areas and selecting sustainable technical, financial and regulatory solutions to ensure affordability and accessibility to relevant connectivity services.
- The Last Mile Connectivity Solutions Guide was developed to help accelerate actions to address last-mile Internet connectivity issues in situations that include a lack of network infrastructure and with a view to encouraging more affordable service delivery. The solutions guide presents:
  - Key challenges to address the connectivity gaps and for scaling and sustaining the connectivity;
  - Key technologies, policies and business models to build and expand last mile connectivity, especially in rural and remote areas;
  - Collaborative strategies to ensure that people at the bottom of the social pyramid achieve reliable and meaningful connectivity;
  - Case studies of successful rollout of last mile connectivity projects deployment.
- Accessible at: https://www.itu.int/en/ITU-D/Technology/Pages/LMC/LMC-Home.aspx

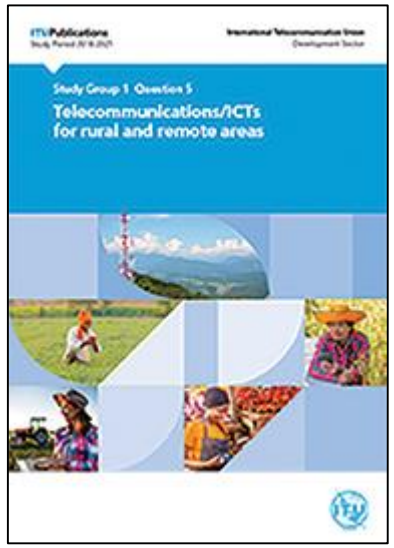
Components of a sustainable (last mile) connectivity solution:

- **Affordability** – Ensuring that connectivity service user pricing falls within a given affordability threshold, such as the 2 per cent of monthly GNI per capita for 1GB of mobile broadband data discussed above.
- **Usage** – Identifying the applications and services that need to be available to the locality and in local language, the digital literacy, user perceived value, and the level of QoS that those applications and services require.
- **Financial viability** – Measuring the economic viability for private investment of the connectivity service, based on estimates of ARPU, availability of backhaul / middle-mile connectivity, options for different local access technologies and the potential level of the service's QoS.
- **Structure** – This involves articulating the service delivery business model and identifying any policy and regulatory constraints on the model and technologies utilized
- **Sustainability** – This requires an understanding of the service's revenue model, any policy and regulation that can help extend the connectivity to the unconnected (e.g., innovative financing, special licensing, tax alleviation, adoption of new technology, etc.) and any other factor such as the network maintenance/upgrade, availability of electricity, etc.

Complementary Resources

- To complement the Last Mile Connectivity Solutions Guide, a range of resources are being developed to help Member States address last-mile connectivity challenges, including a database of case studies (LMC Case Studies Database) and capacity-development courses on last mile connectivity.
- The Broadband Connectivity toolkit also includes methodologies for technology selection and cost estimation in the following cases:
  - Building broadband access networks in localities;
  - Connecting schools, hospitals or other specific objects to broadband transport backbones;
  - Building local area networks (LAN) in the buildings.
- Example: the school connectivity broadband calculator (https://schools.dev.connectivity.tools/) aims to select a set of appropriate technologies and adequate topology to connect multiple schools to the Internet and to estimate the cost of connecting those schools.

ITU-D Study Group 5/1 references



ITU-D Study Groups Question 5/1: Telecommunications/ICTs for rural and remote areas references are as follows:

(1) The ITU-D Study Group final report results from four years of collaborative work of ITU membership on Question 5/1: Telecommunications/ICTs for rural and remote areas approved at WTDC-17.
- Insightful guidelines are brought forward based on country case studies and lessons learnt from industry and academia work.

(2) Annual Deliverable 2019-2020 Broadband development and connectivity solutions for rural and remote areas
- Provides a review of major backbone telecommunication infrastructure installation efforts and approaches to last-mile connectivity;
- Provides high-level recommendations for regulators and policy-makers, and for operators to use as guidelines for connecting rural and remote communities.

(3) Meeting report of Question 5/1 of December 2022
(4) Meeting report of Question 5/1 of May 2023

Six guidelines to help overcome the challenge of low levels of school connectivity in a sustainable manner

Optimize locally

- Divide countries into homogeneous areas to find optimal funding models

Combine funding models

- Apply multiple funding models where possible to minimize funding gap

Merge electrification & connectivity

- Provide internet and electricity to increase revenues streams and share costs

Long-term affordability & demand stimulation

- Ensure schools (and communities) can sustainably pay for connectivity

NGOs empower communities

- NGOs play important roles of mentorship and training of communities

Reforms enable sustainability

- Reforms are necessary in many countries to promote long-lasting transformation

For more information: Meaningful school connectivity: An assessment of sustainable business models which was developed by Giga in collaboration with Boston Consulting Group

Procuring for School Connectivity: Essential Guidelines for Governments and Internet Service Providers

A checklist for Meaningful School Connectivity

Giga supports governments by providing procurement advice and documentation for sourcing meaningful and affordable school connectivity. Here are the key requirements for Internet Service Providers (ISPs) to take into consideration when participating in competitive bidding processes.

Access the full guidelines here.

ICT requirements of people living in rural and remote communities

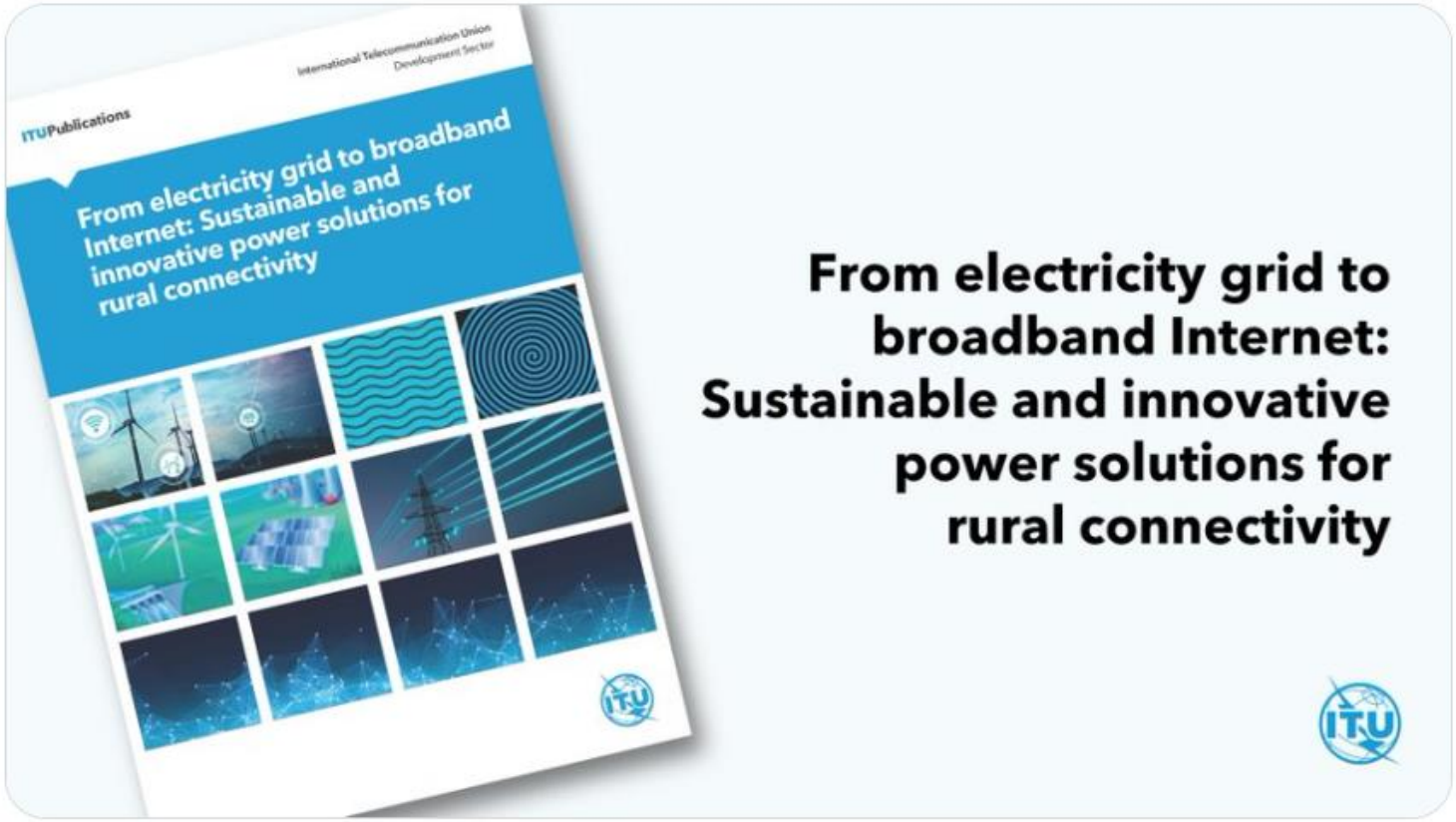
– Infrastructure that **fosters digital transformation**, promotes and **attracts investment** and allows **emerging services**, such as the **Internet of Things (IoT), digital financial services** and **e-commerce**, e-agriculture, e-health, e-education, e-gov etc…

– Technologies that promote youth employment with the establishment of dynamic enterprises in economic sectors.

– Policies and regulatory initiatives on the deployment of ICT infrastructure to rural and remote areas and policies that help narrow the digital divide through affordable broadband service and access to ICT infrastructure.

– Solutions to challenges relating to building human resources or ICT skills for broadband deployment, maintenance and operation, as well as training of technical staff in order to guarantee the reliability of telecommunication infrastructure.

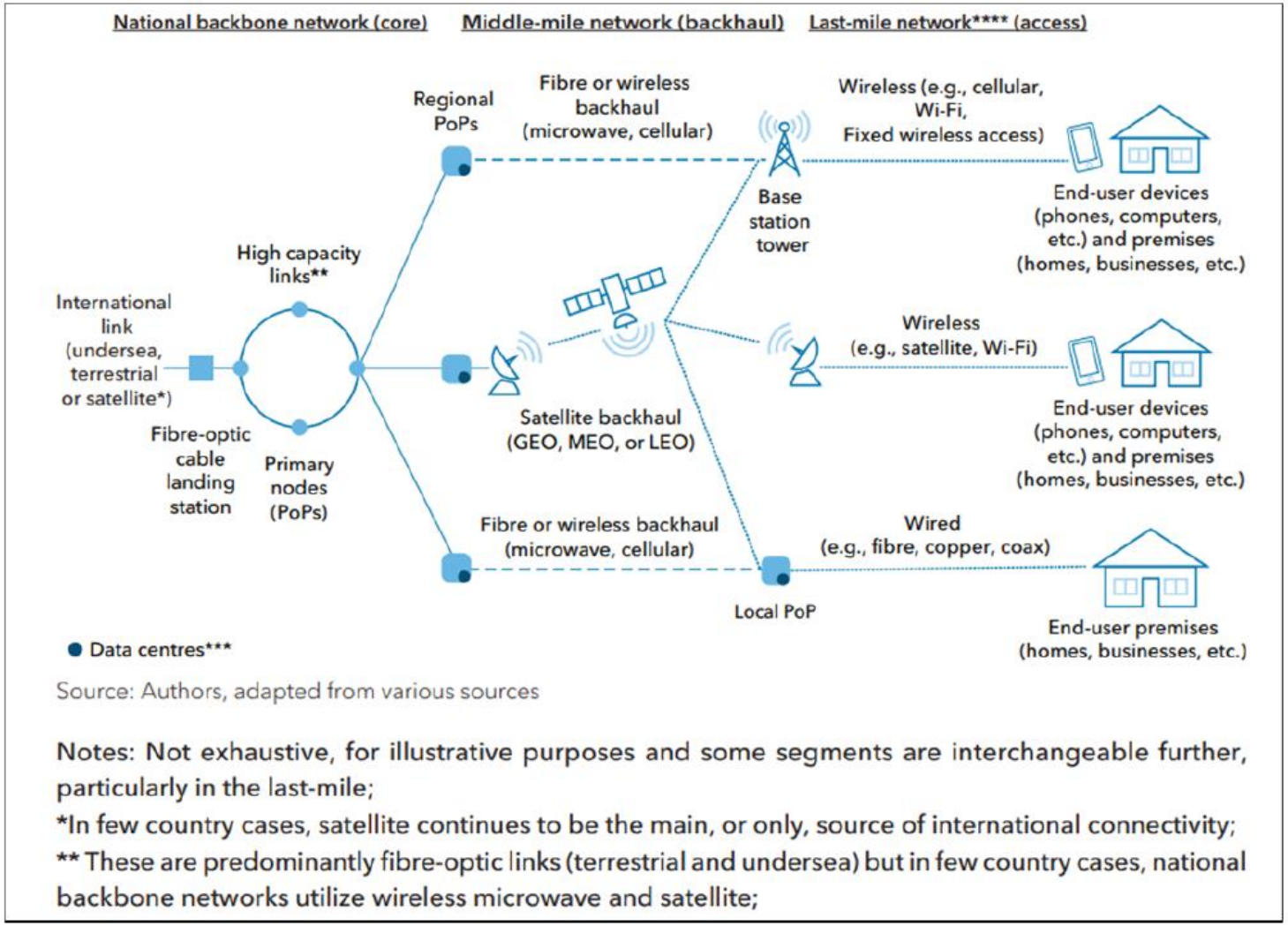
– Availability of electricity and of access roads for transport, which are prerequisites for the construction of



The report has been launched on ITU-D social media channels
https://twitter.com/ITUBDTDirector/status/1643272412664930304

available at:
https://www.itu.int/dms_pub/itu-d/opb/tnd/D-TND-09-2023-01-PDF-E.pdf

Mobile and fixed network architecture for rural and remote areas

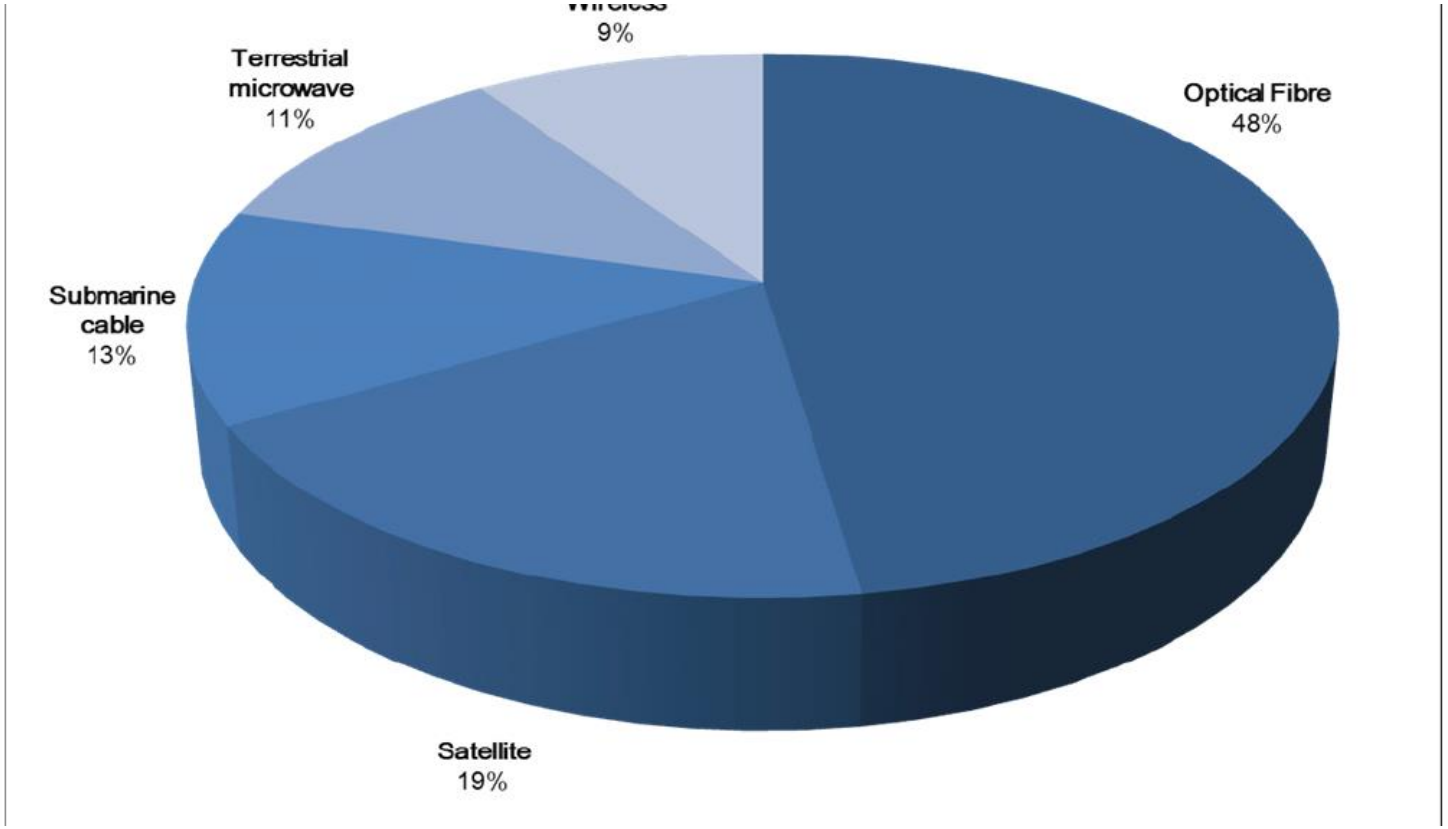


Source: Authors, adapted from various sources

Notes: Not exhaustive, for illustrative purposes and some segments are interchangeable further, particularly in the last-mile;
*In few country cases, satellite continues to be the main, or only, source of international connectivity;
** These are predominantly fibre-optic links (terrestrial and undersea) but in few country cases, national backbone networks utilize wireless microwave and satellite;

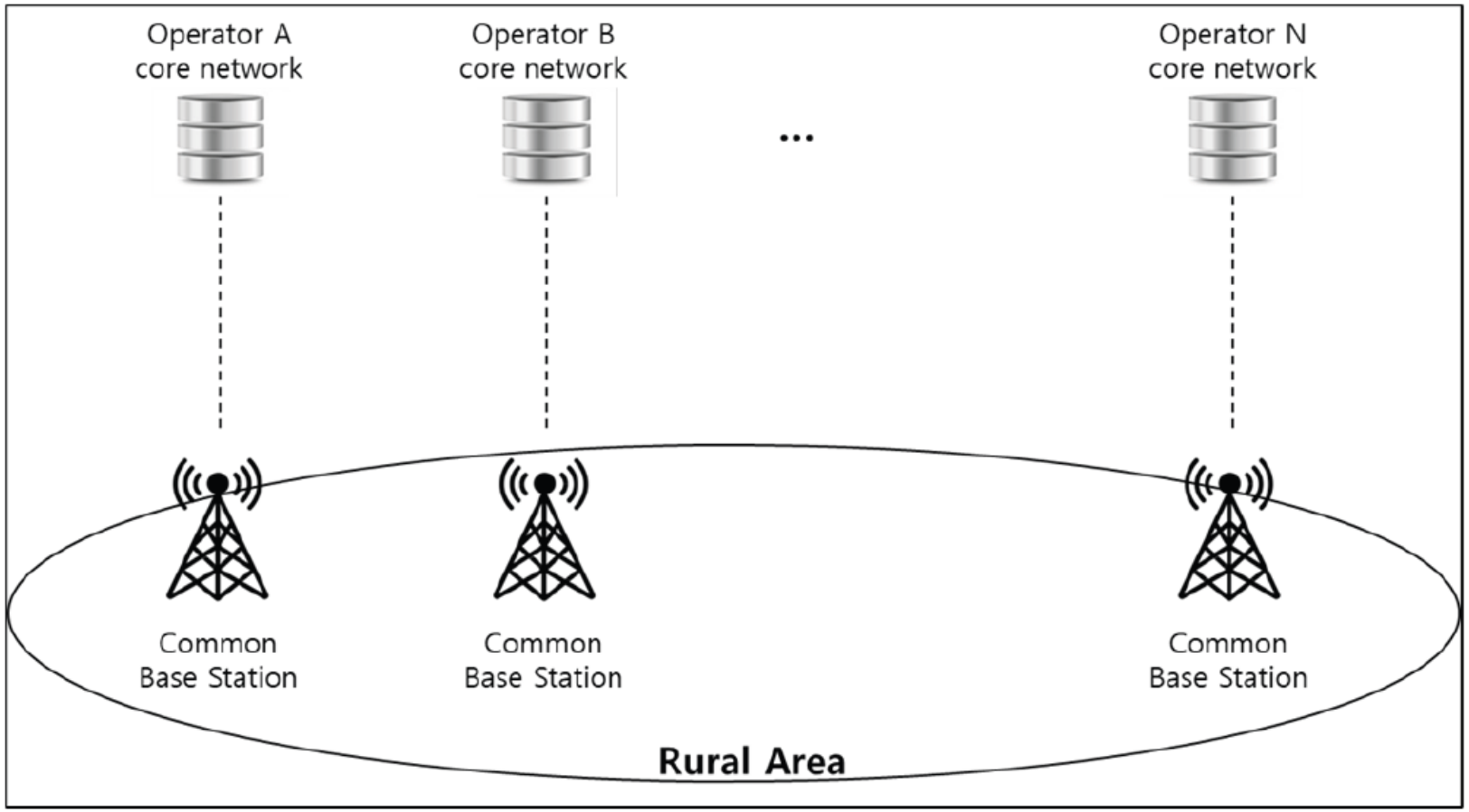
Source: ITU (2020)[53]

Backhaul technologies used for connecting rural and remote areas

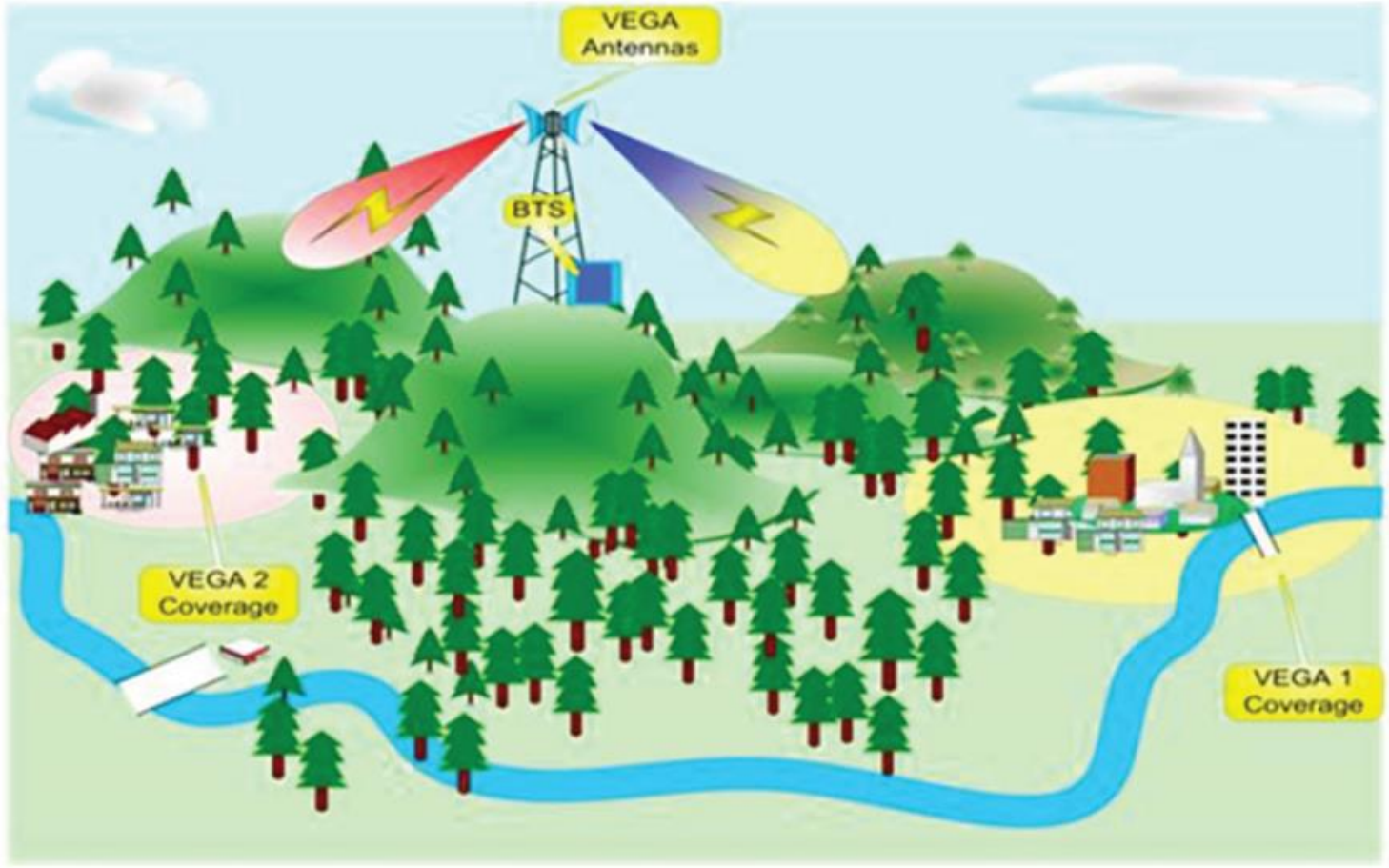


Source: Analysis of contributions from the 2018-2021 study period by Q 5/1

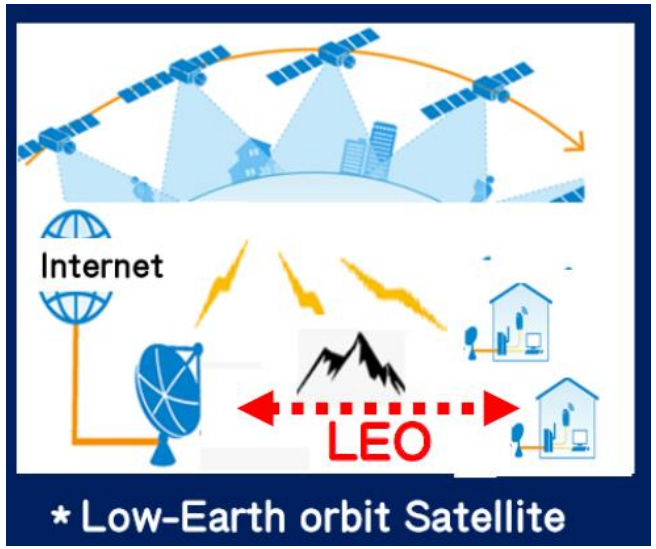
Schematic diagram of existing wireless network structure in rural areas



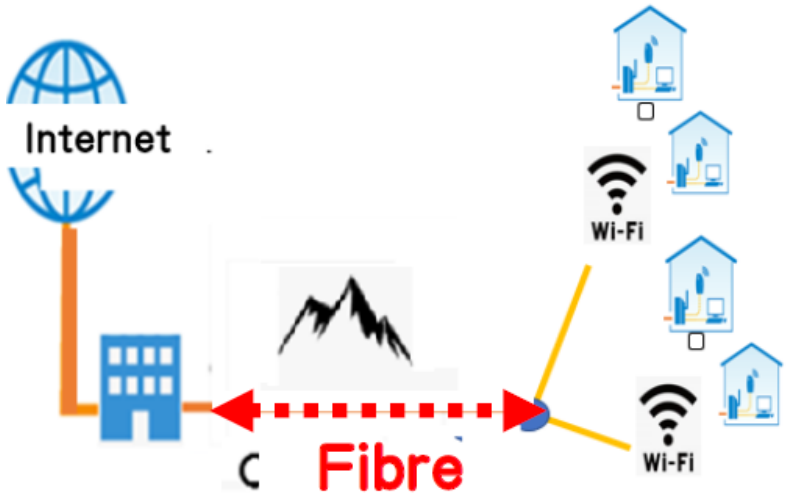
High-gain, narrow-beam antennas on a high-ground strategically placed tower



Backhaul



Data Rate 1
Huge Investment
(e.g., 10 B US$, Amazon's Plan)
Life 5-7 Years



>>1000
DIY Installation
e.g., 8.3 kUS$/km
25 Years

Optical Fibre Cable

Conventional Cable Installation

using Conventional Optical Cables

High Cost using Heavy Machinery !!

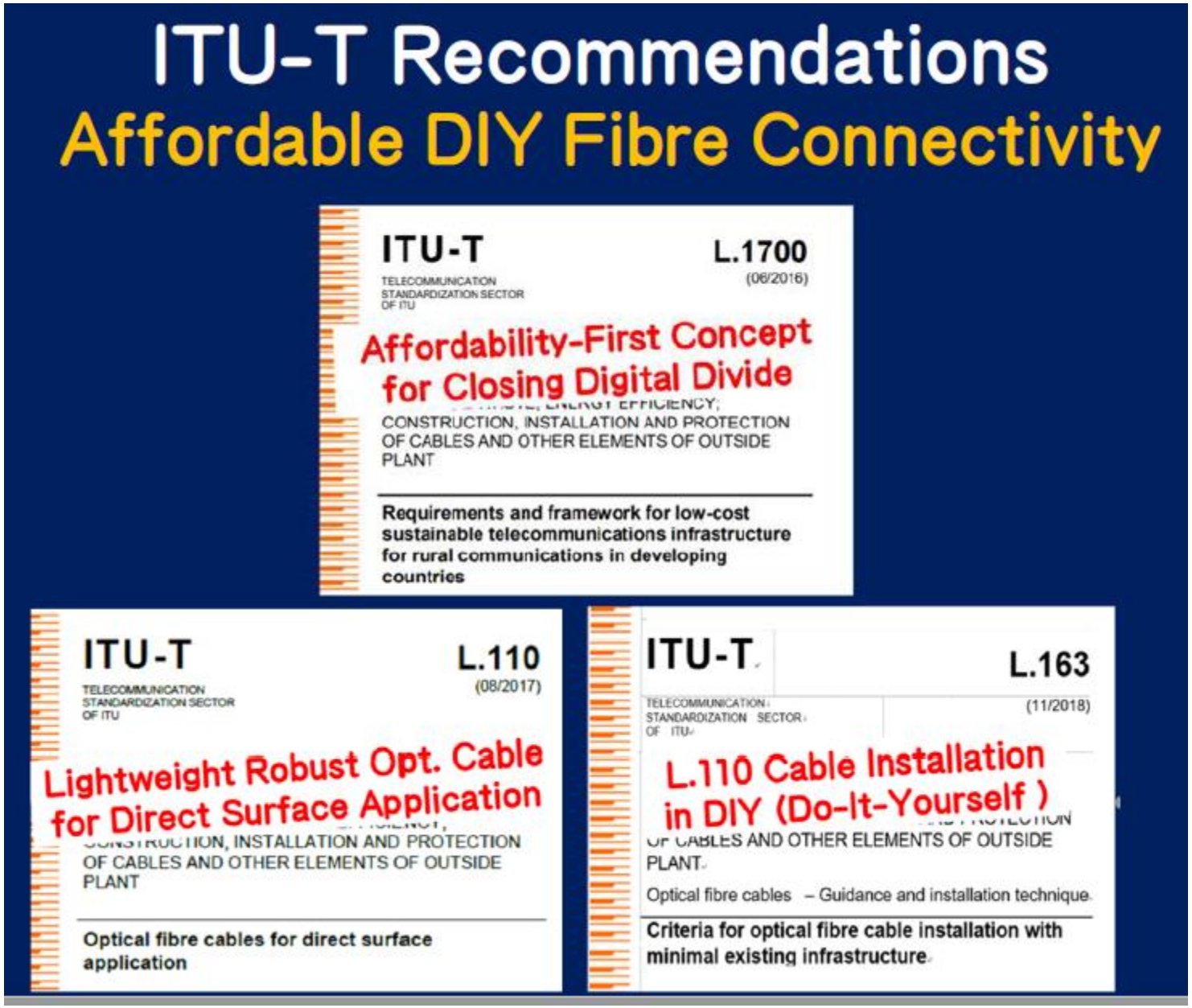
DIY is already happening

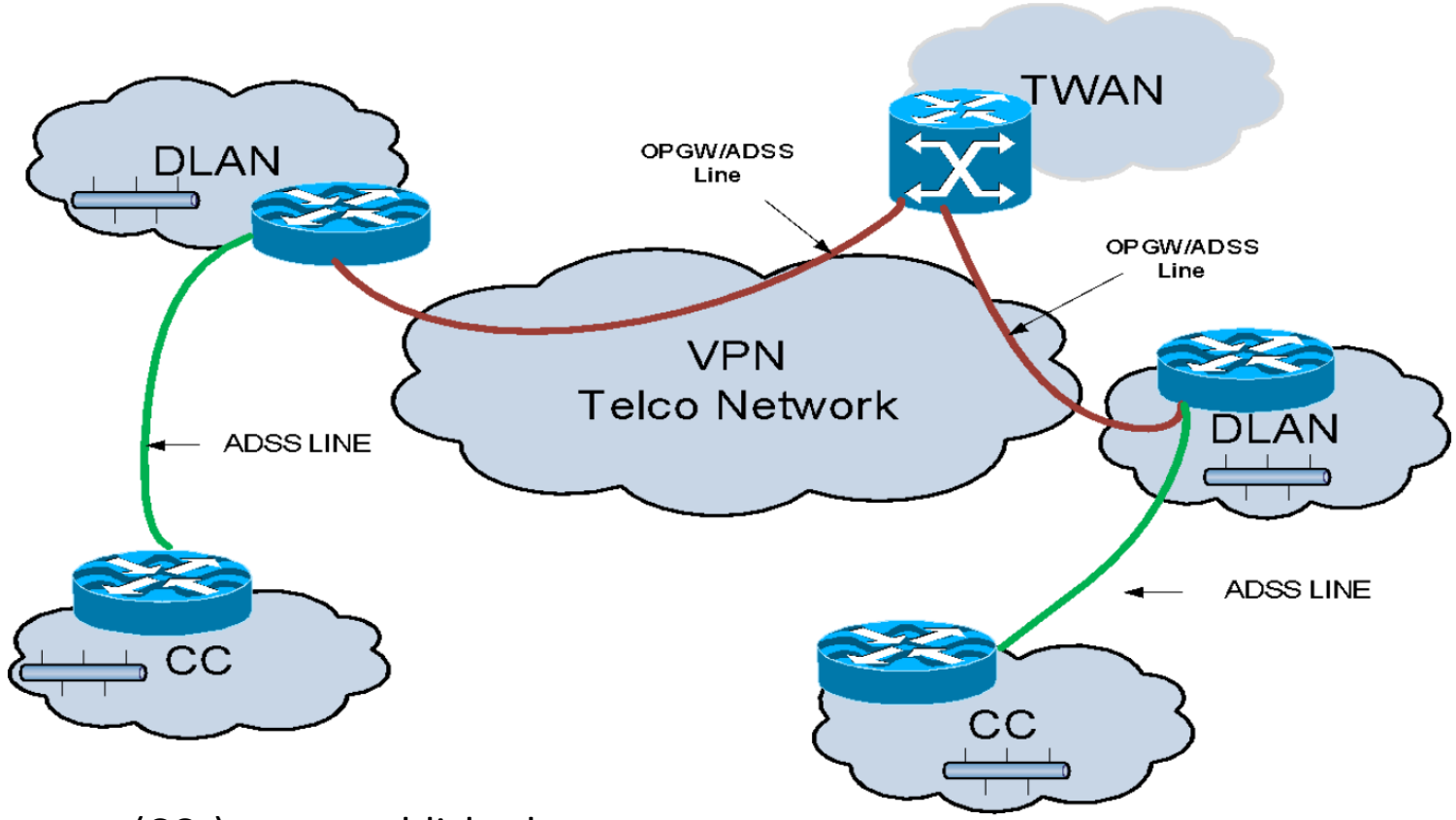
now it is fastest in Wales UK, June 2018

Hard Working !!

http://www.thefoa.org/foanewsletter.html

ITU-T Recommendations
Affordable DIY Fibre Connectivity



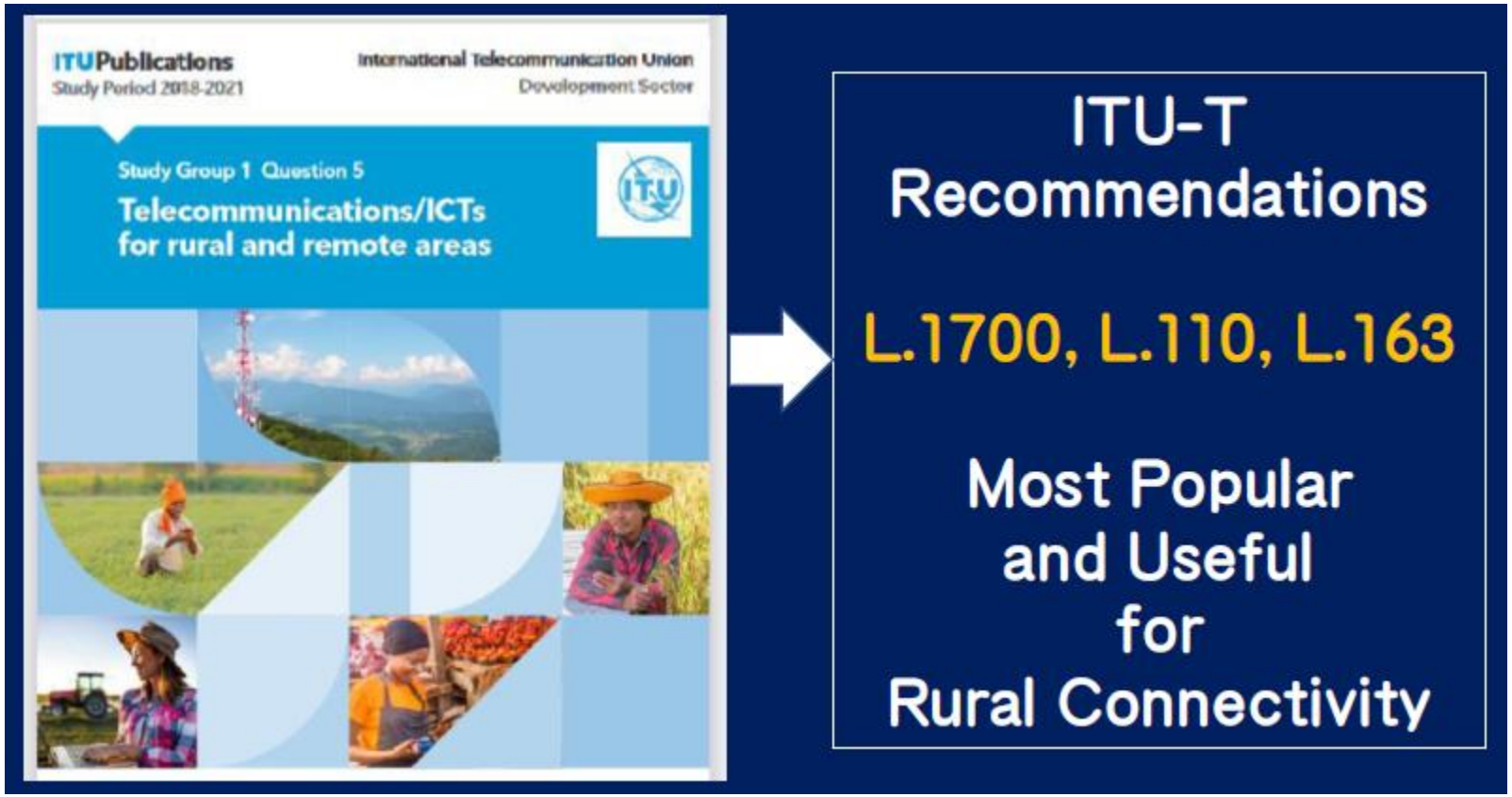


A Village Network of Community Centers (CCs) was established under the South Asia Subregional Economic Cooperation (SASEC) Information Highway Project funded by Asian Development Bank (ADB)

Community Center services

Besides Internet services and G2C services, CCs provides other services namely banking services, printing and photocopying services

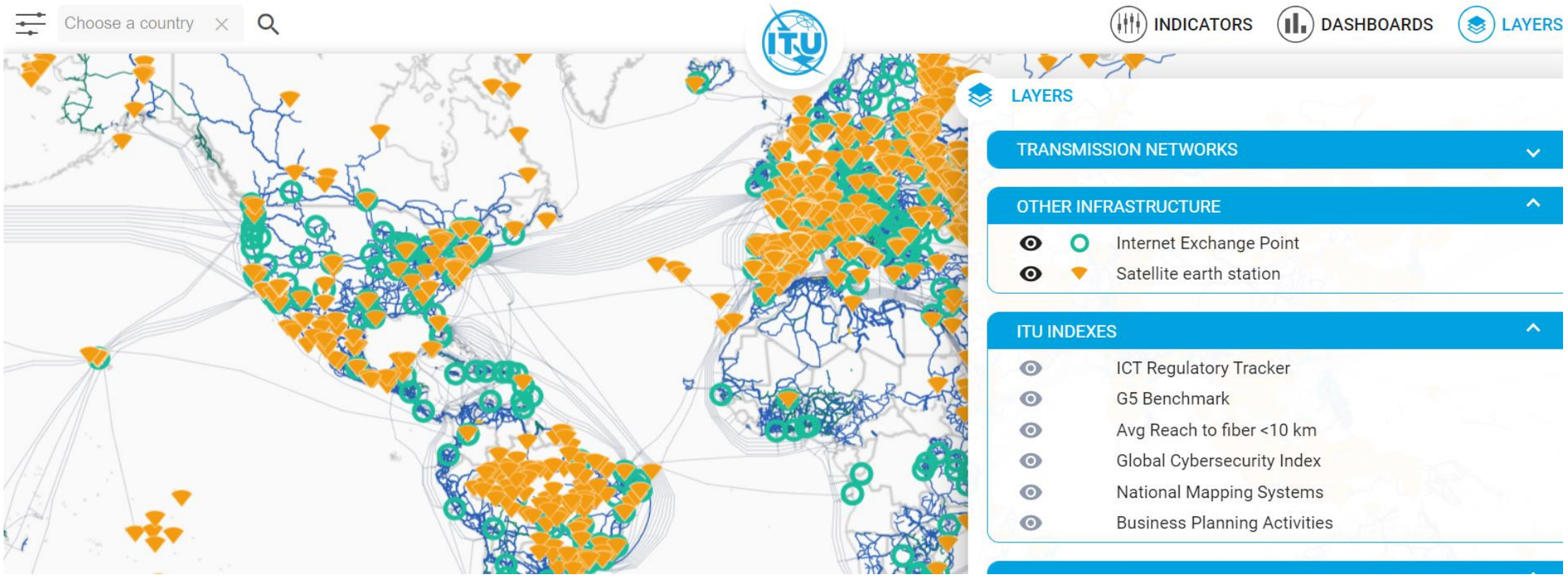
ITU-D SG1 Q5 (Rural Connectivity) Final Report (2018-2021)



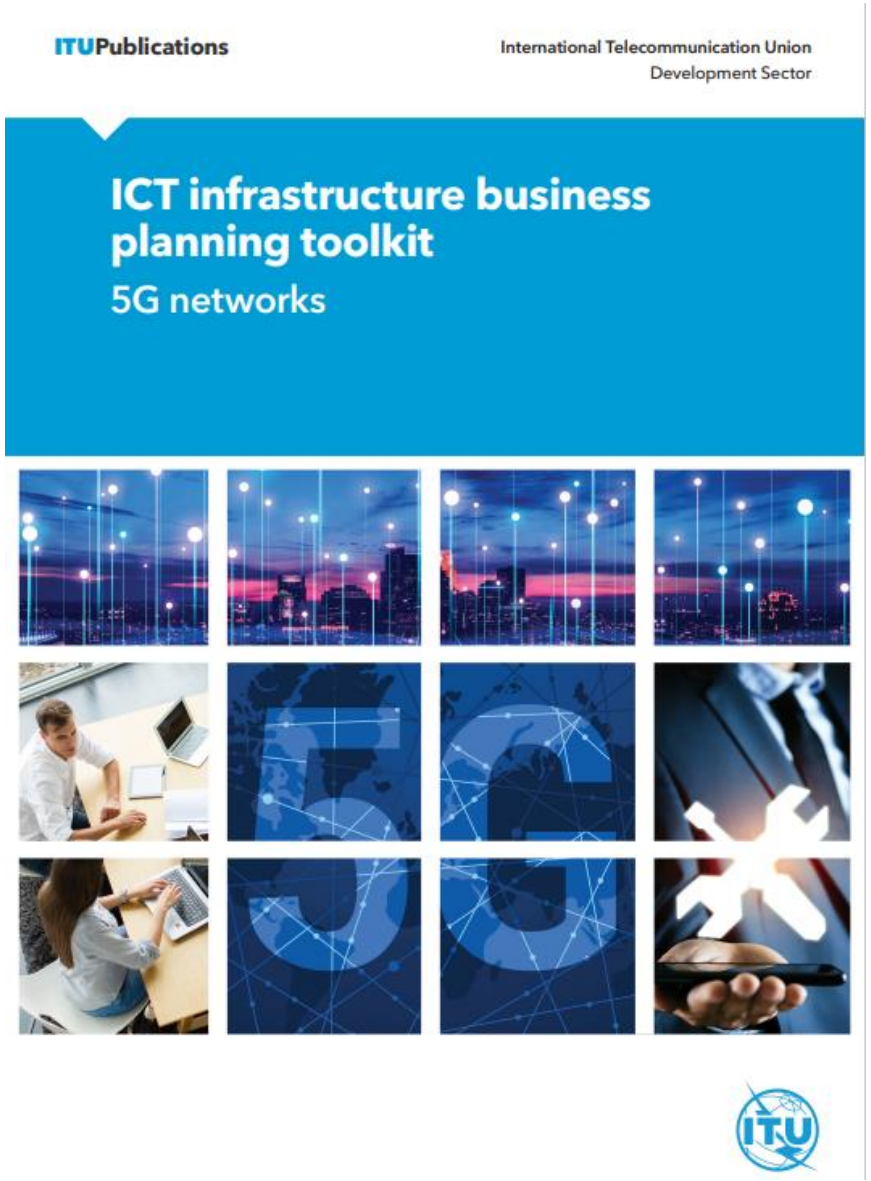
https://www.itu.int/dms_pub/itu-d/opb/stg/D-STG-SG01.05.1-2021-PDF-E.pdf

63	RGQ/187	Women, ICTs and development	United States/AMS	*women; girls; ICTs and development*	7
64	RGQ/193	Rural connectivity	United States/AMS	*broadband; ICTs; rural development*	2, 7, 8
65	RGQ/195	Expansion of Brazilian broadband network (Structural Plan for Telecommunication Networks – PERT)	Brazil/AMS	*broadband expansion; network; PERT; community networks*	2, 4, 8
66	RGQ/200	Access to banking services in remote, hard-to-reach and sparsely populated areas	Russian Federation/CIS	*remote areas; banking services; connectivity; identification*	2, 3, 6
67	RGQ/209	Promoting last-mile connectivity using reverse auctions	United States/AMS	*broadband; reverse auctions; rural development*	4, 8
68	RGQ/212	Using 5G in rural and remote areas: Lessons learned and implications from 5G trial service in PyeongChang and other remote areas	Rep. of Korea/ASP	*5G; 2018 PyeongChang Winter Olympics; 5G fixed wireless access; FWA; Edge cloud centre; UN Broadband Commission report; 5G village*	2, 5
69	RGQ/217	Strengthening the construction of rural information infrastructure	China/ASP	*rural; information infrastructure; rural revitalization*	2, 3, 6, 7

Broadband Interactive mapping systems



ICT Infrastructure Business Planning Toolkit – 5G networks



Thank you.